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Kienbaum Beratungen KB GmbH

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DEMONSTRATION MANUFACTURING PLANT REPORT

UNIDO Contract No. 75/41

Project No. TF/RAF/74/009

KB

KIENBAUM BERATUNGEN

DEMONSTRATION MANUFACTURING PLANT REPORT

UNIDO Contract No. 75/41

Project No. TF/RAF/74/009

Feasibility

Study for the Establishment of a Demonstration Plant
for Local Production of Tools, Implements, and
Simple Manually Operated Agricultural Machines
in
Tanzania, Botswana and Lesotho

Gummersbach, 13 April 1976

KIENBAUM BERATUNGEN GMBH

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Assignment

The UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO), Vienna, awarded the contract relating to a feasibility study for the establishment of a demonstration plant for local production of tools, implements, and simple manually operated agricultural machines in Tanzania, Botswana and Lesotho, on 3rd November, 1975 to Kienbaum Beratungen GmbH, Gummersbach, Federal Republic of Germany.

1.2 Performance

Kienbaum Beratungen GmbH assigned the following experts to the study:

Dr. Helmut Mylenbusch	Project Manager
Mr. Franz Heeke Expert in Mechanical Engineering	Team Leader
Mr. Fritz Glaser	Expert in Agricultural Engineering
Mr. Wolf Schmidt-Ahrendts	Expert in Economics.

After a short preparation of the team at the consultant's home office on the basis of UNIDO's advance telex information, the team leader Mr. Heeke visited UNIDO's headquarters at Vienna for briefing on 22nd and 23rd October, 1975.

Field work was started by a visit to UNIDO's Regional Representative at Nairobi, Kenya, from 31st October to 1st November, 1975 and commenced in Tanzania on 2nd November, 1975. After field work in Botswana and Lesotho a second visit was paid to Dar es Salaam from 13th to 21st December, 1975.

In addition to the above-mentioned three countries, a visit was paid to Kenya. Total field work was concluded on 10th January, 1976.

The mission's detailed itinerary is given in Appendix 1.

A first information on preliminary findings wos given to UNIDO by letter of 2nd December, 1975. On 15th January, 1976 the Project Manager, Dr. H. Mylenbusch discussed the findings with UNIDO, Mr. Swamy Rao. The present draft final report is to be discussed at a meeting at UNIDO's headquarters.

According to Article 2.09 (a) of the contract the final report is giving the details of each of the three Project Area Countries in three separate parts, the present part merely summarizing the integrating points of the project.

1.3 Aim of the Study

Rural development is closely linked with mechanization in ogricultural work. Besides irrigation, proper seed selection, fertilizing and pest and weed control the use of better agricultural tools and machinery contributes to improving agricultural production. In many countries, however, agricultural tools and machinery are not cheaply avuilable

in farming areas, and repair and maintenance services are usually poor.

In order to demonstrate the possibility and usefulness of local manufacturing and distribution of agricultural tools and implements, UNIDO developed the idea of implementing demonstration plants in selected areas. These demonstration plants shall be established to manufacture a feasible variety of tools, implements and machinery and provide maintenance and repair services.

It was the aim of this study to investigate the feasibility of such demonstration plants in the countries Tanzania, Botswana and Lesotho and to develop a concept for the implementation of appropriate UNIDO Projects in these countries.

2. SYNOPSIS

The findings have shown that the situation within the three Project Area Countries differs to some extent.

2.1 Tanzania

Tanzania, being a large country, has fairly developed urban areas near the coast and rather remote areas in the interior of the country. Production and imports of agricultural tools and machinery are not the bottlenecks of development, but rather distribution of these goods into remote areas, after-sales-service and proper application.

Tanzania has got already quite substantial manufacturing capacities for agricultural implements by "Ubungo Farm Implements Ltd." in Dar es Salaam. This factory has signed contracts for a second production line which will more than double its present output. There are further advanced plans to establish a new factory at Mbeya, the "Mbeya Farm Machinery and Implements Ltd." in cooperation with Indian engineering firms. In addition, there is a project to reorganize and extend production capacities for agricultural implements at TAMTU in Arusha.

The mission does not recommend more big production capacities in addition to these. The mission's recommendations are aiming at more efficient distribution on the one hand and at mobilizing technical village capacities on the other, in order to develop the market for larger units and to create a favourable climate for mechanization at village level.

The mission recommends for Tanzania:

Promotion of a network of technical village workshops which finally should cover every larger village in the country. These workshops are to act as

- supporting and service stations for agricultural mechanization,
- manufacturers of small and simple parts, spares, subsupplies,
- repair and maintenance stations,
- relay statian for technical know-how and understanding,
- breeding place for lacal creativity.

Promotion af an efficient technical training system which penetrates down to village level. This technical trading system should assure a better supply of hardware, tools and technical raw materials even to very remote villages, and provide the following services:

- convincing, demonstration, instruction, training,
- disseminating and introducing new ideas,
- assistance in developing local productivity to increase the purchasing power.

The technical trading system should also help in establishing a new pattern - exchanging as many goods as passible between villages within the region, keeping money circulating in rural areas.

Ta understand the need for an improved trading pattern it is necessary to remember that Tanzania's economy and trade have been oriented in the past towards the interests af foreigners. Present trade is largely a mere "distribution" of goods which are short in supply.

The recommended village workshaps and the proposed technical trading system shall be linked and cooperate with each other and with existing and planned large-scale industrial productian capacities in the country.

The mission recommends to implement the given recommendations on a test and pilot scheme basis ot first in two selected regions in Tanzania. One more backward and one more advanced region might be chosen. In each of the selected regions

one "Trading and Demonstration Center" and
four "Demonstratian Village Workshops"

should be established. As project period an initial period of three years is recommended. Thereafter it will be possible to implement the developed system in ather regions by evaluating and utilizing all experience made.

2.2 Botswana

Botswana, having great tradition in animal husbandry, is developing agricultural production and mechanization intensively. Local initiative is channeled into specific "farmers' brigades" and ather groupings. In collaboration with universities, research institutes and other competent organisations within as well as outside the country a multi-purpose farming implement, the so-called MAKGONATSOTHLE has been developed. This machine has been tested intensively, and a number of 35 test machines are being produced for practical field testing.

The mission recommends to establish as soon as possible a manufacturing plant for animal-drawn toolbars and general agricultural implements in Botswana. It gives full support to existing plans for series production of the locally developed toolbar MAKGONATSOTHLE which can be used with separate implements for specific aperations in soil cultivation and - with a cart body - for transportation use.

The mission recommends to plan for a production capacity of at least 500 to 1 000 machines a year.

The planned manufacturing plant must remain flexible. It should be in a position to adjust its production programme according to demand which can be expected to fluctuate and change with seasons and the income situation of farmers. It should produce also tools and parts for animal-drawn implements which used to have been imported from South Africa and which are nat going to be manufactured there any longer.

Care should be taken that the planned manufacturing plant receives sufficient built-in scope for growth and expansion. If the factory develops smoothly it will require an own foundry, forging and extended machine shop within a few years' time.

2.3 Lesotho

Lesotho, being a mountainous country, is highly depending on imports including food imports from South Africa. Migratory employment in South Africa contributes essentially to the per capita income in Lesotho. If methods and techniques of farming in Lesotho are not improved there will be the danger of a further decrease in agricultural production. The efforts of the government should, therefore, be strengthened.

Farmers who have obtained funds from their own or their familiy's migratory employment should find good after-sales-services for their tractors and other machinery. Animal-drawn vehicles should be manufactured locally and sold at cdequate prices in order to replace

primitive sledges which are still in use. Tools and implements which used to have been imported from South Africa should be manufactured locally as far as possible.

The mission recommends to establish as soon as possible a manufacturing plant for animal-drawn agricultural implements in Lesotho. It gives full support to the existing project of BEDCO - Basotho Enterprises Development Corporation (Pty) Ltd. - which plans to set up a manufacturing unit in the new industrial estate at Masern. The planned factory should start with production of some 500 to 700 animal-drawn carts a year (ox, donkey, horse carts). In addition, some 2 000 to 4 000 pieces/year of ploughs, harrows, cultivators might be part-manufactured and assembled under some form of cooperation agreement with a manufacturer in Botswana, Tanzania and any other appropriate neighbouring country.

The planned manufacturing plant must take up step-by-step series production of additional implements and tools as required by the developing agricultural sector in Lesotho.

Care shauld be taken that the planned manufacturing plant has sufficient built-in scope for growth and expansion. If it develops smoothly it will require an own foundry and forging shop within a few years' time.

3. BODY

3.1 Tanzania

3.1.1 Background Information

3.1.1.1 National Economic Background

Tanzania is a large, rather thinly populated country with 940 000 sq.km and 14.7 million people. 93% of the people are engaged in agricultural activities. The per capita income is about US $ 108 p.a.[1] Population growth rate stands at about 2.7% p.a.

Agriculture will remain to be the backbone of Tanzanian economy for a long time to come. Output of industry and mining are still very small (10.5%). Main exports are coffee, cotton, sisal, cashew nuts, cloves and diamonds. Total exports are about US $ 250 million per year.

Major food crops in Tanzania are maize, cassava, sweet potatoes, sorghum and wheat. An estimated 75% of soil cultivation in Tanzania is still done with hand tools.[2] Many farmers work enough land by hand to grow sufficient food for their families, especially in the case of poor rainy seasons. Local food production in Tanzania has not been sufficient during the last few years to meet the rising domestic demand. An alarming portion of 25% of foreign exchange goes for imports of food and food products in Tanzania.[3]

Agricultural methods differ in various regions of Tanzania according to rainfall pattern and soils. Some ox-ploughing is done in Arusha,

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1) UN Statistical Yearbook 1974
2) Report Koka Kesava Rao
3) Statistical Bulletin 1974

Moshi, and Iringa Regions. Tractor use is quite common in areas with export crops.

Rural people in a number of Tanzanian regions with poor rainfall are basically cattle-oriented. Cattle are here not simply regarded as a means of acquiring cash incomes but as a measure of a man's standing in the community and a store of wealth upon which he will only reluctantly draw. The contribution of the national cattle herd to the country's economic performance is disappointingly low. Tanzania produces only 9.64 tons of meat p.a. per 100 head of cattle (see Appendix 2).

The Government of Tanzania succeeded in resettling about 70% of her rural population in Ujamaa villages. These Ujamaa villages are cooperative societies with communal farm working, in line with old African traditions as well as with Tanzanian socialist policies. There are by now an estimated 6 000 established Ujamaa villages with a population of about 1 000 to 3 000 people each. The villages will form "development poles" in time to come, but at present only a minimum of infrastructure is provided. Most villages have a central water well or tap, but no electricity and roads. Communications and transportation are frequently posing severe problems because of remoteness and long distances. Houses within the village district are scattered (with small individual holdings) and of very simple design - clay walls and thatched roofs. Many of the Ujamaa villages are at present still in a transitional phase having not yet found a firm economic base.

Tanzania's present economy is passing through a difficult period. Rising fuel oil prices and the need for increased food imports have placed a heavy burden on her foreign exchange reserves. Two

exceptionally dry years reduced local food production considerably. Inflation has been running high at 76.2% for the year ending March 1975.[1] Food shortages and oil price increases appear to be the major contributors to inflation. The government was forced to restrict the use of private motorcars (no Sunday afternoon driving) to save on oil imports.

3.1.1.2 Development Outlook

Tanzania's economy depends to an overwhelming extent on agriculture. Agriculture in turn depends on sufficient rain and optimum use of available rainfalls. Optimum use of available rainfalls and moisture depends on more intensive soil cultivation. Rainy seasons are short and rainfall on uncultivated or poorly manually cultivated land is running off, lost.

Economic planning in Tanzania obviously has got the most urgent task on hand to push for modernization of the country's agriculture. Villages must achieve at least self-sufficiency. The prevailing subsistence farming then must be transformed step by step into a more dynamic market-oriented food production. Agricultural mechanization will play a major role in rhis transformation process.

Tanzania has got vast reserves in arable land (some 23 million hectares) and on the average more rain (above 750 mm p.a.) than many other African countries. Tanzania can very well become a substantial food exporting country instead of being dependent on imports, if balanced development of Tanzanian agriculture, i.e., extension of cultivated areas, improved seed selection, pest an weed control, use of fertilizers and mechanization will take place.

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1) Bank of Tanzania Economic Bulletin Vol. II-1

3.1.1.3 Project Background

The need to improve supply of agricultural implements to Tanzanian farmers has been realized since years. Demand and general situation are thoroughly analyzed in various reports.

UNIDO Report IND/792/3563
Mr. Taneja, 1973

This report is giving demand forecasts for jembes (hoes), pangas (knives), axes, other hand tools and animal-drawn implements, by evaluating present sales and import figures and assuming growth rates of 3 and 10%.

FAO - UNIDO Cooperative Project DP/URT/74/006/A/01/12
Mr. Koka Kesava Rao, January 1975

This report gives detailed information on existing and planned manufacturing capacities for agricultural implements in Tanzania. Demand forecasts are given again, using present consumption figures and assumed growth rates. The report contains a valuable chart identifying products according to the level of manufacturing technology.

FAO Mission Report URT 74/006/01/12
Assistance in Agricultural Mechanization, January 1975

This report deals with agricultural aspects of mechanization in Tanzania and with costs of tractor services. It recommends power mechanization only on a selective basis because of financing and management problems.

Emphasis in all reports and previous research work is on animal-drawn implements and hand tools, as powered agricultural machinery will be available only to a very limited number of Tanzanian farmers in the foreseeable future. The immense need for more agricultural implements in Tanzania is, however undisputed. The overriding question is to

what extent potential needs will turn into effective demand. This will depend to a large extent on supply and availability (local manufacture) and marketing efforts, including training in application and use.

To give an impression of the expected market some forecast figures may be cited:[1)]

	Annual Requirement 1979
Jembes (hoes)	2.4 million
Pangas	1.3 million
Axes	1.0 million
Pick-axes	23 000
Hand sprayers	18 000
Animal-drawn ploughs	21 000
Disc harrows	1 200
Cultivators	500
Ox-carts	900

During the "International Agricultural Machinery Manufacturing Development Clinic" held at New Delhi, India, in October 1974, various project proposals were formulated to assist in local manufacture of agricultural implements in Tanzania. Several project proposals are also outlined in the FAO report mentioned above. It is not within the scope of this study to set priorities for others' recommendations. However, the need of coordination of planned and ongoing projects became quite obvious during field work. All the mission's findings and investigations support the conclusion that the problem of agricultural mechanization in Tanzania requires an integrated approach. Isolated operating of manufacturing plants, design and development units or other promotional projects have very limited effects.

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1) Report Koka Kesava Rao

The UNIDO mission to Tanzania under this project was requested by SIDO - Small Industries Development Organization - in Dar es Salaam. This institution asked expressively to see the problems also under viewpoints of rural small-scale industrialization. Valuable information and inside views were gathered through arrangements of SIDO, government departments and ather institutians. The mission members would like this report ta be taken as complementary to previous more specific and detailed research wark of ather authors. They hape that their presentatian will be of good help in establishing new prajects.

In 1974 the Government of Tanzania requested assistance in a praject called

"Integrated Production and Marketing af Agricultural Tools and Implements".

The term "integrated production and marketing praject" might become an "umbrella" far agricultural mechanizatian and development of small-scale rural industries in Tanzania.

3.1.2 Findings

3.1.2.1 Government Policies

The Government of Tanzania is fully aware of the need to mechanize and modernize her agriculture. This was shown in all interviews. During the First Five Year Plan a short cut was tried by introducing a maximum number of tractors. However, the experience was made that the country cannot rely on tractors and motor-powered inputs only. A large number of tractors (an estimated 2 000 out of 9 000) is out of service or giving unsatisfactory results due to poor management and maintenance, or due to lack of spare parts and trained operators.

The Government of Tanzania is consequently embarking now on a programme of balanced mechanization whereby especially animal-drawn agricultural implements are to play a wider role. Animal draught-power is to supplement tractor-power and to replace handwork as far as possible.

The scheme of introducing animal power into Tanzanian agriculture on a wider scale is known under "oxenisation programme". This programme has been underway for years with only limited success up to now.

3.1.2.2 Rural Settlements

The "typical" Ujamaa village in Tanzania may have 200 to 500 families with 2 000 to 3 000 inhabitants living in scattered simple huts built with sticks, clay and rood thatching. Each family has an individual holding of 0.5 to 1 hectare. The village community farm may be up

to 300 hectares in size. Cattle is held mostly individually, grazing on common village ground. There is a minimum of infrastructure and very little communication to the outside world. The nearest neighbouring village may be 10 to 20 km away.

The Ujamaa village usually has got one cooperative store stocking the bare necessities of life and a few technical items like handhoes (jembes), knives (pangas) and axes. The range of offered goods is extremely narrow and limited, especially on the technical side. There are no tools, hardware and raw materials on display. The "typical" remote Ujamaa village is absolutely at the end of any supply line. Villages close to main roads or towns are somewhat better off.

Village people are working on the communal farm during the agricultural season. They appear to be mostly idle in between seasons which may be for up to six months a year. The rate of seasonal unemployment is extremely high, stimulating migration to urban areas and creating problems there.

There can be no doubt that the grouping of people in sizeable Ujamaa villages in Tanzania does mean a first step towards formation of "development poles". Such villages can be provided with all necessary infrastructure in time to come (water, schools, electricity, roads, shops, health facilities). They also can keep money circulating within their sphere with multiplying effects. It is apparent, however, that the Umajaa villages in Tanzania still need a lot of impulses before a self-supporting development will take place. These impulses must come from outside and through outside contacts.

3.1.2.3 Cultivation Methods and Farming

The main concern of soil cultivation and farming in Tanzania is conservation of rainfall and moisture. Rainy seasons are short and dry periods long and hot. Land of maximum size must be opened up at the beginning of the rainy season to absorb water. Ploughing and handhoeing, on the other hand, cannot be started before first rains have softened the ground. Thus the cultivation season is very short.

Soil cultivation in Tanzania is to an estimated 75% still done with hand hoes (jembes). Another 10% goes to animal-drawn cultivation and 15% to tractor work[1]. The large percentage of hand tool cultivation indicates the extent of prevailing subsistence farming. A farming family dependent on hand work will hardly be in a position to cultivate sufficient land for own food requirements.

The very limited present use of animal power in Tanzania finds its explanation in the traditional form of cattle management. Many Tanzanian farmers are basically cattle holders. They keep as many cattle as possible for reasons of prestige and social standing. Economic considerations are left aside. Overgrazing and overstocked herds are common in Tanzania with serious consequences to soil depletion and erosion. Animals are quite often extremely small and weak with low economic value (300 sh/head in Tanzania compared to 800 to 1.000 sh/head in other dry countries)[2]. Meat production in Tanzania is considerably below the possible potential (Appendix 2).

It appears to be a fact that after living through the dry season Tanzanian oxen are just not strong enough for ploughing and soil cultivation. Waiting for their recovery with the appearnace of fresh grass in the rainy season means missing precious time. Thus many farmers

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1) Report Koka Kesava Rao, January 1975

2) Diseases are also playing an important part, but undernourishment is anyway reducing resistance.

have no choice but using hand tools. The use of oxen for ploughing might be hampered in some Tanzanian regions also by sentimental feelings. Various tribes still appear to be using blood to supplement their daily diet. The use of oxen as draught power is then not just a technical problem.

The slowness and hardship of hand work quite obviously is a limiting factor to the size of the area which can be cultivated. One family on the average cannot work more than one hectare by hand in Tanzania. The slowness of handwork is further responsible for crude farming methods. Seed is usually sown by hand and then worked in. This results in losses due to poor germination (irregular and incorrect planting depth) and excessive competition of weed for moisture and nutrients. In-row planting with successive weeding would improve farming results and average yields considerably. This, however, means the use of drawn implements (planters-cultivators) ond draught power again.

The land situation in Tanzania is given as follows.[1)]

Land under cultivation	8.49 million hectares
Grazing and other land	2.51 million hectares
Uncultivated but potentially productive land	23.47 million hectares
Woods and forest	31.16 million hectares
Inland water	5.26 million hectares
Total country area	93.48 million hectares

The average yield for cereals (maize, millet, sorghum, wheat, beans) in Tanzania should be around 700 to 1 000 kg per hectare according to information drawn from previous reports[2)] and from own field

1) FAO information and Ministry of Agriculture

2) FAO Report

interviews. An increase of 50 to 100% appears possible which indicates the scope for intensification (use of planters, cultivators, harrows, sprayers, etc.).

There are some doubts about actuol land under cultivation and average yields. The country's requirements in cereals can be expected to be presently around 2.0 million tons p.a. (14.7 million people, 132 kg per capita[1]). The fact that cereals had to be imported in recent years leads to the conclusion that local production did not reach this figure. So there were probably far less than 8.5 million hectares under cultivation and/or average yields must have been far below 1 000 kg per hectare. There must be vast acreages of fallow land in Tanzania (shifting cultivation), even if one allows for a sizeable proportion of land to be allocated to production of export crops.

It is to be mentioned that the principles of successful modern farming are quite well known in Tanzania. Good and impressive results are achieved wherever the required technical inputs are available (estates, tractor-contractor cultivation, parastatal organisations). It appears as if some 10% of the Ujamaa villages do have their primary cultivation done by tractors.[2]

3.1.2.4 Level of Village Technology

The "typical" Tanzanian village is living in an extremely low-levelled technological surrounding. A diesel-driven grinding mill and water pump, sometimes a few ploughs, bicycles and some transistor radios might be all of the technical products in use beside agricultural hand tools (jembe, panga) and knives. Hammer, nails, a saw might not be available within reach of a one day's journey.

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1) Consumption figures 1964-66, UN Statistical Yearbook 1971

2) FAO Report

However, there is quite obviously considerable technical skill in Tanzanian villages. In some villages there are blacksmiths producing axes and jembes (crude but improveable). In other villages fine traditional steel spears are produced. Artisans in further villages may manufacture pieces of furniture (simple, but they can be improved). In all cases artisans have to get along with extremely little supplies in raw materials and tools.

There can be no doubt that creativity at Tanzanian village level and "do it yourself" artisan work would be greatly stimulated if more technical supplies came in (tools, raw materials, equipment, mechanical toys, demonstration models, technical literature). It has to be taken into account that most of the village people are inevitably idle in between agricultural seasons (up to six months p.a.). It can be expected that they are looking for useful work.

Scope and potential for industrial village activities may be demonstrated by the fallowing figures.

According to field information a "typical" Tanzanian Ujamaa village may have an income of 150.000 sh/year or less from agriculture. This represents the production of 150 hectares communal farms with a yield of 1 000 kg/hectare (yield of individual plots used for subsistence). The mentioned income of 150.000 sh/year could be doubled if only 30 talented artisans would produce "industrial" goods at a rate of 20 sh/person a day (which is easily achieved) for 250 days p.a. In a village of 2 000 to 3 000 persons there are bound to be a number of talented and trainable people. And there are quite a few products which can be produced at village level (see Annex of Report Koka Kesava Rao).

3.1.2.5 Farm Transport

There are an estimated 7 000 tractors in use in Tanzania[1] at present mainly working on estates and plantations for export products. Probably less than one third is working in villages and owned by villages, farmers or contractors. Exact figures are not available.

The mentioned tractors are accounting for a small amount of farm transport, quite frequently under neglect of economic considerations. Besides of that there is practically no transport at all available at village level except for human porterage and donkeys. There is no essential evidence of any oxen or donkey carts in many Tanzanian villages. The total number of animal-drawn carts in the country is estimated at only a few thousand. There are also no sledges or other forms of animal-drawn transport.

The lack of transport at farm and village level presents a serious bottleneck in rural and agricultural development in Tanzania. It is just impossible to raise farming above subsistence level without adequate means of transportation. Farmers need transportation for bringing their products to the market or other centers, to move implements and equipment between fields and home, for gathering animal feed (storage for dry season), firewood, manure and building materials or just for communication with neighbouring villages and nearest town.

Villages visited during field work in Tanzania placed oxen and donkey carts on top of their requirement list. The eagerness for animal-drawn carts offers the opportunity to introduce other animal-drawn equipment and to make the use of draught animals more popular. The potential market for oxen and donkey carts should be seen also under this viewpoint.

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1) UN Statistical Yearbook 1974
1973 figures plus estimated growth

Other countries in Africa are having about one oxcart per 250 village people in use besides numerous sledges and other primitive forms of transportation frames.[1] With a rural population of about 13 million people there is a potential market for 52 000 animal-drawn carts (8 to 10 carts per village).

Farm transport and transport at village level in Tanzania must be taken over by draft animals as far as possible. There can be no doubt that for a long time to come tractors will be too costly for short-haul farm transport. Tractors must be employed - for economic reasons - with first priority in primary soil cultivation and heavy duty work. A new tractor including implements costs about 60.000 Tsh, and it has been calculated that the fixed costs per hour for a 45 HP tractor amount to about 17 Tsh[2]. An oxcart might cost 1.200 Tsh. Some 70 hours of tractor waiting time thus are costing more than a new oxcart.

It appears as if the potential market for animal-drawn carts has not received adequate attention yet in Tanzania. Long-haul transport at present costs about 1 Tsh/ton-mile. It may be estimated that short-haul transportation at farm and village level will then have a value of 1 sh/ton-km. With this value one oxcart can contribute to the National Product at a rate of some 1.500 sh/year (2 ton-km/hr x 750 hr/year). Demand for transportation exceeds supply in any development phase (transportation to and from markets, supply of building materials, etc.).

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1) Agricultural survey in Lesotho

2) FAO calculation

3.1.2.6 The Agricultural Implements Market

The approximate sales and local production figures given in Table 1 below are in indication of the size of the present agricultural implements market in Tanzania.

	Estimated Number in Use	Present Annual Sales appr.	Present Local Production appr.
Hand Tools:			
Jembes (Hoes)	8.70 million	2.0 million	0.6 million
Pangas (Knives)	5.10 million	0.8 million	0.1 million
Axes	3.90 million	0.7 million	0.8 million
Sickles	1.00 million	80 000	2)
Shovels	0.50 million	50 000	2)
Grass Slashers	0.75 million	75 000	2)
Hand Sprayers	50 000	11 000	0
Animal-Drawn:			
Ploughs	100 000	12 000	10 000
Disc Harrows	4 000	600	0
Cultivators	4 000	350	50
Planters	500	40	40
Oxcarts	2 000	150	150
Tractors	7 000	600-800	Part Assembly

Table 1: Agricultural Implements Market in Tanzania[1)]

1) Reports Koka Kesava Rao, Taneja and information UFI

2) These items are frequently manufactured in crude quality by village blacksmiths. It is impossible to estimate volumes exactly.

The agricultural implements market in Tanzonia is coordinated by UFI, "Ubungo Farm Implements Manufacturing Company" in Dar es Salaam. This company is producing some important items (jembes, axes, ploughs) ond hos in addition the sole import right for 28 items (Appendix 3). Any quontities required in oddition to local production are imported by UFI.

According to own informotion UFI hod a turnover of about 10 million Tsh in their monufacturing plant last year. In addition, they imported goods valued at about 40 million Tsh, out of which 25 million olone went for jembes (1.4 million pieces).

Distribution of ogriculturol implements in Tanzonia is in the hands of the "Regionol Trading Corporotions" (state-owned). They handle agricultural implements along with a common range of consumer goods.

Prices for jembes ond ploughs are given as follows:

Jembes	17 sh/piece finol price
One furrow plough	280 sh/piece final price

Prices and quality of implements in the Tanzonian market compare favourably with international standards.

Table 1 clearly reveals that agricultural hand tools still form the bulk of the implements market in Tanzania. Total turnovers are estimated as follows:

Agricultural hand tools	60 million Tsh/year
Animal-drawn implements	4 million Tsh/year
Tractors plus equipment	40 million Tsh/year

Some demand forecast figures based on assumed growth rates of 3 and 10% have been given in section 1.3 above. It can be expected, however, that vigorous marketing efforts would speed up the change-over from hand tools to animal-drawn implements. The animal-drawn implements sector has sufficient scope to grow by 15 to 20% p.a. At present there are practically no marketing efforts in the Tanzanian implements market. The UFI budget for sales agents is as low as only 0.15% of total turnover.

In conclusion it must be stated that the market for agricultural implements in Tanzania is extremely underdeveloped, that the potential need is enormous but not exactly quantifyable. An attempt to derive the extent of necessary plough application is made in section 3.2 below. The potential demand for oxcarts in Tanzania is worked out in section 2.5 above to about 52 000. No information nor data are available for systematic demand analysis. On the other hand, there would be little practical sense in developing a more or less comprehensive analysis since actual requirements still have to be developed. This means that the market volume will develop in accordance with the marketing efforts in the Tanzanian implements market in the form of demonstration, instruction and training.

3.1.2.7 Local Manufacturing Capacities

The following local manufacturing capacities for agricultural implements are in production and in the planning stage.

3.1.2.7.1 Ubungo Farm Implements Manufacturing Co.Ltd.
Dar es Salaam

This factory was established with financial and technical assistance provided by the People's Republic of China in 1970. It is a subsidiary of the National Development Corporation. The present annual production[1] is about

600 000 jembes (hoes)
10 000 ploughs
2 000 groundnut shellers

plus a few thousand choppers and parts for ploughs. The company controls imports of some 28 key items of agricultural implements (Appendix 2). The quality of UFI products is good and carefully controlled. Through its sole import rights the company is to coordinate the agriculturol implements market in Tanzania so that it can build up local manufacturing capacity as soon as sufficient demand has developed.

The main problems of UFI in the past have been an unsatisfactory layout of the factory and tooling difficulties. Now a contract has been signed whereby a second forging line is to be installed. This should increase capacity to 2 million jembes p.a. and double the output in ploughs. The whole production unit will gain more flexibility. Cultivators or any other implements might be produced on oddditional production lines. Jembes, plough parts or soil wearing parts of cultivators can be produced alternately on the same presses.

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1) UFI Information

3.1.2.7.2 Tanganyika Agricultural Machinery Testing Unit (TAMTU) Arusha

This institute was originally set up for developing and testing agricultural implements and operates a small batch production unit producing about

60	oxcarts p.a.
10	donkey carts
40-50	ploughs and planters

According to information received from the Project Manager of TAMTU the philosophy of this project was not to establish large production units, but to serve in the adaptation of imported designs and manufacturing technology and in developing local ones according to the specific needs of local farmers.

The production of "TAMTU Developments" shall be carried out by local entrepreneurs. Up to now it seems as if this "dissemination" of TAMTU Developments is still suffering.

The small TAMTU production has little impact on the market. The selling prices are below actual costs of the expensive batch production.

TAMTU Developments could be mass-produced by establishing new factories and workshops. Another possibility would be to give TAMTU some additional equipment permitting TAMTU to take up volume production of selected items such as axles and wheels for ox and donkey carts. Axles and wheels could be supplied to villages where the carts would be completed by village artisans. TAMTU should be capable of producing 6 000 to 8 000 wheel sets p.a. after minor additional investments.

3.1.2.7.3 Other Manufacturers

There are some other manufacturers in the field of agricultural implements such as

- United Engineering Co., Arusha
  (Capacity 500 hammer mills p.a.)
- Prison Workshops
- Scattered private workshops in towns producing winnowers, carts, etc.
- Small village workshops

In general these manufacturers have remarkable underemployed capacities which could be mobilized if better supplies are orranged and coordinated marketing is practised. There appear to be also quite a number of machine repair shops which would be willing to take up series production of smaller parts as a sideline.

It should be mentioned that there is a need to extend the foundry capacities in Tanzania in order to facilitate the development of small-scale engineering works.

3.1.2.7.4 Mbeya Farm Machinery and Implements Mbeya

This factory is being planned and will be set up in the southwestern province of Tanzania in cooperation with Indian manufacturers. The related capacity is given as follows.

Jembes	1 000 000 pieces p.a.
Pangas	500 000 pieces p.a.
Axes	250 000 pieces p.a.
Pickaxes	20 000 pieces p.a.
Sickles	75 000 pieces p.a.
Shovels	50 000 pieces p.a.
Hand sprayers	20 000 pieces p.a.

Animal-drawn:

Ploughs	10 000 pieces p.a.
Disk harrows	1 000 pieces p.a.

Spares for ploughs and harrows: 1 000 tons p.a.

Tractor-drawn:

Dis ploughs	800 pieces p.a.
Disk harrows	500 pieces p.a.
Cultivators	200 pieces p.a.

It is expected that production will start before 1978.

Summarizing existing capacities and planned and potential new ones the picture for 1979 is as follows.

	Potential Production Capacity 1979	Potential Producer
Jembes	3 miilion	UFI & Mbeya
Pangas	500 000	UFI & Mbeya
Axes	250 000	UFI & Mbeya
Sickles	100 000	UFI & small-scale mfgrs.
Shovels	50 000	UFI & small-scale mfgrs.
Grass slashers	100 000	Small-scale manufacturers
Hand sprayers	20 000	Mbeya
Animal-drawn:		
Ploughs	30 000	UFI & Mbeya
Disc harrows	1 000	UFI & Mbeya
Cultivatars	1 000	Small-scale manufacturers
Planters	2 000	Small-scale manuf acturers
Oxcarts	8 000	TAMTU and others
Tractor-drawn:		
Disc ploughs	800	Mbeya
Disc harrows	500	Mbeya
Cultivators	200	Mbeya

Table 2: Potential Production Capacity for Agricultural Implements in Tanzania

Increased production capacities in future will mean more flexibility. The forging lines can turn out hoes as well as parts for ploughs. Arranging ancillary supplies from big factories (soil wearing parts, etc.) allows mobilization of capacities in small engineering firms. Sa it can be expected that some form of rational specialization and division of labour will take place in agricultural implements manufacturing in Tanzania. With this, however, the development of an integrated marketing and productian strategy becomes indispensable.

The mission feels that existing and planned production facilities for agricultural implements in Tanzania are meeting the present situation. This, most probably, because the capacities are designed to patential demands. Effective sales, however, will only be possible if the market is developed, i.e., if comprehensive marketing efforts are extended to farmers' level and if better repair and maintenance services are provided.

3.1.3 Conclusions

3.1.3.1 The Nature of the Problem

Tanzania needs more food and agricultural products. She can grow more agricultural products by extending the area under cultivation. There are sufficient arable land reserves available for doubling or tripling the size of fields. Such additional lands, however, can no longer be worked by hand. The cultivation season is short and dictated by annual rainfalls. A prerequisite of agricultural expansion is mechanization.

Tanzania could grow more agricultural products also by intensification. Changing to more refined cultivation methods might increase the average yield by more than 50%. This means in-row planting, careful weed control and tillage. Again the prerequisite is mechanization - use of planters, cultivators and harrows.

The bottleneck in Tanzania is caused equally by draught power and by implements. Since tractors cannot be provided in sufficient quantity, the only available source of additional draught power are animals - oxen and donkeys. There is no substitute in sight. Reverting to animal draught power on a larger scale in Tanzania imperatively means the need to improve animal husbandry. Weak and undernourished oxen are not able to pull a plough, especially not after the dry season when rainfalls set in and when oxen are urgently needed.

Ox-ploughing is done in some regions of Tanzania (Arusha, Moshi and Iringa). In most other regions this practice is practically unknown. The two major alternatives in the present mechanization strategy in Tanzania are as follows.

(1) Concentrate available production facilities and foreign exchange on intensification implements (planters, harrows, cultivators, etc.). These implements are rather readily accepted by those farmers who are already used to ox-ploughing.

(2) Concentrate available production facilities and resources on extensification implements (ploughs) and try to introduce animal-powered primary cultivation in new regions. Extension has more scope, but introduction of ox-ploughing in new regions is difficult and time-consuming because of ethnical and social barriers.

Agricultural mechanization in Tanzania on a broader scale imperatively requires raising of the technological level of villages in any case. There is no use in introducing ploughs and new mechanical implements as long as there is no back-up service and no blacksmith, mechanic or technical understanding at lower levels. Raising of the technology level in villages means more workshops on village level and more technical trade.

What is missing on village level is

- demonstration,
- instruction / training,
- after-sales-service (maintenance and repair).

These are appropriate means to develop mechanization in farming and agricultural production and thereby to develop the market for agricultural implements, tools and machinery.

3.1.3.2 The Size of the Problem

Tanzania will have a papulation of 16.8 millian people by 1980. To feed this population some 3 million tons of cereals plus 3 million tons of potatoes, cassava, etc. are required.[1] This means that with the present average yields same 5 million hectares must be cultivated beside of plantations and estates which are producing for exports.

Optimistically it might be assumed that there are some 2 500 tractors working at present in Tanzania on lands for food production outside estates and plantations. Another optimistic assumption is that this number can be increased by 14% p.a. Then there will be 5 000 tractors outside estates and plantations in 1980. Under favourable conditions each tractor could cultivate 100 hectares p.a. This sums up to a total of 500 000 hectares.

It was estimated that at present 100 000 ox-drawn ploughs are in use in Tanzcnia. With the existing and planned lacal production facilities this number can be increased by 15% p.a. So by 1980 there will be more than 200 000 ploughs. It may be assumed optimistically that one ox-plough will work 5 hectares p.a.[2] This sums up to a total of 1 million hectares.

There is still an alarming portion of 3.5 million hectares left to hand cultivation after the optimistic calculations for tractor and animal powered tillage. The need is obvious for getting even more tractors and ox-ploughs in use, if possible. Emphasis will be on extensification (replacement of handwork) rather than on intensification. The introduction of ploughs must come before harrows, planters, etc.

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1) Calculated from UN statistics

2) One plough works 3.1 hectares in Botswana, 4 to 5 hectares in Lesotho

Each ox-plough on the averoge requires a team of four oxen (optimistically estimated). The introduction of additional 20 000 to 25 000 ploughs a year means thot Tanzania must bring each year an additional number of 80 000 to 100 000 drought animals (oxen and donkeys) into the field. Donkeys may take over a reasonable share, as they are still keeping in good health where oxen find no more fodder. There are 160 000 donkeys in Tanzania.

It becomes cleor that it is a gigantic task to bring each year 80 000 to 100 000 draught animals into operation. But Tanzania has no alternative, if she wants to raise her food production and the level of her agriculture. She could try to increase the number of tractors at a faster rote, but the effects would be insufficient in any case, irrespective of costs. Tractors too would leave most of the secondary tillage and farm transports to animal power, thus not eliminating the need for more draught onimals.

Tanzanio has o cattle population of 11.3 million heads. She produces only 9.64 tons of meat p.a. per 1 000 heads against 15.6 tons in Kenyo and 19.5 tons in Botswana. Cattle herds in Tanzania are mostly overstocked ond poorly fed. It is o policy point of the Livestock Department to reduce the number of cattle by at least 20% in order to enable the remaining herds to feed well. Reducing the number of heads in connection with better feeding appears to be a prerequisite also for recruiting the required number of draught animals.

3.1.3.3 Conceptual Framework for the Solution

The agricultural machanization process in Tanzania calls for more technical activation at village level and for an integrated marketing and production strategy. Active marketing is required as an instrument for speeding up supplies and for guiding demand and consumption into desirable directions. Technical activation at village level is required to support mechanizatian physically (maintenance, repair, small-scale manufacturing) and mentally (introducing new points of interest, reduce narrow-minded cattle arientation, facilitate recruitment of draught animals). The idea has to be accepted that each of the 6 000 villages in Tanzania eventually will need a metal warkshop (blacksmith, mechanic) and a woodwarking workshop (carpenter) if agricultural mechanizatian and better animal husbandry is to find a secure and broad base. The workshops must be linked ta the industrial natianal economy by an efficient supply system (hardware, raw materials, implements, trade, demonstratian, instructian, trcining, exchange of products and subsupplies).

3.1.4 Recommendations

In order to create a safe basis for agricultural mechanization in Tanzania it is proposed to promote

- a network of technical village workshops which eventually must cover every larger village,
- an efficient technical marketing organisation which penetrates down to village level.

Village workshops and technical marketing organisation should be established first in two selected regions on the basis of a pilot scheme project over a period of three years.

One region might be chosen in which there is no ox-ploughing and mechanization at all as yet. The second region could be somewhat more advanced. Provisionally it is suggested to take the Arusha and Dodoma regions as pilot regions (Appendix 4). The final decision, however, is up to discussion.

3.1.4.1 Establishment and Fostering of Village Workshops

It has been mentioned that in a "typical" village of 2 000 to 3 000 inhabitants there are bound to be a number of people with special skills, interests, and eagerness. These people need advice, tools and raw materials to become productive.

A village with 2 000 to 3 000 inhabitants needs specialization and diversification. Such a concentration of people just cannot progress without specialized services of blacksmiths, mechanics, fitters,

carpenters, tailors. The necessary development towards a mixed agricultural-industrial society at village level needs to be recognized and supported.

The need for specialization and grouping of progressive interests has been realized in other developing countries. In Botswana there is the institution of "brigades". Village people with common interests are forming "engineering brigades", "carpenters' brigades", "builders' brigades", etc. In other countries such formations are calling themselves clubs or some other designation. The name does not matter. What matters is the fact that the initiative to form a group must come from the village level. The grouping must find its roots within the community.

The formation of a "club" or "brigade" in other countries usually is organized by a village individual who heard about the idea and got interested. As soon as he has found sufficient members for a group the "club" or "brigade" will register itself officially. (In Lesotho there are about 15 new registrations p.a.) Then it may look for funds, technical assistance, tools and raw materials with some guidance from government departments or regional development institutions. The club or brigade will run its financial affairs completely independently. Technical assistance may be given by volunteers, short-term advisers or sporadically by trainers and experts.

It is recommended to accept and promote the idea of "brigades" or "working clubs" in villages of Tanzania. The name does not matter. For the sake of simplicity the term "brigade" will be used hereafter.

The idea of forming "brigades" in Tanzanian villages should receive publicity at first in the two (provisionally) selected pilot regions of Arusha and Dodoma. The first villages responding to the idea should

receive special assistance by establishing pilot village workshops which can be copied later in other villages as required.

It is recommended to establish two metalworking and two woodworking pilot village shops in each region. This is to be done in cooperation with such "brigades" which appear most advanced and active. The pilot operation should last three years.

The proposed pilot village workshops must be simply equipped. Tools and equipment should match the expected limited initial skills and management capacity. It is to be taken into account that most Tanzanian villages do not have electricity supply. Such villages need hand tools, hand grinders, drilling machines, and simple wood-working equipment.

The recommended pilot village workshops and "brigades" will require considerable technical advice, training and guidance over a longer period of time. Basic training and technical guidance will have to come from SIDO experts, volunteers or extension services. A constant supply of specific advice and new ideas should flow in afterwards by the proposed technical marketing organisation. It should be remembered that there is a considerable training and development effect in technical trade and improved communication.

In general, the recommended village workshops in Tanzania should act as

- supporting stations for agricultural mechanization (repair and maintenance),
- manufacturer of small and simple parts,
- catalyst for dissemination of technical know-how,
- intelligence units for tackling technical village problems,

- manufacturers' representatives (feedback of information),
- breeding place for local creativity,
- training centers.

In short, the "brigades" and village workshops must raise the technological background of village life.

3.1.4.2 Establishment of an Efficient "Technical Supply Organisation"

It has been explained that there are practically no technical supplies available in "typical" Tanzanian villages at present.

To improve the technological level of villages and enable village workshops to function, it is absolutely necessary to assure a constant supply of hardware, raw materials and also new ideas. For this reason an effective marketing and supply system must be built up which really penetrates down to village level. It should be remembered that many of the villages are completely new and that the traditional trading pattern of Tanzania served outside interests. Historically no specialized hardware trading system has been built up as yet which could cover the new Ujamaa villages. The (government owned) State Trading Companies are doing a substantial lot of distribution, but it is beyond their scope to become involved in specialized technical trading which requires service, expertise, advice, research and sound technical judgment to detect unused resources and suitable equipment to exploit them.

It is recommended to build up a more efficient technical marketing and supply organisation in Tanzania with the following tasks.

- Secure a better general supply of tools, hardware and raw materials to villages in order to stimulate development of technical skill, self-help-mindedness and productive work (do-it-yourself movement in between agricultural seasons);

- disseminate technical know-how and general knowledge by "sales talk" (educational effect of communication); sales talk means demonstration, convincing, explaining and exchange of arguments;

- promote and "sell" productive capital goods (oxcarts, ploughs, implements) as new status symbols (alternative to overstocked cattle herds) enhancing prestige ond pride of villages and individuals (good quality products are important);

- support village workshops by supply of raw materials, tools, subsupplies (oxcart axles, semi-finished articles) and by giving advice and marketing assistance (offering products from one village to the others);

- establish a feedback to manufacturers by presenting practical experience, ideas for improvement and new requirements to factories and giving regions an instrument to actively influence national mechanization policies;

- generally mediate between demand and supply capacities, detect underemployed capacities on the one hand and unsaturated needs on the other, arrange for orders.

The more efficient "Technical Supply Organisation" should be built up first in the two selected pilot regions - provisionally Arusha and Dodoma have been chosen.

The proposed "Technical Supply Organisation" would have to act to a certain extent as marketing force for "Ubungo Farm Implements Manufacturing Co. Ltd.". Its sales programme would have to include the 28 items confined to UFI (Appendix 3), plus a variety of other tools and raw materials. The "Technical Supply Organisation" could be a sister company or affiliate of UFI and cooperate closely with Regional Trading Corporations which are holding UFI agencies. The working relationships should be similar to those with (expatriate) sales and service engineers for tractors, but have a much wider scope. These specialized sales and service engineers (paid by tractor suppliers) are based temporarily at the offices of Regional Trading Corporations. From this base they travel, visit customers giving advice, assisting in maintenance and repair, train service workshops, bring spare parts along and try to create a favourable atmosphere for introduction of their tractors.

To establish the "Technical Supply Organisation" two experienced expatriate sales, service and marketing engineers will be required. They must work in teams with broadly trained local counterparts.

The nature of this task requires an extensive amount of travelling to villages, market places and gathering points. For these travels a sturdy 4-wheel-drive estate car must be used. The car will carry a certain range of popular trading wares, tools, materials and implements along for sale, display and demonstration. In very remote areas some demonstration sales work might be combined with occasional service functions (welding a broken part against charges, etc.).

The two experienced expatriate sales, service and marketing engineers for building up the supply system in the two pilot regions will be required for 36 months each. After that period sufficient local experience should have been built up.

3.1.4.3 Objectives and Expectations

The objectives of the recommendations as outlined above in the previous section are summarized as follows.

- Create a more favourable technological climate at Tanzanian village level for speeding up the agricultural mechanization process and general development,
- mobilize skills and industrial village capacities in order to support agricultural modernization and supplement production programmes and capacities of large-scale industries,
- establish a technical communication line (service / feedback) between end user of agricultural implements and manufacturers.

These objectives might be combined under the term of "integrated manufacturing and marketing".

Undoubtedly improved trade and increased technical supplies are accelerating factors in the development process of any society. Agricultural inputs in a test area in another country of Africa increased by 30% within one year after establishing a network of "supply points"[1]. It may confidently be expected that industrial and technical activities in Tanzanian villages will be stimulated in a similar way as soon as more technical supplies are coming in.

It can be expected that technical implements and activities will have a checking effect also on excessive cattle-orientation. Oxcarts, ploughs, better housing, industrial jobs, etc. are distinct factors towards a more settled agriculture-oriented life. Oxcarts, for instance,

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1) Thaba Bosiu, Lesotho

could become quite fast a status symbol just as important as a big cattle herd. This has been experienced in other developing countries.

A more favourable technological and supply climate can thus be expected to contribute essentially to improved stock farming which can release an enormous development potential (increase of meat production to a similar level as in neighbouring countries).

Another important aspect of the recommended technical supply organisation will be the set-up of a new trading pattern. As many goods as possible must be interchanged between villages within the region to keep money circulating in the area and to save on transportation costs. This new trading pattern will evolve automatically as the supply organisation takes on some or all of the marketing functions for the pilot workshops or any other workshop it supplies with raw materials.

3.1.5 Project Characteristics

It was recommended to implement the idea of "brigades", the establishment of pilot village workshops and the "Technical Supply Organisation" at first in two regions. The Arusha and Dodoma regions were provisionally suggested; this final choice and decision is, of course, still open.

Based on prevailing conditions in Arusha and Dodoma regions some major project characteristics are outlined as follows.

3.1.5.1 Pilot Village Workshops

It is expected that sufficient village initiative will come up for forming two "engineering brigades" and two "carpenters' brigades" in each region. Thus a total of eight pilot village workshops can be established, i.e., four metalworking and four woodworking workshops. A smaller number of pilot village workshops will be established at first if less than eight "brigades" register themselves. Additional funds and credits are to be sought if more than eight "brigades" are coming up.

The activities and working programmes of the village workshops must be tailored to the needs of the village and to the capabilities and skill of the "brigades". They will differ from region to region.

In the Arusha region there is more rain, relatively fertile soil, a farmer community used to some ox-ploughing, considerable income from estates (export products), a lot of tourism, some good infrastructure (roads), a rather high degree of motorization (tractors and cars) and a nearby supply of timber.

In the Dodoma region there is less rain, more subsistence farming, more stock farming, only initial use of oxen for ploughing and cart transport, no income from tourism and export, limited infrastructure (railway, but poor roads), a very low degree of motorization, poor supply of local timber (thornbushes), but good growth potentials in the town of Dodoma because of its new status as capital of Tanzania.

Arusha and Dodoma are neighbouring regions; the distance between the towns of Arusha and Dodoma is 492 km.

The following summary gives an idea about the main characteristics of the proposed eight pilot village workshops. Prevailing conditions in the pilot regions are taken into account. However, individual adjustments will have to be made from case to case. It is assumed that one pilot village workshop in each region can have electric power supply. The average strength of one "brigade" is assumed to be six men. It is estimated that about 50% of the turnover will be value added. This means that the other 50% are inputs in the form of raw materials, subsupplies, energy and auxiliaries.

The equipment provided for the pilot village workshops must be adequate. However, the value of equipment - as a rough guideline - should not exceed the expected one year's turnover. There appears no sense in overcapitalizing new village workshops. Management capacities and individual skills need time to adjust to and appreciate tools and equipment. The initial equipment should be sturdy and simple, it may be of second-hand origin. Additional tools and equipment may come in after one or two years of operation.

Each of the proposed pilot village workshops will require an initial working capital of US $ 1.250 (Ts 10.000). This is to be written off over the project period of three years.

Number	Pilot Village Workshops	Project Phase 3 Years				Possible Production Programme and Activities	
		Strength of Brigade	Estimated Turnover p.a.	Equipment Used	Value of Equipment	Arusha Region	Dodoma Region
(2 each region) 4 (1 each region) 2 (1 each region) 2	Engineering Workshop I (with power supply)	6 Men	Tsh 80,000 US $ 10,000	1 arc welder 1 metal cutting saw 1 drilling machine 1 shear punching mach. 2 grinders 1 forging hearth 1 set of small tools work benches + vices anvil, etc.	US $ 10,000	Simple car and tractor repairs, manufacturing of simple steel structures, water towers, etc., assembling and part-manufacturing of animal-drawn planters and cultivators, ox-carts, all welding work.	Manufacturing of simple steel structures for water supply etc. welding); manufacturing of welded ox-carts and parts for ox-carts; repair and maintenance; part-manufacturing of animal-drawn implements.
	Engineering Workshop II (no power supply)	6 Men	Tsh 40,000 US $ 5,000	1 forging hearth with blower 2 hand grinders 2 hand drilling mach. 1 shear / punch 1 pipe threading equipment 1 set of small tools work benches + vices anvil etc.	US $ 5,000 (incl. install.)	Repair and maintenance of tractors and animal-drawn equipment, assembling and part-manufacturing of ox-carts (axles and wheels subsupplied), planters and cultivators; installation of water piping etc., forged products.	Assembling and part-manufacturing of ox-carts (with supplied axles and wheels); manufacturing, repair and maintenance of animal-drawn implement installation of water pipes, wells, pumps, etc.; production of forged products.
	Carpenter's Workshop (no power supply)	6 Men	Tsh 40,000 US $ 5,000	2 work benches 2 sets of hand tools (saw, chisel, planer) 1 hand grinder 2 hand drilling mach. 1 foot-operated lathe	US $ 5,000 (incl. install.)	Simple carpenter's work; ox-cart bodies; wooden parts for supply to other regions.	Simple furniture and carpenter's work; ox-cart bodies; production of small turned parts from thorntree wood handles, toys, etc.
	For 2 pilot regions	Turnover: US $ 50,000		Investment:	US $ 50,000		

1) See also Appendices 5 and 6

3.1.5.2 The "Technical Supply Organisation"

It is expected that the proposed "Technical Supply Organisation" will be associated in some way with "Ubungo Farm Implements Manufacturing Co.Ltd." and that it will share offices with the Regional Trading Corporations which are the agents of UFI.

The "Technical Supply Organisation" in the two selected pilot regions will thus have its base in the existing offices of the Regional Trading Corporations in the towns of Arusha and Dodoma.

It will organize and channel more supplies to the villages through the Regional Trading Corporations and will always combine such supplies with technical advice, assistance, demonstration and some training wherever possible.

3.1.5.2.1 Personnel

The "Technical Supply Organisation" in the pilot scheme will consist of a team of six persons in each of the regions.

	Expenses p.a. US $	Expenses p.a. Tsh
1 expatriate sales-service engineer (Manager)	48.000	
1 local counterpart engineer (Assistant Manager)		40.000
1 administrative officer		14.000
1 typist		10.000
2 drivers		16.000
for each region:	48.000	80.000
Total for two pilot regions	96.000	160.000

The "Technical Supply Organisation" is arranging for and assisting with orders, although actual order handling will be done by the staff of the Regional Trading Corporations. For this reason a relatively small number of staff is sufficient.

3.1.5.2.2 Office

An office space of 30 sq.m will be required. The estimated annual costs of the office (including share of telehone, furniture, stationery) are in each reagion Tsh 8.000

Total for two regions Tsh 16.000

3.1.5.2.3 Travelling

The nature of their task require the Manager as well as the Assistant Manager to travel extensively for the "Technical Supply Organisation". Each region may have some 200 larger villages, and each of these should be visited several times a year. With an average operating radius of 100 km around the base in Dodomo and Arusha towns some four to five villages can be covered each day. Manager and Assistant Manager will do some of the travelling together, some individually. With 120 travelling days and a total mileage of 40 000 km p.a. each they should be in a position to see each larger village at least twice a year and any village of more importance (villages with pilot workshops or any private imitiative) once a month.

Manager and Assistant Manager require each a sturdy 4-wheel-drive estate car.

2 estate cars per region à 6.000	US $ 12.000
4 estate cars for two pilot regions	US $ 24.000

Operating costs will be about 0.15 US $ per km;

per year and car	40 000 x 0.15 US $ 6.000
Total for 4 cars in 2 pilot regions	US $ 24.000

3.1.5.2.4 Working Capital

The "Technical Supply Organisation" will help in organizing more supplies of agricultural implements to villages as per UFI list (Appendix 3). For these items a basic distribution system exists which might be improved by more technical service, demonstrations, market research, etc. No new capital will be required.

The "Technical Supply Organisation" then will organize basic supply of raw materials, hardware and do-it-yourself tools to all villages. This will include, but not be limited to

- hammers, pliers, saws, drills,
- chisels, files, taps,
- a basic assortment of bolts and nuts,
- a basic assortment of nails,
- a basic assortment of spanners and screw drivers,
- some raw materials (pipes, plates, small sections).

This basic supply will be put on display and for sale in each village store. Estimated supplies

per village	US $ 100
per region / 200 villages x 100	US $ 20.000
for two pilot regions	US $ 40.000

The pilot village workshops (section 3.1.5.1.1 above) will need raw materials and subsupplies at a rate of about 50% of their expected turnover (US $ 50.000) = US $ 25.000. It is expected that existing small village workshops and other enterprises deserving promotion and perhaps new "brigades" will ask for supplies summing up to a similar amount of US $ 25.000.

Summary of new supplies in the two pilot regions:

Tools and hardware on display in village stores	US $ 40.000
Raw material and subsupplies to pilot workshops	US $ 25.000
Supplies to existing workshops deserving promotion	US $ 25.000
Total required working capital:	US $ 90.000

This working capital should form a continuously revolving fund to be used for financing new orders and imports. But initial material losses are unavoidable (rejects, spoilage, broken tools, etc.). It is suggested to write off the working capital in full over the project period of three years.

3.1.5.2.5 Operating Costs

The "Technical Supply Organisation" should live from trading profits in the long run. In the short run it will depend on subsidies. It should be realized, however, that it is not the intention to subsidize the price of supplies, but rather the costs of getting supplies through to the villages. Village people are to pay the same price as people in towns.

The "Technical Supply Organisation" will have approximately the following annual operating costs in both regions:

Expatriate Engineers		US $ 96.000
Local Personnel	Tsh 160.000	20.000
Office expenses	16.000	2.000
Travelling expenses		24.000
Working capital (1/3 of 90.000)		30.000
Miscellaneous		8.000
Total operating casts in two regions:		US $ 180.000

After its initial start-up phase the "Technical Supply Organisation" should be able to achieve an average turnover af at least US $ 500 per village and year. This would amount to a tatal turnover of US $ 200.000 in the estimated 400 large villages in the two selected pilot regions of Arusha and Dodoma. With 15% trading profit the earnings would be US $ 30.000. The "Technical Supply Organisation" has got a realistic chance of covering its operating costs after three years when turnover has increased and when expatriate experts are no longer needed.

3.1.6 Institutional Set-Up

3.1.6.1 Frame

The "Ubungo Farm Implements Manufacturing Co.Ltd." in Dar es Salaam have expressively explained that they feel an urgent need for improving their marketing. They would like more market research and a close cooperation with village workshops to shift assembling work and simple part-manufacturing of agricultural implements into villages.

The "Ubungo Farm Implements Manufacturing Co.Ltd." has at present an extremely limited sales budget of only Tsh 60.000 p.a. This is by far not sufficient to cover extensive sales services such as demonstrations, organizing of repair agencies, market research, etc. An increase of the sales budget, on the other hand, would not be possible without (substantial) increases of product prices which would mean a hardship to farmers.

SIDO - "Small Industries Development Organization" in Dar es Salaam have a declared interest in developing industrial village activities. They are showing a growing concern about development problems of village skills and existing village capacities.

At present SIDO is training 25 local engineers overseas for extension services. It is planned to provide wide advisory services to potential small-scale industries in villages. Manufacturing of agricultural implements will receive high priority. Several expatriate experts and volunteers are working already with SIDO.

The "Ministry of Agriculture" in Dar es Salaam is showing growing concern about the slow progress of agricultural mechanization in Tanzania. A committee was appointed in November 1975 to find ways and means to accelerate the process. The "Livestock Department" is trying to induce stock farmers to reduce their stock by 20% in order to improve the remaining herd.

There is the obvious task to coordinate the prevailing needs and on-going projects and to investigate as to how the project recommendations of this report would fit in.

3.1.6.2 Organisation

It is evident that the recommended pilot village workshops and the "Technical Supply Organisation" can function smoothly only if close cooperation is assured between

SIDO - Small Industries Development Organization,
UFI - Ubungo Farm Implements Mfg.Co.Ltd.,
RTC - Regional Trading Corporations,
NDC - National Development Corporation,
NSC - National Steel Corporation (for raw materials),
TAMTU - Tanganyika Agricultural Machinery Testing Unit.

A general coordination is required with the Ministry of Agriculture and the Ministry of Industries.

As a concept it might be suggested to form a new company for taking over the tasks of the "Technical Supply Organisation". The shares of this company could be held by

- SIDO,
- UFI,
- NDC,
- RTC

in a balanced distribution. For better understanding to outsiders it should be mentioned that quite an extensive interlinkage of share-holdings exists already between these companies. NDC as the most important financial body in Tanzania holds furthermore interests in a number of other Tanzanian companies.

It is reiterated that the "Technical Supply Organisation" should live in the long run from trading profits. In the short run some subsidies will be required, and the company must have access to development funds. It should be clear that subsidies are not given to lower the actual prices of technical supplies. The subsidies are required to cover excessive transportation and sales costs, to bridge sales barriers and to establish a communication link between remote villages and manufacturers - briefly, to get technical products really through to ultimate consumers.

The proposed pilot village workshops and "brigades" appear to be clearly falling under the competence of SIDO. But also here individual and separate companies should be formed with local "development boards", "trusts" or cooperatives as partners. It is of utmost importance that "brigades" and village workshops are run along the lines of business management. They will absorb considerable support in the form of free advice and consulting services. There is also an excellent opportunity of linking up the assistance to new "brigades" with available volunteer services and existing extension services of SIDO. The village workshops should not require cash subsidies.

In Tanzanian Ujamaa villages people can be expected to do some free work for the sake of development and training. They are used to this, and thus labour costs are not a constraining factor during the initial start-up period. In view of all of this the conditions for overcoming the infant phase are good.

3.1.7 Proposed UNIDO Assistance

It is recommended to start an efficient "Technical Supply Organisation" in two regions first on a pilot scheme basis with four pilot village workshops in each region. UNIDO-UNDP assistance in the implementation of these recommendations is suggested by the following.

3.1.7.1 Assign two Marketing-Engineer Experts

These experts will be required for 36 months each. They will work as Regional Managers of the new company:

"Technical Supply Organisation".

The experts will be responsible to the Board of Directors of this company (probably formed by SIDO, UFI and NDC).

The financial input (section 3.1.5.2.1 above) amounts to

72 man-months x US $ 4.000 each = US $ 288.000

3.1.7.2 Provide Fellowships

Four local engineers (two assistant managers and two trainees later for other regions) should undergo 6 months' special marketing training each overseas. They are to be trained in sales techniques, demonstration of implements, administration of sales and purchase contracts, general market research and recognition of development trends.

The financial input amounts to

24 man-months x US $ 750	US $ 18.000

3.1.7.3 Provide Transport

Managers and Assistant Managers depend heavily on reliable transport. Four 4-wheel-drive estate cars will be required in the two pilot regions (section 3.1.5.2.2 above).

4 estate cars, each US $ 6.000	US $ 24.000

3.1.7.4 Provide Working Capital for Experts

The "Technical Supply Organisation" will need initial (foreign exchange) working capital to put basic tools, raw materials and hardware on display in the villages. To stimulate initial industrial activities some US $ 100 worth of tools and hardware at least should be put on display in each village. In addition, pilot village workshops and existing workshops must be supplied (section 3.1.5.2.3 above).

Total input	US $ 90.000

This capital will be used as revolving fund and will remain in the project during its whole phase of three years.

3.1.7.5 Provide Equipment for Pilot Demonstration Workshops

The following will be required to establish two pilot metalworking and two pilot woodworking demonstration workshops in each of the two selected regions (section 3.1.5.1.1 above).

8 sets of equipment for pilot village workshops

Total input US $ 50.000

Pilot village workshops have relatively simple equipment to match limited skills and management capacity.

3.1.7.6 Provide Working Capital for Pilot Demonstration Workshops

The proposed eight pilot demonstration village workshops will require some initial working capital in the form of raw materials and consumables. It is estimated that US $ 1.250 will be adequate per workshop (section 3.1.5.1 above).

8 x US $ 1.250 US $ 10.000

Theoretically the provided working capital should flow back into the revolving fund. In practice, however, there will be substantial losses of raw materials due to spoilage, rejects, etc. in the beginning. The working capital is to be written off over the project period.

The total recommended UNIDO-UNDP input in three years is US $ 480.000

3.1.8 Counterpart Contributions

3.1.8.1 General Operating Costs of the"Technical Supply Organisation"

The proposed morketing and supply organisation - "Technical Supply Organisation" - may have a turnover of US $ 200.000 p.a. in both regions. With a trading margin of 15% this will mean an income of US $ 30.000. This will be about sufficient to cover the costs outside UNDP contributions.

Counterpart contribution about US $ 30.000

3.1.8.2 SIDO Assistance to Village Workshops

The eight proposed pilot village demonstration workshops should receive each at least 12 man-months ossistonce from local extension services and engineers in addition to advice given by expatriate marketing engineers. The input is to be calculated at

8 x 12 months x US $ 750 counterpart contribution US $ 72.000

It might be possible to provide some of this assistance at lower costs by volunteers.

3.1.8.3 General Government Assistance

It is expected that some general assistance through agricultural extension services, livestock departments, TAMTU and other institutions will be available as well as free advertising and publicity over radio. This assistance can be vaguely estimated at 100 man-months in 3 years.

100 man-months x US $ 750 plus inputs in kind
estimated contribution US $ 88.000

3.1.8.4 Goodwill

There is the absolute need to provide the proposed "Technical Supply Organisation" with foreign exchange allocations - through UFI or RTC - so that tools, hardware, implements and raw materials can be imported at the required rate. It is taken for granted that this assistance will be forthcoming although an extreme foreign exchange shortage is recognized. This input is to be mentioned, but it cannot be expressed in monetary value.

The estimated expressable total counterpart input is US $ 190.000

3.1.9 Proposed Further Action

In the mission's view the following further actions are required.

- The Tanzanian Government (SIDO, UFI, NDC, etc.) should decide whether the described recommendations are generally acceptable and in line with national development strategies and policies.

- UNIDO-UNDP should decide which of the recommended inputs they can give and inform the Tanzanian Government accordingly.

- SIDO - UFI - NDC - RTC (in case of proposal acceptance) should decide on the type of structure of the recommended marketing and supply organisation and company.

- SIDO - UFI - RTC in cooperation with regional development agencies should decide which two regions to be selected for the pilot scheme.

- SIDO in cooperation with regional development agencies should select suitable villages for establishment of the pilot village workshops.

- UNIDO should recruit suitable experienced marketing engineers in close consultation with Tanzanian counterpart departments and institutions.

It is to be mentioned that SIDO has expressed a keen interest in receiving the mission's findings and proposals at the earliest possible date. The Tanzanian Government appears extremely concerned about the slow progress of her agricultural mechanization programme.

3.2 Botswana

3.2.1 Background Information

3.2.1.1 Project Background

There is practically no indigenous engineering industry as yet in Botswana which could provide for the technical needs of the agricultural sector. The "Mochudi Farmers Brigade" have been working in their workshops for a number of years to develop and perfect a multi-purpose farming implement suited to local conditions. Development work was done by exchanging ideas with universities, research institutes and organisations within and outside the country. Valuable assistance in development work was provided to the general benefit of the product.

The developed multi-purpose farming implement - an animal-drawn toolbar - has been named

MAKGONATSOTHLE

(the machine which can do everything).

This toolbar can be used for soil cultivation, planting operations and as cart for farm transports. Some illustrations are given in Appendix 7.

The toolbar was tested intensively and an extended number of 25 trial machines are being produced at present for field tests on a practical scale. After successful completion of these tests a munufacturing plant must be established to take up volume production.

The Makgonatsothle can basically be considered as sufficiently matured to be ready for mass production although mass-production design requirements are not as yet incorporated in present models. The

price/strength/weight relation is still to be optimized, and concessions will have to be made to the available sources of subsupplies. Axles, wheels and soil wearing parts must be imported from South Africa.

It should be mentioned that the principles of animal-drawn toolbars are not new. Such machines are well proven in other countries. Manufacturing in Botswana can thus draw at any time on experience made in other parts of the world.

A multi-purpose farming implement as the Makgonatsothle can be expected to make a major contribution to improved farming in Botswana. It is for this reason that the Ministry of Agriculture and other institutions concerned in Botswana are showing a keen interest in volume production and introduction of this machine. The toolbar will enable farmers to increase average yields with less draught power.

The United Nations Industrial Development Organization has a declared interest in assisting developing countries in building up own manufacturing facilities for agricultural implements. Main emphasis is on simple equipment and animal-drawn implements as shown by the proceedings of the "Manufacturing Development Clinic", New Delhi, India, in October 1974. It is obvious that a valuable demonstration effect would be achieved if UNIDO could assist the existing project in Botswana. Experience made in Botswana then might be available to other countries in similar positions.

3.2.1.2 National Economic Background

Botswana is a large, thinly populated, and semi-arid country covering an area of 600 000 sq.km with only 675 000 inhabitants. The per-capita income reaches about R 200 (US $ 282) p.a., and the economic growth rate is around 15%/year. The population growth stands at 2.8% p.a.

Botswana is traditionally a cattle-raising country. The national herd exceeds 2.4 million heads. Meat has been the chief export product until recently when mineral exports took the lead (diamonds, copper, nickel, coal). The main problem in Botswana is the instability of agricultural production due to unreliable climatic conditions and erratic and unpredictable rainfalls. Large parts of the country are dry desert - non-arable lands.

People in Botswana are largely cattle-oriented. Cattle are not simply regarded as a means of acquiring cash incomes, but rather as a measure of a man's standing in the community and a store of wealth upon which he will only reluctantly draw.[1] Cattle-mindedness goes right through all ranks of society - from taxi drivers and bar keepers to government officials, many of them having perquisites from a share in a cattle post up country. Some figures on stock farming in a country comparison are given in Appendix 2. The results are quite impressive, but there is plenty of scope for improvement.

Food production in Botswana - in sharp contrast to stock farming - is falling behind expectations. It is done mainly on subsistence level. The country appears to be importing about 60% of her average requirements in grain and cereals[2]. The import bill for food is going

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1) Agricultural Survey 1971/72 Government Printer Gaborone

2) Estimated from import figures and average requirements per capita

up at an unnecessary rate, making the country increasingly dependent on supplies from South Africa.

The poor performance of agriculture in Botswono is to be explained by high risks of crop foilure (drought, diseases, insect ond bird damage) combined with crude agriculturol methods and limited financiol capabilities of subsistence formers. Mony small farmers cannot offord to have own implements with a team of draught oxen (usuolly four to six required). They depend on someone else to plow their land, resulting in deloys and poor yields and leading to a continuation of the unfavourable economic situation.

The poor prospects of ogriculture in Botswana have increased the labour migration to neighbouring countries. An estimated 40 000 people from Botswana are working in South Africon mines. These workers - a high percentage of about 6% of the total population - are urgently needed to develop their own thinly populated country.

3.2.1.3 Development Outlook

In general the economy of Botswana is doing quite well. The main future issue of economic planning will not be more growth by all means, but rather a more bolanced growth. Especially the small subsistence farmers must receive a better chance to catch up with owners of large cattle herds and with the general development in the country. This will be possible only by improved cultivation methods and adjusted agricultural mechanization.

Botswana as a whole cannot be considered as a poor country. 2.4 million heads of cattle (3.5 per capita) mean a considerable hidden weolth. The per-capita income of R 200 p.a. at an economic growth

rate of 15% is also quite impressive. The poor housing standard in many Botswanian villages should not be taken as a yardstick of living standards. Cattle-oriented people are not very consumer-minded. Individual freedom and prestige are ranking high among their priorities. There is, however, a strong drive towards faster development now. Especially the younger generation wants better education, more jobs and modern housing as well as more food and consumer goods. Economic planning in Botswana will have to take these changing needs of village people into account.

Botswana has good economic prospects in mining and mineral recovery (copper, nickel, coal, salt). This will strengthen the general national economy, but usually it has only slow effects on development at village level. Agricultural mechanization must be the instrument to counteract any unbalanced development.

The prospects for large-scale industrialization in Botswana are limited because of the small and scattered home market. There are, however, excellent prospects for small-scale industries which are linked to building and construction activities and to processing of local raw materials (agro-industries, leather, etc.).

The existing and future small-scale industries in Botswana urgently need an indigenous engineering industry for technical support and supplies. There is the opportunity of laying the foundation for an indigenous engineering industry by establishing the manufacturing plant for agricultural implements.

3.2.2 Findings

3.2.2.1 Policies and Trends

The Government of Botswana is actively promoting agricultural modernization and rural development in order to

- improve the income situation of subsistence farmers,
- reduce the country's dependence on imports in general and specifically from the South African economy,
- diversify and find a broader base for a growing population outside stock forming,
- counteract excessive migration to the capital of Gaborone.

It has been recognized in Government Departments that agricultural modernization and improved cultivation methods are a must in Botswana if a balanced growth pattern is to be found. Extensive research work is done in this direction by various universities and institutions.

There is a sound power base available for mechanization in Botswana. Fortunately the use of draught oxen and animals is quite common, having been introduced from South Africa a long time ago. There are an estimated 200 000 draught oxen in action.[1] The present fleet of tractors - about 1 000 in operation[2] - appears to be increasing by 15 to 20% p.a. The growing tractor fleet and the considerable reservoir of trained draught animals are forming a strong basis for more mechanization.

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1) Calculated from Agricultural Survey 1971/72 and 1972/73

2) 1973 statistical figure = 815 plus calculated imports in 1974

3.2.2.2 Settlement Pattern

It appears that more than 90% of the total population in Botswana live in rural areas. People are concentrated in rather large villages with up to 20 000 to 25 000 inhabitants. Farmers move out of these villages during the agricultural season to stay on their lands or cattle posts. Thus they are usually having two or more homesteads. Houses are traditionally of simple clay construction with thatched roofs. Now, however, there is a strony tendency towards permanent brick houses in villages.

The rather large villages in Botswana are offering themselves as excellent "development poles" which can keep money circulating within their spheres (high multiplying effect). But the primary generation of income will depend on agriculture for a long time to come. Improved agricultural methods and productivity are the basis on which transformation of traditional Botswana villages into modern townships will take place.

Botswana villages are already quite important trading centers. It appears to be not difficult to reach farmers with better supplies (more implements, spare parts, new ideas) if some reorganisation takes place. A considerable proportion, especially of technical trading, appears to be in the hands of foreigners (South Africans); they are purely profit-oriented and without any development or service interests.

3.2.2.3 Cultivation and Farming Methods

On the average 200 to 600 mm of rain falls on Botswana lands per year, but with great variations. There may be several successive years with extremely little rainfall followed by years with heavy

thunderstorms and hail. Due to the unpredictable climatic conditions subsistence farmers are running extraordinary high risks of crop failure (estimate: one complete failure once in five years). It appears as if farmers are responding to these risks by investing as little money and effort as possible. The traditional way of cultivation is sowing of seed over fields and ploughing in. Seed covering and preparation of the soil for moisture absorption is thus done in one operation. Much seed is lost due to inadequate covering (too deep or remaining on the surface). Moreover, weed control is lacking. Crops are competing for moisture with usually much stronger weed plants.

Botswana has 130 000 to 230 000 hectares under cultivation[1] depending on rain expectations. Up to 30% of the planted area is not harvested due to failure. Plaughing is usually done by using draught oxen and other cattle. There are some 1 000 tractors which at present appear to be covering less than 20% of total soil cultivation work. Oxen are still to be a major source of power for a long time to come. Even if primary tillage can be shifted to tractors, oxen will definitely work more economically in secondary tillage and short-haul farm transports. Oxen are advantageous whenever slow work and much idle time are involved. Their "fixed costs" are negligible.

Secondary tillage is not yet common in Botswana, as mentioned before. This is demonstrated by the number of implements in use. Some 53 700 farmers in Botswana use draught oxen. 83 000 ploughs are in use, but only 5 700 planters and harrows and 4 000 cultivators.[2]

Major crops in Botswana are sorghum, maize and millet. Average yields are extremely low - only about 300 kg per hectare on the average over a five year period.[3] This compares with 1 000 to 1 500 kg

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1) 1968-1973; Statistical Abstract 1974

2) Agricultural Survey 1971/72

3) Statistical Abstract 1974

per hectare and more which are achieved with modern methods in other dry countries.

It has been tested and proved that average yields in Botswana can be tripled if farmers change over to new cultivation techniques. This means mainly in-row planting (using planters for controlled coverage), weed control in between rows and strict moisture conservation by adjusted tillage methods.

Botswana farmers urgently need more planters and tillage tools for improved cultivation techniques - ideally a toolbar to which all of these implements can be fitted as required.

3.2.2.4 Stock Farming

Generally stock farming in Botswana compares relatively well with other countries. Some 19.5 tons of meat p.a. were produced per 1 000 head of cattle in 1973 (Appendix 2). But there is obviously still much scope for improvement. Some 11% of the national herd died a natural death in 1971/72 while a mere 8% were slaughtered. Only 5% of all stock farmers sold young fat cattle less than 3 years old.[1] Interpreting such statistics it must be assumed that Botswana could easily double her meat output if stock farmers were induced to sell the cattle in time instead of letting it die of old age or because of lack of food and water.

It seems that quite substantial crop damage is due to uncontrolled stock farming. Improved stock farming must be a major issue of the future agricultural policy in Botswana, and in parallel to more

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1) Agricultural Survey 1972/73

mechanization. Improved methods in stock farming mean controlled grazing (fencing), fodder conservation, improved water supply, adjusting the number of cattle, cattle spraying posts, etc. There is considerable interlinkage. A manufacturing plant for agricultural implements can also provide the important market of stock farming items.

3.2.2.5 Farm and Village Transports

It is obvious that transports are playing a vital role in a country as wide as Botswana, and especially an farm and village level since farmers usually have got two homesteads.

No statistics are available showing the number of animal-drawn carts in the country. It seems, however, as if most of Botswana's subsistence farmers do not own or have carts as yet. They will be in urgent need of some form of farm transport as soon as they raise their standard above subsistence farming. Obviously any surplus products grown have to be brought to the market.

Long loading and idle times are involved in farm transports. Under these conditions animal-drawn carts are more economical than tractors (because of low fixed costs) as long as short hauls and rough roads are involved. Thus a large market for animal-drawn carts can be expected in Botswana. The number of subsistence farmers owning draught oxen or other animals is estimated at 40 000 in Botswana.[1] With this number it can be safely assumed that there is a potential market for animal-drawn carts in the neighbourhood of at least 20 000. Traditionally used sledges[2] are obviously outdated and will not be used any more in the future.

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1) Agricultural Survey 1971/72

2) Photograph, Appendix 12

The proposed production of a toolcarrier - convertible to a 0.5 ton cart - can cover part of the described market potential. A certain other part of the demand will go for carts with higher carrying capacity.

3.2.2.6 Consumption of Energy and Engineering Products

Energy consumption in developing countries is usually rising at double the rate of increase in per-capita incomes. Closely linked is the consumption of engineering products (engines, machinery, transport equipment). Consumption of engineering products usually grows at about one and a half times the rate of per-capita incomes.[1)]

No detailed statistical figures ore available in Botswana which would show consumption of energy and engineering products. Import figures,[2)] however, are giving an indication.

	1972 Million Rand	1973 Million Rand	
Mineral fuels and related products	3.8	6.0	+ 57%
Machinery and transport equipment	33.6	40.8	+ 21%

Mineral fuel imports reflect some oil price increases, but the growth rates should be convincing.

Botswana with her economic growth rate of 14% p.a. must expect rapidly increasing demands in energy and engineering products. She urgently needs an indigenous engineering industry if she does not want to fall into a state of complete technological dependence.

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1) UN: Engineering Industries

2) Statistical Abstract 1974

There can be no doubt that in future also remote farming communities in Botswana will want to use more power and engineering products. Demand will arise in windmills, oxen, tractor, diesel, or electric driven pumps, threshing, milling, cutting, and other machines. The country will need an engineering industry in general and at least one manufacturing plant to cover the specialized demand of the agricultural sector.

3.2.2.7 The Market in Agricultural Implements

At present Botswana is importing practically all of her agricultural implements and technical equipment from or through South Africa. The available statistics appear to be reliable with regard to value. The Customs Department, however, has no figures with regard to quantity. Only an estimate of the number of agricultural implements and animal-drawn equipment in the market can be given.

Botswana has been importing soil cultivating equipment and machinery worth 418 000 Rand in 1973 and worth 188 000 Rand in 1974 (without spares and shares). Deducting 25% for tractor and other equipment and taking an average price of R 40 for an animal-drawn implement[1] the approximate annual import figures are as follows.

7 837 units in 1973	animal-drawn ploughs, cultivators, harrows and planters
3 525 units in 1974	

These figures compare with a total number of about 98 500 implements in use in the country[2] and mean combined sales for replacements and a growth of only 3.5 to 8% for animal-drawn implements.

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1) Estimates of Customs Department and traders

2) Agricultural Survey 1971/72

Botswana is facing a serious problem by the fact that supplies of animal-drawn equipment from South Africa are drying up. South African manufacturers are mainly supplying their home market and are changing their production lines to tractor equipment. They have no longer much interest in the small-scale business of animal-drawn implements and related after-sales-services appear to be extremely poor. The low turnover in the animal-drawn agricultural implements market is to be attributed to the difficult supply situation which must be seen in the light of an already existing shortage. 15.9% of farmers reducing their planting operations in 1971 gave as reason a lack of implements.[1] There is also the huge gap between the number of ploughs in the country (83 000) and planters (4 000). It was described under section 3.2.2.2 above that in-row planting (use of planters) will be the most important step in improving average yields and agricultural productivity in Botswana.

In comparison, 152 new tractor registrations were recorded in Botswana in 1973 [2] According to calculations from import values about 200 tractors must have been imported in 1974.

The existing few local engineering workshops in Botswana are making only a small contribution to the agricultural implements market by batch manufacture of some trailers and pumping sets. Their capacities are insignificant in relation to demand.

3.2.2.8 Local Technology

Due to their size Botswana villages are attractive for trades of all kinds. There are shops offering a variety of consumer goods, textiles and hardware. The range, however, is still very limited. Spare parts

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1) Agricultural Survey 1971/72

2) Statistical Abstract 1974

supply is a serious problem in Botswana, and it is also quite difficult to get technical raw materials in many villages.

It seems as if most of the large Botswanian villages do have a traditional well-trained blacksmith. Besides, several "engineering brigades", "carpenters brigades", "builders brigades" etc. have formed in recent years. They are stimulating technical training and activities and can be considered as a promising base for an improving level of technology in villages. It must be remembered, however, that technical dependence on South Africa has been total in the past, and there is a need to promote self-reliance in Botswana now.

There are a few engineering workshops in the towns of Botswana. They are engaged in light engineering such as welding, car repair and general jobbing. The total number of skilled workers employed, however, is probably not exceeding 100 in the whole country. There is no foundry nor forging and modern machine shop as yet in Botswana except for the internal maintenance workshops in the mining areas.

3.2.3 Conclusions

3.2.3.1 The Nature of the Problem

It is being realized that Botswana must improve the technological level and productivity of her agriculture on a broad basis in order to

- better feed a growing population,
- reduce dependency on food imports,
- improve the income situation of subsistence farmers and find a pattern for more balanced growth,
- create an economic basis for modernization of villages (job opportunities, health, education),
- counteract excessive labour migration to South African mines and to urban areas of Gabarone growth center.

In the semi-arid climate of Botswana agricultural productivity can be raised by introducing improved cultivation methods which must aim at better moisture conservation and more rational use of draught power (minimum tillage, in-row planting, weed control). The risk of crop failure must be reduced in absolute terms and in relation to cultivation efforts (less draught power required means less costs).

The principles of better farming are known in Botswana. To meet the needs of Botswanian farmers and agriculture a special implement, the toolbar named

MAKGONATSOTHLE

has been developed. The problem remains to produce this toolbar in large numbers and get it through to subsistence farmers for use on a wide scale.

The need to take up volume production of the "Makgonatsothle" in Botswana for raising the agricultural productivity runs parallel with the urgent need to establish an indigenous engineering industry in the country. A fast developing country like Botswana needs an engineering industry if it does not want to fall into a state of complete technological dependency.

It is concluded that the manufacturing plant for the "Makgonatsothle" toolcarrier in Botswana must be established with wide scope for growth. It should serve as a backing and pilot plant for a general engineering industry.

3.2.3.2 The Size of the Problem

Botswana will have a population of 790 000 by 1980.[1] At that time she will have to produce some 150 000 tons of grain plus 150 000 tons of other products (potatoes, etc.) if she wants to be selfsufficient. The cultivoted area which at present covers up to 230 000 hectares needs to be extended only on a small scale if the average yield can be pushed up to 1 000 kg per hectare a year for cereals and twice that figure for starch products. This is possible by improved cultivation methods.

On the national level there is no shortage in draught power. Botswana will have a fleet of some 2 000 tractors by 1980 if the present growth rates continue. These tractors might account for 150 000 hectares of land cultivation p.a. if they concentrate on primary tillage (contract basis, etc.).

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1) Statistical Abstract

Secondary tillage and farm transports should be left to animal power as far as possible. At present Botswana has got 200 000 draught oxen and other animals. With improved implements (toolbar) one team of oxen (4 animals) can be expected to easily cultivate 5 hectares p.a. Given sufficient equipment ox-powered farming can cover 250 000 hectares.

At present 53 000 farmers in Botswana are using draught oxen and other animals. The agricultural modernization problem boils down to the point that these farmers must be supplied with more and better implements as soon as possible. There is no other way to achieve selfsufficiency in food production. Local manufacturing of agricultural implements must be taken up with a view to 53 000 farmers as potential buyers.

The potential for an indigenous general engineering industry in Botswana is to be seen against the following figures: Imports in machinery and transport equipment amounted to 40.8 million Rand in 1973. Imports can be expected to rise above 100 million Rand in 1980 (15 to 20% p.a.). Machinery and transport equipment up to a total value of more than 500 million Rand will be in use by then. Maintenance and repair work connected with this investment alone will provide 2 000 to 3 000 jobs even if repair costs are estimated at a low 5% p.a. and the turnover per worker as high as 8 000 to 10 000 Rand p.a. This workforce cannot operate efficiently without supporting facilities such as foundries, modern machine shops, etc.

3.2.4 Project Recommendations

It is proposed to establish a manufacturing plant for agricultural implements in Botswana as soon as possible within the following scope of planning.

3.2.4.1 Production Programme

In the first phase the proposed manufacturing plant should start with a basic production of

500 to 1 500 "Makgonatsothle" toolbars p.a.

This is a relatively small volume in relation to the market potential (53 000 farmers). Limited skill and management capacity in production and distribution suggest to start on a modest scale.

Soil wearing parts, castings, axles and tyres for the toolbars will be bought as subsupplies from neighbouring countries during the first phase.

Production will start with the design which is presently being tested. It is assumed that design improvements will be made continuously in accordance with field experience. Adjustments will have to be made in connection with available subsupplies and requirements of efficient volume production. Thus details of design need not be discussed at this stage. It is important, however, to avoid serious mistakes. Introduction of toolbars in a West African country suffered a serious setback when rubber tyres got punctured in thorny areas rendering this implement unusable to farmers. Standardization is important to guarantee interchangeability of parts and spares.

It is expected that a certain number of farmers will accept the soil cultivating functions of a toolbar but is not satisfied with the function as a cart (which is a technical compromise in any toolbar design). Such farmers will want a high-performance cart in addition to cultivating implements. Other farmers may have a cart already and require only cultivation tools.

In view of the above and also with regard to seasonal fluctuations in demand the proposed manufacturing plant must include in its programme right from the start at least the following products:

- one or more cart designs for animal draught (Appendix 8),
- individual planters, cultivators and harrows,
- small machinery such as maize shellers, seed treaters, chaff cutters, hand seeders (Appendices 9 and 10).

An exchange of designs with other countries, especially with Lesotho and Swaziland appears feasible. No additional development work should be required. The toolbar named "Mongonatsothle" might be assembled in Lesotho, and Botswana might take in exchange cart designs by using always the same subsupplies from outside sources (economics of scale).

3.2.4.2 Production Facilities

The proposed production programme for toolbars plus sideline products will yield a turnover of about 500 000 Rand in the second year. At this time the factory will employ an estimated 70 people including trainees. The factory will require working premises of 700 sq.m with scope for expansion and 10 000 sq.m of ground including reserve land.

The possibility of getting subsupplies from appropriate neighbouring countries allows Botswana to build up the proposed manufacturing plant in 2 (or more) stages. The manufacturing process in the first stage will merely involve

- cutting, shearing, punching of sections and plates,
- bending, heating,
- drilling,
- welding, spot welding,
- painting,
- small machine work.

A list of machinery and equipment required is given in section 5 below. It will be possible to increase the output during the first phase by adding some more equipment and subsequent recruitment of additional labour, if required. Some of the machine capacity will be blocked by trainees (building up skills for the second phase). For this reason a generous capacity layout is required.

3.2.4.3 Proposed Development

The proposed manufacturing plant for toolbars and agricultural implements in Botswana should enter its second phase after three to four years. By then it must be in a position to supply a more developed and extended market. Production volume, production programme and degree of integration are to be extended. In the second phase the production programme may include:

- some tractor equipment,
- threshing machines,
- equipment for hay-making and fodder conservation,
- storage equipment,
- windmills,

- animal-operated automatic water pumps,
- equipment for stock farming (fencing material, etc.),
- spraying equipment,
- forged tools and parts.

In most cases existing and proven designs can be copied, but some development and adjusting work will still be required.

In the second phase the manufacturing plant will need

- drop forging equipment,
- bigger mechanical presses,
- a foundry,
- precision lathes,
- milling and gear cutting machines,
- heat treatment and hardening facilities.

The second phase involves considerable investments; the above units and capacities are indivisible to a large extent.

There will be the temptation to branch out into manufacturing of equipment for the construction industry since a boom in this sector is to be expected (most of the additional national income goes into construction). But it is strongly recommended to estoblish a separate factory for this purpose. Manufacturing of agricultural implements and construction equipment in one factory will mean a dilution of management capacity, experience and development efforts. There can, of course, be an exchange of components (castings, gears) and sub-supplies (standardized parts) as far as practicable.

3.2.4.4 Location of the Manufacturing Plant

It is recommended to put up a completely new plant for the proposed manufacture of toolbars and agricultural implements. The plant should be located at the railway line (to facilitate supplies) north of Gaborone (see map, Appendix 11). A location there will facilitate communications to farming areas as well as to sources of supply.

3.2.4.5 Marketing Strategy

The proposed manufacturing plant for the "Makgonatsothle" toolbars and other agricultural implements in Botswana has got the advantage that it can draw (relatively) readily on subsupplies from appropriate other countries (common customs area). This means that it can start with modest investments and modest skills, a fact which will contribute greatly to favourable cost prices of products.

The proposed manufacturing plant has got the further advantage that it will be producing a main product for which there is no immediate competition. In its animal-drawn version the toolbar is not produced in South Africa and competing imports from overseas are very unlikely because of transportation costs.

Another advantage of the proposed manufacturing plant are the relatively low labour costs.

With the above advantages the proposed manufacturing plant will be enjoying a rather strong position if the product is good and accepted in the market. So it can be expected to work economically.

It is quite clearly in the national interest that the proposed manufacturing plant follows the strategy of maximum volume production with relatively low profit margins. This will necessarily lead to an agreement with the Government whereby the manufacturing plant will work on a basis of cost plus fixed profits (it needs profits for dividends and development work). The Government then will open the way for the manufacturing plant to share in institutional resources:

- The Ministry of Agriculture

  could greatly help in accelerated penetration of the market through existing extension services (demonstration, etc.) and through careful dosage of subsidies and incentives.

- Government Development Projects

  could help in sales and distribution (engineering brigades), The costs and burden of building up an own agency network should not go to the factory (limited management capacity).

- Universities, International Research Institutes and Organisations

  could help in research and development for new implements as required by changing technologies (preparation for second phase).

In the first phase the proposed manufacturing plant should concentrate on production and on achieving quality products. The factory should not devote much of its own funds to development work and building up an own sales network. The sales organisation should take the initiative, but use the activities and assistance of brigades and government institutions and experts of development projects, etc. as much as possible.

It might also be checked whether regional agencies for the products might be given to existing local engineering brigades, thereby giving them a chance to gain a foothold and experience in technical business, maintenance, assembling (to a certain extent) and repair.

They could attract additional business as their experience and the income position of farmers grow. Relations between the manufacturing plant and "engineering brigades" - if they are to take over the agency - must be strictly on business terms.

3.2.4.6 Licensing and Know-How Agreements

With volume production of the "Makgonatsothle" toolbar a royalty will become due to the "Mochudi Farmers Brigade" for development work invested into this machine. The royalty is calculated at 15 Rand per machine. The royalty title might be partly or totally capitalized and converted into stock. An agreement is to be made with the "Mochudi Farmers Brigade" for smooth transfer of know-how and for settling the question of royalty title and future practical cooperation.

3.2.5 Plant and Production Characteristics

The following preliminary data on production and production costs are given for the first phase of manufacturing. These data need local cross-checking as project plans progress.

3.2.5.1 Production Programme

For the first phase of the project the production programme is foreseen as follows.

Production	Year 1	Year 2	Year 3
"Makgonatsothle" toolbar Average weight 300 kg complete	500 machines	1 000 machines	1 500 machines
Sideline products:			
Oxcarts Average weight 280 kg each	100 carts	150 carts	200 carts
Small items	10 tons	15 tons	20 tons
Total Output in Tons	182	348	516

A detailed estimate on production costs will be given for the first two years. A forecast for the third year would be unrealistic as basic improvements and design changes will have been made by then.

3.2.5.2 Land and Buildings

An area of 10 000 sq.m. will be required including medium-term reserve land. Some adjacent land should be kept free for long-term planning. The following buildings are to be erected.

	Area in sq.m	Price per sq.m in Rand	Total Rand
Manufacturing area	500	70	35.000
Storage area	100	80	8.000
Office space	100	90	9.000
Total	700	-	52.000

The factory needs easy access to the railway. Land requirements for an eventual railway siding are not included in the estimate.

It is estimated that 10 000 sq.m of developed industrial land (road, power, water) will cost 10.000 Rand.

3.2.5.3 Machinery and Equipment

Essential machinery and equipment for the first phase of manufacturing are given in the following table.

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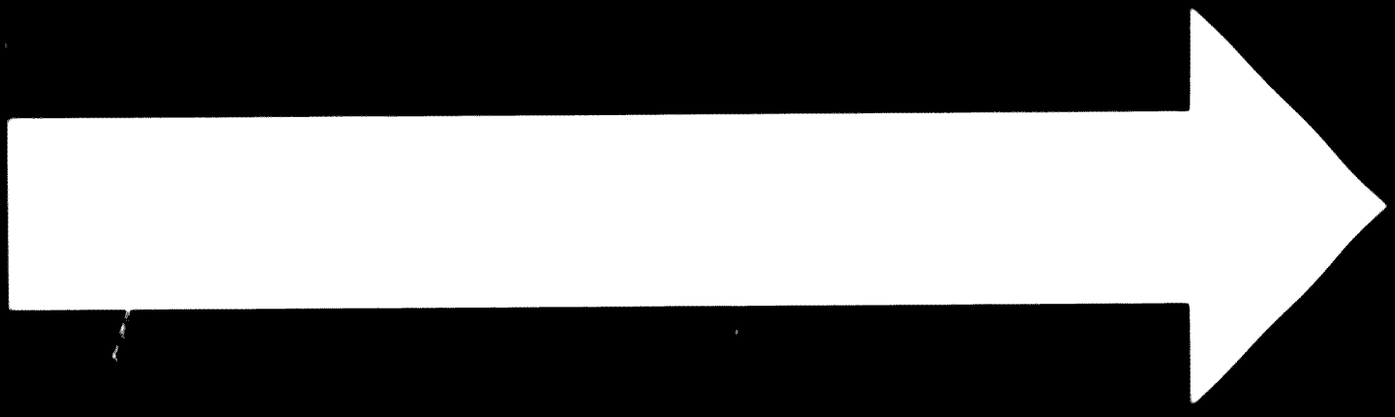

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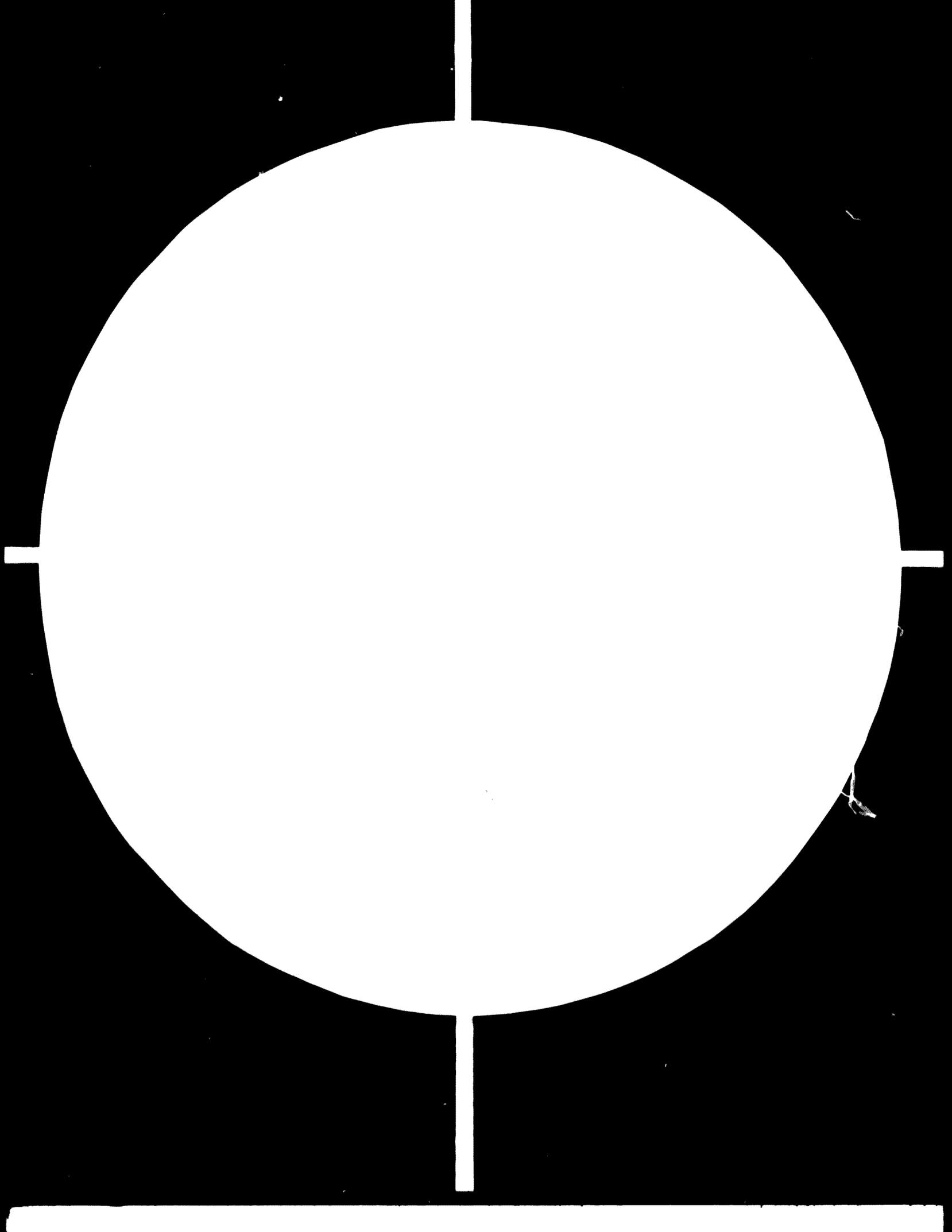

Machinery and Equipment	Quantity	Estimated Price per Unit cif Rand	Total Price Rand
45 ton power press	1	4.500	4.500
Lathe 250 x 2000 mm	1	4.000	4.000
Saw	1	2.000	2.000
Drill press	2	1.200	2.400
Drilling machine	2	1.000	2.000
Grinder	2	250	500
Rolling machine	1	2.000	2.000
Sheet bending press	1	1.500	1.500
Shearing machine	1	1.500	1.500
Forging hearth with blower	1	1.200	1.200
Electric welder	6	500	3.000
Hand grinder	2	200	400
Hand drills	2	75	150
Power nibbler	1	500	500
Air compressor	1	1.500	1.500
Paint spraying equipment	1	1.500	1.500
Gas torch	2	250	500
Punches, dies, machine cutting tools			3.200
Hand tools			2.650
Sub-Total			35.000
Jigs and fixtures, material racks, tool cabinets			2.000
Work benches with vices	20	100	2.000
5 ton truck	1	12.000	12.000
1.5 ton truck	1	3.000	3.000
Internal transport equipment			2.000
Total Costs			56.000

The estimated prices are to be taken as an average and as a guideline. It is recommended to select sturdy and not too sophisticated machine tools.

3.2.5.4 Raw Material Requirements

During the first two years of operation the raw material and subsupply inputs are estimated as listed below. Exact supply prices depend on individual negotiations.

Material	Price Free Factory Rand	Total Costs 1st Year Rand	Total Costs 2nd Year Rand
Axles for toolcarrier, complete with wheels and tyres, 500 first year 1 000 second year	100 per set	50.000	100.000
Axles for oxcarts, complete with wheels and tyres 100 first year 150 second year	100 per set	10.000	15.000
Mild steel bars, channels, sections, plates 168 tons first year 330 tons second year	250 per ton	42.000	82.500
Special steel and other subsupplies, plough and soil wearing parts, chains, bolts and nuts 20 tons first year 40 tons second year	500 per ton	10.000	20.000
Consumables, paint, welding rods, oxygen, tools, miscellaneous		4.000	8.000
Total material costs		110.000	225.000

3.2.5.5 Energy and Water

The proposed manufacturing plant will need power supply of 50 KVA in the first phase. Total power consumption in the first two years is estimated as follows.

		Unit Price	Total Costs
First year	30 000 kWh	x 0.06	1.800
Second year	60 000 kWh	x 0.06	3.600
Water costs:	700 Rand / first year		800 Rand / second year

3.2.5.6 Staff Requirements and Expenses

The following staff requirements and annual expenses are to be expected in the first two years.

	Employees 1st year	Employees 2nd year	Annual Expenses per Employee Rand	Total Annual Costs 1st year	Total Annual Costs 2nd year
Top Management	1	1	12.000	12.000	12.000
Production					
- upper management	1	1	6.000	6.000	6.000
- middle management	2	3	3.000	6.000	9.000
- skilled labour	10	20	2.100	21.000	42.000
- unskilled labour and trainees	15	30	1.500	22.500	45.000
Administration					
- upper management	1	1	6.000	6.000	6.000
- office staff	2	4	2.600	5.200	10.400
- unskilled labour	1	2	1.500	1.500	3.000
Sales					
- upper management	1	1	6.000	6.000	6.000
- office staff	2	3	2.600	5.200	7.800
Development/Design					
- upper management	1	1	6.000	6.000	6.000
- draughtsmen	1	3	3.000	3.000	9.000
Total	38	70		100.400	162.200

3.2.5.7 Estimated Investment Costs

The following table gives a summary of costs.

	Costs Rand
Land	10.000
Buildings	52.000
Machinery, equipment and tools	56.000
Lumpsum for staff training during investment period	20.000
Miscellaneous planning costs, insurance, installation and start-up contingencies (40% of machinery ...)	22.400
Investment in plant and equipment	160.400
Cost of capital procurement and interest during construction (8% : half of 160.400)	6.416
Working capital (35% of first year's material requirement)	40.250
Total Investment	207.066
Investment per employee (on first year's employment figure)	5.449

The investment costs per employee are comparatively low which finds its explanation in the non-sophisticated manufacturing process in the first phase (use of subsupplies).

3.2.5.8 Annual Operating Costs

The annual operating costs in the first and second year can be summarized as follows.

	1st Year	2nd Year
Costs of materials and subsupplies (section 3.2.5.4 above)	116.000	225.000
Wages and salaries	100.400	162.200
Energy and water	2.500	4.400
License fees	7.500	15.000
Miscellaneous (Public relations, stationery, insurance, training expenses)	3.000	6.000
Total operating costs	229.400	413.100

Wages and salaries going into the operating costs of the first and second years contain a considerable training component by which the succeeding years of operation will benefit.

3.2.5.9 Price and Profitability Calculation

The proposed manufacturing plant will be enjoying a monopoly position in the Botswana market with its main product, the "Makgonatsothle" toolbar. To a certain extent the factory can fix the selling price ex works at its own discretion as long as the price remains attractive to farmers (favourable cost / benefit relation). It is suggested to fix a price at a level to achieve an average gross profit of 15% which results in a net profit of 10.5% (company tax = 30%).

	First Year Rand	Second Year Rand
Annual operating costs	229.400	413.100
Depreciation		
4% on buildings (52.000)	2.080	2.080
10% average on machinery, equipment and tools + miscellaneous (78.400)	7.840	7.840
Interest on loans		
8% on half of 160.400	6.416	6.416
10% on half of working capital (half of investment covered by equity capital)	2.012	2.012
Total costs	247.748	431.448
Total sales, turnover (total costs + 15%)	284.910	496.165
Profit before taxes (total sales - total costs)	37.162	64.717
Taxes = 30%	11.148	19.415
Profit after taxes (= about 10.5% of total costs)	26.014	45.302
Net cash flow = turnover -/. expenses annual oprtating costs -/. interest on loans -/. taxes	35.934	55.222

The pay-back period will be less than four years if production increases further as planned in the 3rd and 4th years (total investment of 207.066 : net cash flow = pay-back period).

The following approximate sales prices ex works result from the above cost and profit calculations.

First year			Rand
490 Rand	1 Makgonatsothle toolbar	x 500	245.000
175 Rand	1 oxcart	x 100	17.500
2.241 Rand	1 ton of small machinery	x 10	22.410
Total turnover first year			284.910

Second year			
441 Rand	1 Makgonatsothle toolbar	x 1000	441.000
157 Rand	1 oxcart	x 150	23.550
2.108 Rand	1 ton of small machinery	x 15	31.615
Total turnover second year			496.165

In the third year prices can probably be reduced again by a further 10%. It is obvious that production costs are highest in the first year. Prices must also be high to avoid losses.

The Government of Botswana and organisations interested in rapid modernization of agriculture might subsidize high costs of the start-up phase by

- providing low-cost land and buildings,
- granting tax holidays (3 years),
- providing credits at low interest rates,
- providing machinery grants,
- providing free expert advice,
- providing training subsidies (fellowships),
- assisting in bulk purchase of raw materials.

With some assistance as outlined above it should be possible to sell the "Makgonatsothle" toolbar at a price of about Rand 415/piece. The prototypes (of lower quality) which are presently sold in the market are taken up at this price.

3.2.6 Institutional Framework

After completion of the mission's field work in connection with this study a wrap-up meeting was held at the Ministry of Finance and Development Planning in Gaborone on 5th December, 1975. This meeting was attended by representatives of the

- Ministry of Agriculture,
- Ministry of Finance Development Planning,
- Ministry of Commerce and Industry,
- Agricultural Research Station,
- Botswana Enterprise Development Unit,
- Botswana Development Corporation,
- Mochudi Farmers Brigade,
- UNIDO (mission members and Regional Adviser on small-scale technology).

All participants at the meeting supported the need for establishment of a manufacturing plant for agricultural implements in general and a toolbar as the "Makgonatsothle" in particular. The conclusion was reached that a promotion group should be formed to prepare the implementation of the project. This group can be expected to be established and active meanwhile.

The proposed manufacturing plant for the "Makgonatsothle" toolbar and other agricultural implements in Botswana requires a company structure which blends government development interests with private entrepreneurship. Ideally the company should grow into a public company with wide distribution of shares.

Provisionally it has been proposed to divide shareholdings between:

- BDC - Botswana Development Corporation (45%?)
  (Government and banker interest)
- Mochudi Brigade Trust (20%?)
  (Regional and promoter interest)
- BEDU - Botswana Enterprise Development Unit (15%?)
  (Holding for private entrepreneurs)
- Local or foreign engineering companies, if interested (20%?)
  (Know-how influx, link-up with subsuppliers, etc.)

The risk capital (stock) should be about 50% of the investment in plant and equipment as given under section 3.2.5.7 = R 80.000.

It appears important that the "New Company" receives a maximum of management assistance from its shareholders (bankers' advice, cooperation with government, regional development interests, etc.). The technical side of production is definitely easier than getting the produced equipment through to poor subsistence farmers (need for credit schemes).

As described before, the major aim of the "New Company" must be growth. The enterprise will not be viable in the long run if it does not invest in additional machinery (foundry, presses, machine shop) in 3 to 4 years' time. This means that the "New Company" cannot do without profits, and the profits must go for re-investments over a longer period. Shareholders will have to accept this necessity.

3.2.7 Proposed UNIDO Assistance

UNIDO-UNDP could assist in the implementation of the described project by the following.

3.2.7.1 Assigning a Project Manager

Substituting the top management as budgeted under section 3.2.5.6 above. He should be an experienced engineer working as Managing Director of the "New Company". He will be responsible to the Board of Directors. His services will be required for 36 months.

Input: 36 man-months at US $ 4.000 = US $ 144.400.

3.2.7.2 Providing Fellowships

They are part of the investment costs given under section 3.2.5.7 above. Additional training is desirable for two mechanical engineers (production and quality control), one financial manager (cost control) and one marketing engineer (sales, services, market research).

Input: 4 x 3 man-months at US $ 750 = 12 x 750 = US $ 12.000.

3.2.7.3 Providing Workshop Equipment

This equipment is listed under section 3.2.5.3 above, with some flexibility for final adjustments.

Input: A total of R 56.000 = US $ 64.400.

3.2.7.4 Bearing Planning and Promoting Costs

They are part of the investment costs given under section 3.2.5.7 above - planning and start-up contingencies.

Input: R 17.331 = US $ 20.000.

It can be calculated that this input would reduce the sales price of the "Makgonatsothle" toolbar by about 30 Rand per machine during the crucial introduction phase.

3.2.8 Counterpart Contributions

The project is based on completed development work done on the "Makgonatsothle toolbar. This is the predominant counterpart contribution which cannot be expressed in monetary value. The next important valuable counterpart contributions to the project are expected in the form of marketing assistance, sharing in organizational resources (extension services, etc.), assistance in building up agency networks, and in general goodwill. These contributions are also intangible. It will be necessary, however, to commit the involved government agencies and institutions expressively on the scope of assistance expected from them.

Tangible counterpart contributions will be the following.

3.2.8.1 Land and Buildings

The "New Company" will provide land, buildings and infrastructure, i.e., 10 000 sq.m land and 700 sq.m for factory premises and office space (see section 3.2.5.7 above).

Value:	R 10.000 for land R 52.000 for buildings	=	US $ 71.548

3.2.8.2 Staff Training Expenses

as budgeted under section 3.2.5.7 above and as far as not covered by outside donors.

Value:	R 10.000	=	US $ 11.540

3.2.8.3 Initial Working Capital

The "New Company" will provide working capital as budgeted under section 3.2.5.7 above.

Value:	R 46.666	=	US $ 53.852
Total tangible counterpart contribution		=	US $ 136.940

3.2.9 Proposed Action

- UNIDO/UNDP to decide which of the recommended inputs they are able to give at short notice. It will not serve the project if unspecified promises for future dates are given.

- BDC-Botswana Development Corporation to decide on establishment and organisation of the "New Company" which is to carry out the project. A decision to go ahead one way or the other is indispensable and must be made.

- The "New Company" to accept UNIDO/UNDP assistance, look for other donors or decide in favour of free financing. The budget is to be prepared accordingly.

- The "New Company" to appoint a preliminary project team which will initiate and carry out preparatory work until the final Project Manager is engaged. Such preparatory work will be, for instance,

  evaluation of field results of prototype machines,
  pre-selection of alternative factory sites,
  calling for preliminary architects' proposals,
  calling for quotations to update estimates,
  looking for sources of raw material and subsupplies,
  collect market information,
  collect applications of potential distributors/agencies,
  collect applications of qualified staff,
  collect applications of skilled workers (emigrant labour),
  investigate possible sources of finance,
  discuss government incentives, tax holidays, etc.,
  establish preliminary budgets, operating plans and time schedules.

3.3 Lesotho

3.3.1 Background Information

3.3.1.1 Project Background

A project proposal for establishing a manufacturing plant for agricultural machinery and implements in Lesotho was first drawn up during the "Manufacturing Development Clinic" held in New Delhi, India, in October 1974. The actual idea may have been alive already somewhat longer. Up to now implementation has been hampered mainly by consideration of competitiveness. There is practically no engineering industry in Lesotho as yet. All engineering supplies and agricultural implements are imported from South Africa. South African manufacturers are well established and within relatively easy reach of the Lesotho market. Any new factory in Lesotho is facing the task of competing in price and quality with South African standards.

3.3.1.2 National Economic Background

Lesotho is a small, landlocked and mountainous country with an area of 30 000 sq.km and a population of 1.1 million. It is completely surrounded by South Africa. Only 12% of the mountainous country are arable (about 364 000 hectares). The average agricultural holding has a size of no more than 2 hectares - too small for the farmer to make a decent living. Climatic conditions and soil erosion impose severe problems. Productivity on Lesotho farms is low.

An outstanding feature of the Lesotho economy is its dependence on migrant labour. Of the total population of 1.1 million 200 000 Bhasotos are working on contract basis in South African mines. The

population is growing at a rate of 2.29%p.a. and is not in a position to live on own natural resources. The income of migrant labour exceeds the GDP produced within the country's boundaries by far.

Lesotho remains an agricultural country, but each farm family has on the average ot least one member working across the border. About 80% of the income of overage farm households derive from off-farm work (mainly miners' remittances), and only 6% derive from land cultivotion while the remoining 14% ore earned by stock forming, marketing of fruits, etc.

The Lesotho economy is in a vicious circle: Miners' wages in South Africa are increasing (obout 15% p.a.) thus moking mine work more attractive. Landholders pay less attention to aroble farming causing a further decreose in its importance as a source of farm household income. Forms are run by women, elderly men ond boys. Farming is becoming increasingly a marginal source of income, and an improvement of forming techniques can only marginolly improve the overall income of farm households.

The growing importance of migrant employment has serious consequences for the country. Lesotho's dependence on South Africo increases in spite of all counter efforts. Lesotho herself (with a population growth of 2.29%) produces a steadily dwindling percentage of own food requirements. In 1970 food and livestock imports had a worth of 5.98 million Rand while in 1974 this figure rose to 16.2 million Rand,[1] an increase of 170% over a period of four years.

Lesotho's growing dependence on imports is not only alarming in the food sector. It is just as alarming in the engineering sector. Imports

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1) Annuol Statisticol Bulletin 1973 and 1974

of machinery and transport equipment amounted to 3 million Rand in 1970 and to 8.1 million Rand in 1974.[1)]

Lesotho has no engineering industries of her own to meet the demand in technical products which is mainly created by improved remittances of migratory employment.

3.3.1.3 Development Outlook

If Lesotho seriously wants to develop she will have to strive for emergence from the worsening state of economic and technological dependence on South Africa. This can be done by

a) negotiating a better deal with South Africa in connection with massive supply of labour. Not only better wages and working conditions for labour must be discussed, but also questions of general national interest (own port and transit facilities, mutual protection of investments and supplies, etc);

b) speeding up industrial development of Lesotho. Efforts will have to concentrate at first on such industries which use local raw materials (wool, mohair, leather, agricultural products) or industries producing high added values on imported raw materials.
Engineering industries should receive high promotion priority in Lesotho. They produce high added values, create high quality jobs (distracting skilled labour from migration) and serve as stimulus and support to other industries;

c) improving agricultural productivity. Considerable intensification will have to be done if a widening of the gap between farm income and off-farm income is to be prevented. However, it must be stated that sufficient scope for development is available. With more mechanization and improved agricultural methods Lesotho should be in a position to produce sufficient food for her population and keep farming attractive. The present average yield of 1 000 kg per hectare can be doubled.

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1) Annual Statistical Bulletin 1973 and 1974

3.3.2 Findings

3.3.2.1 Policies and Trends

The trend towards more labour migration to South Africa with its negative effect on agriculture in Lesotho has been described in the previous section. The Government of Lesotho - assisted by international organisations and other nations - is combatting this trend by following a policy towards improvement of agricultural productivity. Growing of new and additional crops such as potatoes and vegetables is encouraged, and various pilot projects are directed towards balanced mechanization and introduction of increased inputs of fertilizers, pesticides, etc.

3.3.2.2 Rural Settlements

The average Lesotho village is small and comprising about 50 households with 300 to 500 people. Village affairs are handled traditionally by chiefs and headmen, governed by superiors at district level. Chiefs and headmen are allocating the available land which, however, does not become permanent ownership of individuals. Individuals may keep the land as long as they work it.

The system operated in Lesotho leads to a remarkably even distribution of wealth and resources. But individual farms are too small to make a decent living. Allocated lands and the village community system provide nevertheless an appreciated social security to which migrant labour can return. This function is of great importance.

Lesotho village houses are traditionally simple clay constructions with thatched roofs. More solid buildings made of bricks and concrete blocks are becoming popular now. Most Lesotho villages have no electricity and communicotion is o problem for all settlements off the main road from Mafeteng to Leribe.

3.3.2.3 Cultivation and Farming Methods

The climate in Lesotho is semi-arid to humid with average rainfalls from 600 mm in the lower lands to over 1 000 mm in the mountains. Winters are cold (at night) and dry; heavy and intensive roins occur in summer. There are no forests to alleviate climatic influences. Wind and water erosion are severe.

The traditional way of soil cultivation in Lesotho is based on the use of oxen, cows and donkeys as source of draught power. There are also some 114 800 horses in the country, but they are used only for riding. At present about 600 troctors in Lesotho occount for around 15% of soil cultivation. There is a strong trend towards use of tractors for primary tillage on contract basis. All follow-up work such as planting, cultivating and harvesting is done individually with the help of animals and animal-drawn equipment. This appears to be a most economic solution with regard to costs, average size of farms and optinium use of labour and investments. Contractors are frequently grouping small individual holdings into "blocks" for economic tractor operation.

It is expected that because of its inherent economics the combination of contract tractor ploughing and animal-powered secondory tillage will gain ground and remain in use for at least two more decades. Small individual farmers cannot use own tractors each on their small holdings because this would be uneconomical.

Main subsistence crops in Lesotho are maize (35%), wheat (28%) and sorghum (22%) covering together 85% of arable land. Other crops are beans, peas, barley and oats. Average yields for grain are 700 to 1 000 kg per hectare.

There is a distinct trend and policy towards new crops which are promising higher yields or better returns such as potatoes, asparagus, beans, peas, etc. These crops require special implements and equipment (ridgers, etc.) which in an animal-drawn versian are no longer on the market in South Africa. Agricultural develapment in Lesotho is blocked in some fields by lack of implements.

3.3.2.4 Stock Farming

The performance of the Lesotho cattle industry is shown in Appendix 2 in an international comparison. Traditional stock farming is still poor. In general, there is no controlled grazing, no fodder conservation for the dry winter periods and na aptimizing of input - output. Overgrazing is common, and it seems as if the excessive number of goats and sheep (2.5 million) are causing considerable erosion damage by destroying vegetation and grass coverage on hills.

There can be no doubt that Lesotho will have to improve her stock farming rapidly if she wants to increase productivity of her agriculture in general. Improved stock farming will mean a reduction in the number of cattle and goats, fodder conservation, introduction of hay-making and silage equipment, controlled grazing, setting up of traditional and electric fencing, introduction of cattle spraying, etc. Better stock farming means a vast market for additional implements.

3.3.2.5 Farm Transports

Farm transports appear to be a real bottleneck in Lesotho. There are an estimated 36 000 primitive sledges (Appendix 12)[1] still in use in the country. Ox-drawn sledges are responsible for a major part of soil erosion, and they have very limited carrying capacity and transportation range. The inefficient (sledge) farm transport must be made responsible also for considerable crop losses and for the insufficient integration of Lesotho farmers into the national market economy. Lack of transport at village level is a major constraint to intensification and improved productivity in Lesotho agriculture.

Sledges as farm transportation are anachronistic and outdated, especially for Lesotho with her alarming erosion problems. The replacement of sledges by proper modern animal-drawn carts (oxen, donkeys, horses) must be given high priority. Modern efficient carts will act as stimulus to further mechanization. (Appendix 8).

3.3.2.6 Energy Supply

Fuel and energy supply appears to be a major problem in Lesotho farm households. Winters are cold, and fuel is the most important item after food and clothing.[2] Subsistence farmers appear to use mainly cow dung mixed with straw and crop residues and the very scarce wood for heating. They can hardly afford (the even relatively very cheap) coal from South Africa (R 12 to 15/ton). It is estimated that at least some 100 000 tons of wood and organic residues are burnt annually for heating purposes in Lesotho. This means that trees and bushes which are urgently needed for erosion control are going up in flames. The same applies to organic fertilizers in the fields.

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1) Agricultural Survey 1971

2) "Poverty eats my Blanket", Maseru 1975

Demand for energy is bound to go up rapidly in Lesotho. This demand increase will not only be due to the population growth but also to higher standards of living in rural areas as a result of higher miners' wages in South Africa. On the average the energy consumption goes up much faster than per-capita incomes.

Growing demand for energy means that a more efficient coal distribution system will have to be established.[1] Given better availability of coal combined with better and cheaper farm transports should induce farm households to shift from burning wood and organic residues to coal. Based on the calorific value coal is anyway considerably cheaper.

Leaving organic residues on the fields as fertilizer would mean again a change in agricultural technology which will be reflected in a demand for new implements (manure handling).

It can be expected in the future that Lesotho villages will also want electricity supply. There is an opportunity of installing fast moving windmills for power generation in remote areas. Slow moving windmills for water pumping are already quite common in several regions of the country. The technology is known, introduced and accepted. Since Lesotho villages are small it appears feasible to supply them by a single windmill unit with some battery storage. Windmills of 10 kW should be an economic proposition under the favourable wind conditions in Lesotho.[2]

The possibility of supplying a large number of villages with wind-generated electricity will offer good chances to an indigenous engineering industry.

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1) The problem is presently being tackled by Thaba Bosiu

2) Windmills of such capacity are available now

3.3.2.7 The Implements Market

It seems as if Lesotho is presently importing the following quantity of animal-drawn agriculturol implements (approximate figures).[1)]

	Pieces	Average Price Rand	Number in Use 1970 Census
Ploughs	700	35	(65 000)
Cultivators	330	50	(23 000)
Planters	880	110	(18 500)
Harrows	290	20	(19 000)
Carts	300	260	(3 500)

The import figures represent sales which are made with practically no marketing efforts in a sellers' market. South Africon dealers would not spend much time on Lesotho customers in sales talk and services. They are also hardly interested in keeping adequate stocks of spare parts. The turnover would be unattractive to them. Many implements are out of use in Lesotho just because a single small part is missing. It can be expected that sales of ox-drawn ploughs will go down in Lesotho because of increasing tractor contractor ploughing. However, the saturation point for all other implements is still far away. Improved availability through local manufacture and assembling will definitely increase annual sales figures.

According to statistics 118 new tractor registrations were recorded in 1974 in Lesotho; with 482 re-registrations this sums up to an operational tractor fleet of 600. The increase of 24% is remarkable. It appears as if quite a few Basotho migrant workers are bringing home tractors from South Africa when they return from their working contracts. It may be expected that the nationcl tractor fleet will exceed 1 500

1) Investigation Mr. Cobbald with South African suppliers 1975, Report Mr. Napo Mohloai 1974

by 1980 and that tractors account for more than 50% of primary tillage by then. This will greatly stimulate the demand for animal-drawn secondary tillage equipment.

There is no indigenous dealer network for implements and hardware as yet in Lesotho. Up to now the small country has been supplied exclusively from across the border. The UN Thaba Bosiu Project is building up a supply system in one region.

3.3.2.8 Village Technology

As already mentioned, villages in Lesotho are small with no more than 200 to 500 people on the average. Available technical skills seem to be extremely limited. There are no traditional blacksmiths, plumbers or other metalworking artisans. Skills of the Basotho people concentrate apparently more on non-metalworking crafts like spinning, weaving, carving and pottery.

The introduction of tractor contractor services is putting new technical dimensions into Lesotho villages. There is an urgent need for supporting services and for establishing local engineering skill.

3.3.3 Conclusions

3.3.3.1 The Nature of the Problem

Lesotho's central development problem is to improve the own GNP and to reduce economic and technological dependence on South Africa.

Any economic planning and development strategy in Lesotho will have to accept the fact that there is an urgent need to improve agricultural productivity and to establish a national engineering industry. Improvement of agricultural productivity is necessary to achieve a higher degree of self-sufficiency in food and to keep farming attractive by raising farm incomes. The establishment of a national engineering industry is necessary to support a tailored agricultural mechanization programme and in order to provide high-value local jobs to skilled workers as an alternative to contract jobs across the border.

Within the framework of this study only the aspects as described above can be dealt with. It should be remembered, however, that additional efforts towards more independence are urgently required on other levels too.

3.3.3.2 The Size of the Problem

Lesotho has a proven and rather stable market for animal-drawn agricultural implements to the following extent:

- 100 carts
- 2 000 implements for soil preparation (ploughs, cultivators, planters, harrows)

This proven market can be used as basis for establishing a small local engineering industry which will concentrate in its first phase on manufacturing and assembling of parts.

In addition to the existing market there is a large-scale latent market for animal-drawn implements, especially carts, cultivators and planters. This latent and dormant market must be opened up and supplied as soon as possible to bring agriculture in Lesotho out of its stagnant phase.

The latent demand for animal-drawn carts and soil cultivation implements in Lesotho can be estimated at a total of more than 100 000 items. This figure represents 36 000 primitive sledges to be replaced and some 40 000 pieces each of cultivators and planters which are required if all of Lesotho's farmland is to come under intensive cultivation. Against this latent demand a manufacturing capacity of 10 000 to 15 000 items p.a. might be justifyable.

In addition to this latent demand Lesotho has a developing market for new equipment tailored to changing agricultural methods and improved stock farming. Moreover, there is a demand in engineering products which is expected with increased consumption of electric power in rural areas. These demand sectors can support vast employment in an indigenous engineering industry.

3.3.4 Project Recommendations

The Second Five Year Plan of Lesotho (1975 to 1980) is making expressive provisions for the establishment of a manufacturing plant for agricultural implements. The Ministry of Agriculture as well as the Ministry of Commerce and Industry show a keen interest in this project. BEDCO - Basotho Enterprises Development Corporation (Pty) Ltd. - has been entrusted with the implementation.

It is recommended to establish the planned manufacturing plant for agricultural implements in Lesotho as soon as possible in order to cover the existing and expected demand in the agricultural sectar and to lay the foundation for an indigenous general engineering industry.

3.3.4.1 Production Programme

It is suggested to plan the production programme of the proposed manufacturing plant in the first phase (3 to 4 years) along the following lines.

500 to 700 carts p.a. (ox, donkey, horse carts).
Carrying capacity: 300 to 500 kg.
Mostly in 2-wheel version, some in 4-wheel version.
(Appendix 8).
Axles with wheels and rubber tyres to be bought as subsupplies from other appropriate neighbouring countries.
No coaperation agreement is required for this product.

2 000 to 4 000 pieces p.a. of animal-drawn implements such as ploughs, planters, cultivators and harrows.
They are to be assembled and partly manufactured in co-operation with established producers of appropriate neighbouring countries. The local manufacturing content should reach 20 to 30%. (Appendix 9).

1 000 to 2 000 pieces p.a. of
hand-operated implements like seed drills, rotary weeder, wheel hoes, chaff cutters, etc. (Appendices 10 and 13). To be copied from proven designs and fully manufactured locally.

The proposed capacity is low compared to the latent demand. This is done with a view to limited management capacity and skills in production and marketing.

During the first phase preparatory work must be done for taking up series production of additional implements and machinery as required by progressing agricultural and rural development. Additional production lines will probably be

- equipment for potato cultivation and harvesting,
- equipment for hay-making and fodder preparation,
- threshing machines,
- equipment for minimum tillage (subsoilers, toolbars, etc.),
- cleaning and grading equipment for seeds and cereals,
- storage equipment,
- plant protection equipment,
- windmills,
- animal or tractor-drawn earthmoving equipment for erosion control and dam building.

In most cases existing and proven designs can be copied (if necessary, with some adjustments to suit local conditions). Own development work and re-inventing of new machines should be kept to a minimum as it is extremely costly and time consuming. An exchange of designs with other countries, especially Botswana and Swaziland, and other neighbouring countries appears feasible by using the same subsupplies.

Parallel to the extension of the production programme preparatory and planning work must be done also with regard to increase the degree of integration in manufacturing.

3.3.4.2 Production Facilities

In the first phase the proposed manufacturing plant will concentrate on simple manufacturing operations such as

- cutting, shearing, punching of plates, bars and sections,
- drilling,
- bending,
- welding, spot welding,
- machining of small parts,
- painting and finishing.

About 40 people including trainees will be employed in the second year. Sophisticated parts are subsupplied from other appropriate neighbouring countries.
In its second phase - after three to four years - the proposed manufacturing plant will engage also in the following operations:

- forging,
- foundry work,
- press forming,
- precision machining,
- heat treatment processes.

Equipment for the first phase requires modest investments. Investments in the second phase (forging and pressing lines) are indivisible and substantial. They will permit, however, local production of plough shares, tyres and forged products like hoes and pickaxes.

In its first phase the proposed manufacturing plant will require about 600 sq.m covered working space and a total of 2 000 sq.m of land.
For the second and subsequent phases a sufficiently large area should be

kept in reserve (10 000 to 12 000 sq.m). This area then will require all the infrastructure needed by heavy industries (railway siding, good power supply, water, etc.).

3.3.4.3 Marketing Strategy

The proposed manufacturing plant for agricultural implements in Lesotho should achieve a turnover of about 400.000 Rand in the second year. On the one hand it has the advantage of drawing readily on subsupplies from industries of neighbouring countries and thereby saving time, investments, and management capacity. On the other hand, however, there is no doubt about keen competition in price and quality. Established products are naturally flowing into the Lesotho market just as easily as subsupplies.

A real concern to the proposed manufacturing plant in Lesotho must be quality. If the plant turns out quality products which are comparable to imported implements and accepted by Lesotho farmers, it will be in a position to meet import competition for the following reasons:

- South African manufacturers are getting less interested in the market for animal-drawn implements. This is a marginal business to them and they might drop it entirely if manufacturing is taken up in Lesotho.

- Wages in Lesotho are cheaper. The costs of assembling and simple engineering work will be definitely lower in Lesotho than in South Africa even if initial lower productivity is taken into account.

- The proposed manufacturing plant in Lesotho has got the advantage of being right in the middle of the market and thus saving transportation and middleman costs.

- The proposed Lesotho plant has got some important economics of scale in its favour.

In the engineering sector economics of scale appear in three separate ways: in regard to the length of production run, in regard to the scale of overall output of a production shop, and in regard to the sharing of organizational resources.

The proposed manufactuiring plant in Lesotho has certainly got the length of production run in its favour. It will still turn out animal-drawn implements in ten to fifteen years' time when in South Africa even the last corner is tractorized.

The Lesotho manufacturing plant has got the further possibility of sharing organizational resources.

- Project Organisations

  (Thaba Bosui - Sengu Pru - Khomokhoama - Thaba - Khupa etc.)

  These organisations will help in sales and distribution. The costs of building up an agency network will not be a burden to the factory.

- Ministries of Agriculture and Industries

  These departments can be expected to assist in advertising and public relations in order to speed up agricultural, rural and general development.

- LTI - German Technical School

  This institute can be expected to produce jigs, fixtures and dies for series production at nominal costs. It is within their Technical Aid Contract to assist in the establishment of local engineering industries.

- Universities, International Institutions and Organisations

  To a certain degree such institutes can be expected to finance and assist in research and development of agrigultural tools and implements.

It is recommended to have the marketing done by a separate organisation. The proposed manufacturing plant should in its first phase concentrate on quality and on proper technical development. It should be allowed to work on a basis of "costs plus agreed profit". A reasonable profit is indispensable with regard to re-investments. There would be no sense in involving the manufacturing plant in the risks of marketing (in addition to quality guarantees). Any undue risk will slow down the technical development of the plant.

The need to upgrade village technology in Lesotho is clearly recognized. This could be done by the separate marketing organisation in connection with setting up a network of technical sales and service points for the manufacturing plant. The management of the plant would assist in the technical side of this task by training of sales agents in the factory.

3.3.5 Plant and Production Characteristics

The following preliminary data on production and production costs are given. They are based on estimates and require local cross-checking as project plans progress.

3.3.5.1 Production Programme

During the first phase of the project the production programme might be envisaged as follows.

Production	Year 1	Year 2	Year 3
Carts Ox, donkey, horse carts in various designs	400	550	700
Implements Animal-drawn ploughs, planters, cultivators, harrows	2 000	3 000	4 000
Implements Hand-operated seed drills, rotary weeder, wheel hoes, chaff cutters, etc.	1 000	1 500	2 000
Total approximate output in tons	170	245	320

A detailed estimate on production costs will be given for the first two years in order to establish a planning framework.

3.3.5.2 Land and Buildings

An area of 2 000 sq.m will be required in the first phase of manufacturing. Area and buildings will probably be available on lease during the first phase. Purchase values are calculated to arrive at overall investment costs.

2 000 sq.m land Value: R 2.000

Buildings:

	Area in sq.m	Price per sq.m in Rand	Total Rand
Manufacturing area	400	70	28.000
Storage area	100	80	8.000
Office space	100	90	9.000
Total	600		45.000

These calculations include infrastructure such as roads, power and water supply, telephone.

3.3.5.3 Machinery and Equipment

The essential machinery and equipment for the first phase of manufacturing is listed as follow.

Machinery and Equipment	Quantity	Estimated Price per Unit Rand	Total Price Rand
Lathe 180 x 2000	1	4.000	4.000
Metal cutting saw	1	2.000	2.000
Sheet shearing machine	1	2.000	2.000
Combined shear, punching, cropping machine	1	2.000	2.000
Sheet bending press	1	1.500	1.500
Drilling machine	1	2.000	2.000
Bench drills	2	400	800
Grinder	2	250	500
Rolling machine	1	2.500	2.500
Forging hearth with blower	1	2.000	2.000
Arc welding machines	3	600	1.800
Spot welding machine	1	2.000	2.000
Gas torch	2	250	500
Tool grinder	1	300	300
Air compressor	1	1.500	1.500
Paint spraying equipment	1	1.500	1.500
Punches, dies, machine cutting tools			4.000
General forging equipment			1.500
Hand tools			2.600
Sub-Total			35.000
Jigs and fixtures, material racks, tool cabinets			6.000
Work benches with vices	15	100	1.500
3 ton truck	1	6.000	6.000
Internal transport equipment			1.500
Total Costs			50.000

It is recommended to select sturdy and not too sophisticated machine tools and equipment. Final selection of machinery is to be made after negotiations on subsupplies and components from appropriate neighbouring countries (adjustment of local manufacturing). LTI should be consulted for preparation of jigs and fixtures and coordinated purchase of machine tools.

3.3.5.4 Raw Material Requirements

The raw material and subsupply inputs during the first two years are estimated below. It is understood that final prices depend largely on negotiations with subsuppliers and on the eventual cooperation agreement with manufacturers of appropriate neighbouring countries.

Material	Price Free Factory Rand	Total Costs 1st Year Rand	Total Costs 2nd Year Rand
Axles for animal-drawn carts with wheels and rubber tyres, complete	100 per Set (average)		
400 first year		40.000	
550 second year			55.000
Subsupplies for animal-drawn and hand-operated implements (soil wearing parts, castings, forged and pressed companents	500 per ton (average)		
55 tons first year		27.500	
80 tons second year			40.000
Mild steel, bars, channels, sections, plate	250 per ton		
90 tons first year		22.500	
120 tons second year			30.000
Consumables, paint, welding rods, oxygen, bolts and nuts, miscellaneous		5.000	7.500
Total Estimated Raw Material Costs		95.000	132.500

3.3.5.5 Energy and Water

The proposed manufacturing plant will need a power supply of 30 kVA. Total power consumption is estimated at

15 000 kWh in the first year x 0.06 R = R 800
23 000 kWh in the second year x 0.06 R = R 1.380

Water costs are expected to be insignificant and might be budgeted at R 100 for the first and R 150 for the second year.

3.3.5.6 Staff Requirements and Expenses

The following staff requirements and annual expenses are to be expected in the first two years (approximate figures).

	Employees		Annual Expenses per Employee Rand	Total Annual Costs Rand	
	1st year	2nd year		1st year	2nd year
Top Management	1	1	12.000	12.000	12.000
Production					
- upper management	1	1	4.200	4.200	4.200
- middle management	1	2	2.800	2.800	5.600
- skilled labour	6	10	2.000	12.000	20.000
- unskilled labour and trainees	10	12	1.200	12.000	14.400
Administration					
- upper management	1	1	4.000	4.000	4.000
- office staff	2	3	2.200	4.400	6.600
- unskilled labour and trainees	1	3	1.200	1.200	3.600
Sales					
- upper management	1	1	4.200	4.200	4.200
- office staff	2	3	2.200	4.400	6.600
Development/Design					
- upper management	1	1	4.600	4.600	4.600
- draughtsmen	1	2	2.200	2.200	4.400
Total	28	40		68.000	90.200

Staff expenses include social costs such as housing allowance, transport and medical care.

3.3.5.7 Estimated Investment Costs

The following table gives a summary of investment costs.

	Costs Rand
Land	2.000
Buildings	45.000
Machinery, equipment and tools	50.000
Lumpsum for training during investment period	8.000
Miscellaneous Planning costs, insurance, machinery installation, start-up contingencies (40% of machinery, ...)	20.000
Investment in plant and equipment	125.000
Cost of capital procurement and interest during construction (8% on half of 125.000)	5.000
Working capital (about 32% of first year's raw material requirement)	30.000
Total investment	160.000
Investment per employee (on first year's employment figure)	5.714

Investment costs per employee are comparatively low. This is explained by the non-sophisticated manufacturing process (availability of subsupplies) in the first phase.

3.3.5.8 Annual Operating Costs

The annual operating costs in the first and second year of operation can be summarized as follows.

	1st Year	2nd Year
Cost of raw materials and subsupplies (section 3.3.5.4 above)	95.000	132.500
Wages and salaries	68.000	90.200
Energy and water	1.000	1.530
License fees	-	-
Miscellaneous (Public relations, insurance, stationery, general expenses)	4.000	6.000
Total Operating Costs	168.000	230.230

Wages and salaries going into the first and second year's operating costs contain a considerable (unproductive) training component by which succeeding years of operation will benefit.

3.3.5.9 Price and Profitability Calculation

The price policy of the proposed manufacturing plant will be aiming at reasonable profits (cost + profit basis). The plant will be sharing in government resources (marketing assistance) and development efforts which would not be compatible with a policy of profit maximizing in the existing monopoly position.

It is suggested to aim at an average gross profit of 15% which results in a net return of 10.5% after deduction of 30% company tax.

The resulting calculation is as follows.

	First Year Rand	Second Year Rand
Annual operating costs	168.000	230.230
Depreciation		
4% on buildings	1.800	1.800
10% average an machinery and equipment	7.000	7.000
Interest on loans		
8% on half af investment in plant and equipment	5.000	5.000
10% on half of warking capital	1.500	1.500
Total costs	183.300	245.530
Turnover / sales (costs + 15%)	210.795	282.359
Profit before taxes (turnover minus tatal costs)	27.494	36.829
Taxes 30%	8.248	11.048
Profit after taxes (= about 10.5% of total costs)	19.246	25.781
Net cash flow	28.047	34.581

= turnover
'/. expenses annual operating costs
interest on loans
taxes

The pay-back period will be less than five years if production continues to increase in the third and fourth years as planned (total investment of 160.000 : net cash flow = pay-back period.

Approximately the following average sales prices ex works result from the above calculation.

First year			Total Sales
R 175 =	1 animal-drawn cart	x 400	70.000
R 55 =	1 animal-drawn implement	x 2 000	110.000
R 30 =	1 hand-operated implement	x 1 000	30.000
	Total turnover first year	R	210.795

Second year			
R 165.00 =	1 animal-drawn cart	x 550	90.750
R 50.00 =	1 animal-drawn implement	x 3 000	150.000
R 27.73 =	1 hand-op. implement	x 1 500	40.000
	Total turnover second year	R	282.359

It is evident that cost-based prices are highest in the first year.

The calculated sales prices compare favourably with present import prices. Oxcarts are sold in Lesotho for R 180 to 200 at present, animal-drawn implements for R 50 to 110 per piece depending on type. Hand-operated implements are practically not yet on the market.

The Government of Lesotho and organisations interested in rapid modernized mechanization of agriculture in this country could subsidize the initial high costs of manufacturing by

- providing low-cost land and buildings (as will be done under the existing project),
- granting tax holidays (3 years) (which is probable),
- providing credits at lower interest rates (also probable),

- providing machinery grants,
- providing free experts,
- providing training subsidies (fellowships),
- assisting in bulk purchase of raw materials.

It appears quite feasible to reduce costs and sales prices by 10 to 20% by the above assistance.

3.3.6 Institutional Framework

The planned and proposed manufacturing plant for agricultural implements in Lesotho is being sponsored ond promoted by

BEDCO
Basotho Enterprises Development Corp. (Pty) Ltd.

This development company has been formed and is being funded by the Government of Lesotho as well as by Canada and Great Britain. It will be in charge of the project implementation and overall coordination.

BEDCO in general is giving an "umbrella" to successful applicants, covering financial and management assistance. It will give up its controlling financial interest when the sponsored company can stand on its own. The idea is to hand over as soon as possible in order to keep funds revolving.

The sponsored and proposed manufacturing plant for agricultural implements will probably require a slightly different approach. In view of the national interest involved and with a view to the inherent need for substantial growth (in the long run the plant will not be viable without a forging line) a longer-term government investment must be envisaged. The project cannot be looked upon as a typical small-scale industry to be managed by a single entrepreneur.

BEDCO should be prepared ta hold a major financial interest until the company can be turned into a public company or until other means af attracting additianal investment capital and management capacity are found.

BEDCO as the major shareholder of the proposed manufacturing plant will have to appoint the Managing Director (top management) who is responsible for successful operation of the plant. This post will have to be given to an experienced expatriate engineer for the first phase as no experienced local engineers are available at present.

3.3.7 Proposed UNIDO Assistance

UNIDO-UNDP can assist in the implementation of the described project by the following.

3.3.7.1 Assigning a Project Manager (Managing Director)

An experienced expatriate engineering expert will be required for 36 months. He will be working under BEDCO and be directly responsible to the Board of Directors of BEDCO. The estimated input is 36 man-months at $ 4000 = US $ 144.000.

3.3.7.2 Providing Fellowships

They are part of the investment costs given under section 3.3.5.7 above. The following local management staff will require additional overseas training:

Project Manager - counterpart	(1 engineer)
Quality controller	(1 engineer)
Finance manager	(accountant)

Each of these staff members should receive 6 months special training abroad.

The estimated input is 3 x 6 months at $ 750 = US $ 13.500.

3.3.7.3 Providing Workshop Equipment

The initially required equipment is provisionally listed under section 3.3.5.3. A final list of equipment - within the budgeted amount - can be submitted after the praparation of the layout (and consultation with LTI).

The total cost of initially required equipment is estimated at R 50.000 = US $ 57.700.

3.3.7.4 Providing Plonning and Promoting Costs

The project requires some subcontroct work for the preparation of workshop drawings (engineering office), material testing ond consultoncy work in the supply of equipment (part of investment costs given under section 3.3.5.7 obove - planning).

The costs ore estimated ot R 12.825 = US $ 14.800.

Total input UNIDO-UNDP US $ 230.000

3.3.8 Counterpart Contributions

The most important counterpart contributions to this project are expected in the form of marketing assistance and help in development and research, public relations and general goodwill. These contributions are intangible and cannot be expressed in money value. It will be necessary, however, to exchange written notes about the expected assistance with all departments and organisations involved.

The following contribitions can be expressed in monetary values.

3.3.8.1 Land and Buildings

BEDCO is expected to provide land, buildings, infrastructure, management assistance and some pre-production expenses such as feasibility study, etc. The estimated total value is R 52.000 = US $ 60.000 (see section 3.3.5.7, land, buildings, plus part of miscellaneous).

3.3.8.2 Working Capital

In cooperation with local banks BEDCO will provide credit facilities and working capital for the purchase of raw materials and subsupplies. The estimated value is R 35.000 (section 3.3.5.7, cost for capital ... plus working capital) = US $ 40.000.

The total counterpart contributions which can be valued amount to US $ 100.000.

3.3.9 Proposed Action

The following activities are necessary:

- UNIDO/UNDP to decide which of the recommended inputs they can give at short notice. It will not serve the project if unspecified promises are given for future dates.

- BEDCO to be informed about UNIDO/UNDP position earliest so that they can make alternative arrangements for parts not covered by UNIDO/UNDP assistance.

- BEDCO to look out for suitable candidates for the post of the Managing Director.
  UNIDO to look out for and screen simultaneously suitable applications of capable candidates. UNIDO-BEDCO to decide together on successful candidate.

- BEDCO to appoint local counterpart for Managing Director (local partner). This local partner to start preparing work immediately (investigating subsupplies from manufacturers of appropriate neighbouring countries, worldwide manufacturers, etc.).

- BEDCO to inform LTI - German project on the planned production programme and entering into a contract with LTI covering

  production of jigs and fixtures,

  advice on machinery and equipment to be ordered,

  assistance in getting required workshop drawings (must probably be produced after samples),

  assistance in start-up of plant,

advice on power and utility requirements,

advice on foundation and building requirements for the installation of machinery.

- BEDCO to establish contacts with various project organisations in Lesotho to avoid duplication of work in the field of development of agricultural implements.

- BEDCO/UNIDO to hand over full project responsibility to appointed Managing Director as soon as he arrives in Lesotho.

4. TERMINAL SECTION - PROJECT PROPOSALS

The following summarized project proposals have been elaborated in close accordance to UNIDO. They may serve as a direct basis for follow-up measures.

4.1 Tanzania

4.1.1 Title of Project

TANZANIA: Establishment of a network of technical village workshops as model scheme at Arusha and Dodama Region: Agricultural Tools and Implements and Simpe Metal Products.

4.1.2 Description of the Project

Main objectives of the project are:

a) to contribute to Government's Ujamaa Village and rural development programme;

b) to develop rural entrepreneurship;

c) to promote manufacture of agricultural tools, simple metal products and spare parts through appropriate technology;

d) rural extension and technical training.

The proposed integrated project is based on the recommendations of the project TF/RAF/74/009 (see section 4.1.3 (h) below) as follows:

(i) The project (3 years duration) consists of establishing a rural industrialization pilot project through a network of village workshops and village cooperative brigades in two sub-regions. Each sub-regional project will consist of two small metal-working workshops and two wood-working shops, with simple equipment.

(ii) Each of the projects will manufacture simple tools and implements, act as supporting stations for repair and maintenance and shall be the means for dissemination of technical know-how and requirements to manufacturers (feedback) and to farmers and rural potential entrepreneurs. They shall also act as a "supply centre" for tools, hardware and other products.

(iii) The proposed project consists of establishment of such integrated units and providing necessary experts, equipment and training programme toward UNIDO assistance. The Government will provide the necessary counterpart contribution and services to an extent of around $ 200.000.

4.1.3 Background Information

a) Recommendations of the UNIDO expert (Mr. M.L. Taneja) project TAN-121-SHC (SF/ID) on market survey on agricultural implements 15 September 1972;

b) recommendations of expert (Mr. Ukrainets) VC/URT/70/001 and URT/74/008 on repair and maintenance, July 1974;

c) recommendations of experts Mr. Koka Rao and Mr. B. Pothacari) UNIDO/FAO project URT/74/006 on agricultural mechanization, February 1975;

d) fellowship report (Mr. Mlyauki and Mr. Meneko) agricultural machinery RP/URT/73/001-002 in March 1975;

e) Government proposed UNDP/UNIDO/FAO projects URT/75/028(CP) 21 October 1975: 1978/1981 on repair and maintenance;

f) Government request IS/URT/75/013 Assistance to Manufacture of Farm Implements (21 February 1975): No UNDP finances, and

g) recommendations of UNIDO/INDIA Agricultural Machinery Clinic (1974) attended by Tanzania, and

(iv) Report of Consulting Firm, project TF RAF 74 009 on establishment of a pilot plant in Tanzania, 16 February 1976.

The following are the recommendations by the subcontracting firm Kienbaum Beratungen, FRG, who implemented the project TF RAF/74 009. This feasibility study on establishment of a pilot project in 3 LDC's (Tanzania) was financed by UNIDO under 1974-75 voluntary contribution from the Federal Republic of Germany. (Ref. Report, page 29).

(i) The Government of Tanzania has embarked on a programme of balanced mechanization whereby animal drawn agricultural implements are to play a wider role. The Government is also promoting "Ujamao Village cooperative development schemes" with integrated programmes on rural industrialization and development of agriculture.

(ii) The present annual demand (as indicated by sales) are:

Hoes	2.0 million
Knives	0.8 million
Axes	0.7 million
Sickles	0.8 million
Shovels	0.5 million
Grass knives	0.7 million
Hand sprayers	11.000
Animal drawn implements	13.000
Carts	150 units

The present annual production is limited to around 0.6 million hoes, 0.1 million knives, 0.8 million axes and around 10.000 units of simple implements, which are mostly manufoctured by UBUNGO Farm Implements Manufacturing Company. In oddition, Mbeya Forms Implements Company is under planning.

(iii) However, in order to meet the future demond and to promote rural industriolization, there is o need to develop an integrated programme of establishing villoge level octivities including production extension, marketing, repair and maintenance and technical service. Such a programme will have to incorporate establishment of village level marketing system for the 2 factories now

producing agricultural implements and tools as well as establishing utilities for small scale manufacturing, development adaptation and extension services.

4.1.4 Costing Data

I. Subcontract

Project planning and set up	$ 15.000
Two experts, 36 mm each	$ 288.000
Workshop equipment and vehicles	$ 75.000
Raw materials	$ 90.000
Prototype equipment, etc.	$ 10.000
Fellowship	$ 18.000
Total subcontract	$ 496.000
II. UNIDO Staff missions	$ 4.000
G and Total	$ 500.000

4.1.5 Currency Requirements

$ 500.000 in convertible currency.

4.2 Botswana

4.2.1 Title of Project

BOTSWANA: Assistance to Botswana Development Corporation: Establishment of a Pilot Manufacturing Plant for local production of simple engineering products.

4.2.2 Description of the Project

The main objectives of the project are assistance for local entrepreneurship, development and assistance for rural industrialization and for successful agriculture.

(i) The proposed project is a bankable proposal from a techno-economic point of view as detailed in the consultant's report on project TF/RAF/74/009 "Demonstration Manufacturing Plant" in Botswana.

(ii) The project proposal (3 years duration) consists of establishing a pilot demonstration manufacturing plant for local production of 1.500 units/year "tool bar" and appropriate matching plows, cultivators, harrows and 200 carts/year and achieving an output of 516 tons/year by the end of the third year. The plant is recommended to be established near Mochudi, around 30 km north of Gaborone. Total employment potential: 70 workers.

(iii) The Government should contribute 10.000 sq.m of land with 700 sq.m of covered area (around $ 60.000). The Government should also provide the total staff and persons to be trained (70 persons: first 2 years). In addition, the supporting and running expenses are to be met by the Government. The total operational cost will be around $ 300.000 in the first year and $ 450.000 in the second year.

(iv) The external aid necessary are equipment, components and raw material, technical experts and training programme.

(v) The Government of Botswana is interested in the realisation of this proposed project with participation by Botswana Development Corporation, Mochudi Brigade Trust and Botswana Enterprises Development Unit by establishing a new company as shareholders.

4.2.3 Background Information

a) The Botswana Enterprises Development Unit, in cooperation with the Minister of Agriculture is interested in this project (ref. Mr. Ali Hadeba's mission report 9 September to 1 October 1974, page 13);

b) Government has initiated a programme on agricultural implements as a part of their dryland farming research scheme (ref. National Policy on Rural Development, No. 2 of 1973);

c) 1973 Seminar on LDC in Africa has supported such project proposal;

d) the 1975 UNIDO project TF/RAF/74/009 on agricultural machinery has recommended a programme for local manufacture.

The consultant's (Kienbaum Beratungen of FRG) report on project TF/RAF/74/009 "Feasibility Study on Establishment of a Demonstration Plant for Agricultural Tools in Botswana" (a project financed by UNIDO through voluntary contribution pledged by the Federal Republic of Germany in 1974-75) has highlighted the following conclusions and recommendations (see report pages 18-36).

(i) Botswana has around 98 500 units of implements. The average imports during 1973-74 were around 5 600 units of agricultural implements, and around 175 units of tractors. The country has a good demand for tool bars, planters, animal drawn implements and the future requirements on a significant scale will include wind mills, pumps, threshers and engines and tractors. A special implement, "tool bar", has been develaped in Botswana, which is very suitable to local conditions and level of technology.

(ii) A first stage local production of 1 500 units of tool bars, carts, animal drawn planters, seeders, cultivators and harrows is recommended to be locally manufactured by establishing a workshop. The second stage should include local development and fabrication of tractor implements, wind mills, threshers, pumps, etc. through establishment of a forge shop, heat treatment and foundry facilities.

(iii) The Government of Botswana is interested in the realization of this project.

4.2.4 Outline of Proposed Plan of Implementation

Negotiation with Botswana's Government	June 1976
Selection of subcontractor	August 1976
Project planning	December 1976
Project start-up	May 1977
Project implementation	May 1977 to May 1980

4.2.5 Costing Data

I. Subcontract

Planning and development cost	$ 25.000
Technical expert, 3 years	$ 144.000
Workshop equipment	$ 75.000
Jigs, fixtures, raw material (first year)	$ 125.000
Prototype implements	$ 10.000
Training	$ 20.000
Total subcontract	$ 399.000
II. UNIDO staff technical review mission (2)	$ 6.000
Grand Total	$ 405.000

4.2.6 Currency Requirement

$ 405.000 in convertible currency.

4.3 Lesotho

4.3.1 Title of Project

LESOTHO: Assistance to Lesotho National Development Corporation (LNDC): Establishment of simple engineering products pilot demonstration plant at Thaba-Bosiu rural development project or at Leribe pilot scheme.

4.3.2 Description of Project

The main objectives are to develop a pilot workshop for local fabrication of appropriate products development and repair and maintenance. To train local personnel and to assist in technology transfer and promotion of rural industrialization and agriculture.

(i) This techno-economic viable project proposal (3 years duration) is based on the analysis of the Report by consulting firm (project TF/RAF/74/009) on manufacturing feasibility study on agricultural tools, implements and simple metal products in Lesotho (see section 4.3.3 e), (i)-(iii); also ref. report pages 13-18).

(ii) The proposed project consists of establishing a pilot demonstration manufacturing plant. With first phase (3 to 4 years) annual production programmed as follows: carts: 700 units; animal drawn implements: 4 000 units, with initial 30% local content and hand operated implements: 2 000 units. Initial employment potential: 40 persons. Total annual output: 320 tons.

(iii) Second phase expansion should include local development and manufacture of equipment for potato, haymaking, threshers, storage bins, wind mills, etc. with forging and pressing facilities.

(iv) The Government sholl provide 2 000 sq.m of land with 600 sq.m of covered orea (around $ 45.000) including infrastructure. Physical facilities and expenses (electricity $ 3.000, woter $ 1.000) and 40 local technical and administrative personnel (worth around $ 180.000) on the basis of first 2 years of operation shall be supplied by the Government of Lesotho.

(v) The first phase machine tools requirement (ref. Report page 21) to be supplied under the project will be around $ 80.000. In addition, the project shall finance first year of imported components and material worth $ 75.000, and training programme ($ 15.000). In addition, the service of a project manager for 3 years ($ 144.000) is included).

(vi) The project is to be implemented os o package subcontract in toto.

4.3.3 Background Information

a) Lesotho Village Industry Development Organization, Lesotho National Development Corporation LNDC) and Development Bank ore interested in promotion ond de-veleopment of appropriate small industries;

b) Thaba Bosiu rural development project and Leribe pilot scheme are promoting agricultural and rural industry development;

c) recommendations of UNIDO/Indio agricultural machinery clinic 1974 attended by Mr. Nopo O. Mohloai;

d) recommendotions of 1973 LDC Seminar;

e) recommendations of consulting firm Kienbaum Beratungen (FRG), which has implemented on a subcontracting basis the project TF/RAF/74/009 (Study on Establishment of a Pilot Demonstration Plant in 3 LDC's: Lesotho), which was financed by UNIDO through voluntory 1974-75 contribution by Federal Republic of Germany. Their report on Lesotho is summarized below.

(i) Present annual recommended figures (Ref. page 9, section 2.7 and page 11, section 3.2):

Plows	700 units
Cultivators	300
Planters	800
Harrows	290
Carts	300

Total 2 500 units worth around $ 250.000. Total park: 130 000 units of above 5 implements and 600 tractors. Future demand for implements significantly higher reaching around 15 000 units and tractor fleet expected to increase to 1 500 by 1980.

(ii) Conclusion
The proven market justifies establishment of a small local engineering industry with a manufacturing capacity of 10 000 to 15 000 items p.a. with emphasis on local manufacture and assembly. In addition, demand for simple engineering products will increase with increase in rural electrification. These demand factors can support vast employment in rural areas through local engineering industry (Ref. page 12, section 3.2).

(iii) Government plans
The Second Five-Year Plan of Lesotho (1977-1981) is making expressive provision for the establishment of a manufacturing plant for agricultural implements. The Ministry of Agriculture and Ministry of Commerce and Industry have shown a keen interest in this project. BEDCO has been entrusted with the implementation. The Government is interested in establishing a pilot plant.

(iv) Techno-economic viability
The techno-economic details of Report TF/RAF/74/009 support the viability of this project.

4.3.4 Outline of Proposed Plan of Implementation

Negotiation with Government of Lesotho	May 1976
Selection of subcontractor	August 1976
Start-up	October 1976
Project implementation	November 1976 to November 1979

4.3.5 Costing Data

I.	Subcontract	
	Project planning cost	$ 15.000
	Expert (project manager) 3 years	$ 144.000
	Workshop equipment and vehicles	$ 80.000
	Prototype implements and products	$ 10.000
	Components, jigs, fixtures, raw material	$ 75.000
	Total subcontract	$ 339.000
II.	UNIDO HQ Staff technical mission (2)	$ 6.000
	Miscellaneous	$ 5.000
	Subtotal	$ 11.000
	Grand Total	$ 350.000

4.3.6 Currency Requirements

$ 350.000 in convertible currency.

LIST OF APPENDICES

Countries Visited	Institutions and Persons Visited and Interviewed
Kenya 31-10 to 1-11-1975, 22-12-1975 to 10-1-1976 Mr. Heeke	UNIDO Regional Headoffice Nairobi, Department of Statistics, University of Nairobi, Friedrich-Ebert-Stiftung, Institute of Development Studies, Kenya Farmers' Association, Kenya Industrial Estate
Tanzania 2-11 to 22-11-1975 Mr. Heeke, Mr. Glaser 14-12 to 21-12-1975 Mr. Heeke	TAMTU, Arusha Mr. Mujemula, Mr. Kaaya, Mr. Catterick LIDEP - Project Soui Mr. Esche, Mr. Hammer, Mrs. Bonin, Mr. Diwani Dar es Salaam UNDP Office, Mr. Holst SIDO Office, Mr. Mramba, Mr. Gosch, Mr. Kakubukubu German Embassy, Dr. Jensch Investment Board, Mr. Tanya UFI, Mr. Kida, Mr. Mussa, Mr. Makere NDB, Mr. Steffan, Mr. Thamm TAMECO, Mr. Mbawata Department of Statistics National Engineering Co. Burns & Blane Engineering, Mr. Sleigh SIDO-Dodoma, Mr. Mola, Mr. Henry Ministry of Agriculture Mr. Maneno, Mr. Fear, Dr. Maebo Ministry of Industries, Mr. Biteyeko British High Commission, Mr. Gaddis
Botswana 24-11 to 3-12-1975 Mr. Heeke, Mr. Glaser	Ministry of Finance and Development Planning Mr. Leach, Mr. Bird, Miss Peavy BEDCO, Mr. ter Haar Ministry of Agriculture, Mr. Gerhart Agricultural Research Station, Mr. Willcocks Botswana Development Corporation, Mr. Smith Ministry of Education, Mr. Kukler, Miss Tapper Mochudi Farmers' Brigade, Mr. Eshleman Ministry of Commerce and Industry, Mr. Bareki, Mr. Maehrle, Mr. Mendelsohn Customs Department Molepole Brigade

Lesotho

4-12 to 12-12-1975
Mr. Heeke, Mr. Glaser

UNDP Office, Mr. Siba Brajbhandry
Central Planning Department, Mr. Modiano, Mr. Jennes
Khomokhoana Project, Mr. Dick, Mr. Salae, Mr. Mennim
Thaba Bosiu Project, Mr. Napo Mohloai, Mr. Victor Burke
Consultant Mr. Cobbald, CFTC
Thaba Khupa Project, Mr. Morris
Customs Department
Department of Statistics
Ministry of Agriculture, Mr. Chaka M'tsane
Sengu Pru Project, Mr. Broadhurst
BEDCO, Mr. Pruden, Mr. Sebatane

Year	1. TANZANIA Area: 940 000 sq.km			2. LESOTHO Area: 30 000 sq.km			3. KENYA Area: 583 000 sq.km			4. BOTSWANA Area: 660 000 sq.km			5. SWAZILAND Area: 17 000 sq.km			6. EUROPE		
	000 Cattle	000 to Meat Prod.	to Meat per 1000 C.	000 Cattle	000 to Meat Prod.	to Meat per 1000 C.	000 Cattle	000 to Meat Prod.	to Meat per 1000 C.	000 Cattle	000 to Meat Prod.	to Meat per 1000 C.	000 Cattle	000 to Meat Prod.	to Meat per 1000 C.	000 Cattle	000 to Meat Prod.	to Meat per 1000 C.
1065	10 000	89	8.90	410	8	19.50	7 500	112	14.90	1 200	32	26.60	510	12	23.50	117 344	7 178	61.10
1966	10 500	88	8.85	270	4	14.80	7 400	121	16.30	1 000	29	29.00	490	12	24.40	-	-	-
1967	11 200	103	9.19	370	6	16.20	7 200	120	16.60	1 200	23	19.10	500	12	24.00	-	-	-
1968	12 300	103	8.37	440	5	11.30	7 500	124	16.50	1 400	28	20.00	510	12	23.50	-	-	-
1969	12 800	121	9.45	470	6	12.70	7 900	127	16.00	1 600	26	16.20	538	12	22.30	124 086	8 644	69.60
1970	13 200	127	9.62	550	8	14.50	8 600	136	15.80	1 600	31	19.30	568	12	21.10	123 683	8 942	72.20
1971	12 300	121	9.68	560	8	14.20	8 100	129	15.90	1 700	33	19.40	572	12	21.00	123 068	8 999	73.10
1972	11 900	114	9.57	560	8	14.20	7 700	120	15.60	2 000	40	20.00	589	14	23.70	124 670	8 427	67.60
1973	11 300	109	9.64	570	8	14.00	7 300	114	15.60	2 100	41	19.50	602	13	21.60	129 755	8 748	67.40
	Average Rainfall p.a. 750 to 1000 mm			Average Rainfall p.a. 600 to 700 mm			Average Rainfall p.a. 500 to 750 mm			Average Rainfall p.a. 250 to 500 mm			Average Rainfall p.a. 1000 to 1500 mm			Average Rainfall p.a. 700 to 1000 mm		

Ha/kgr

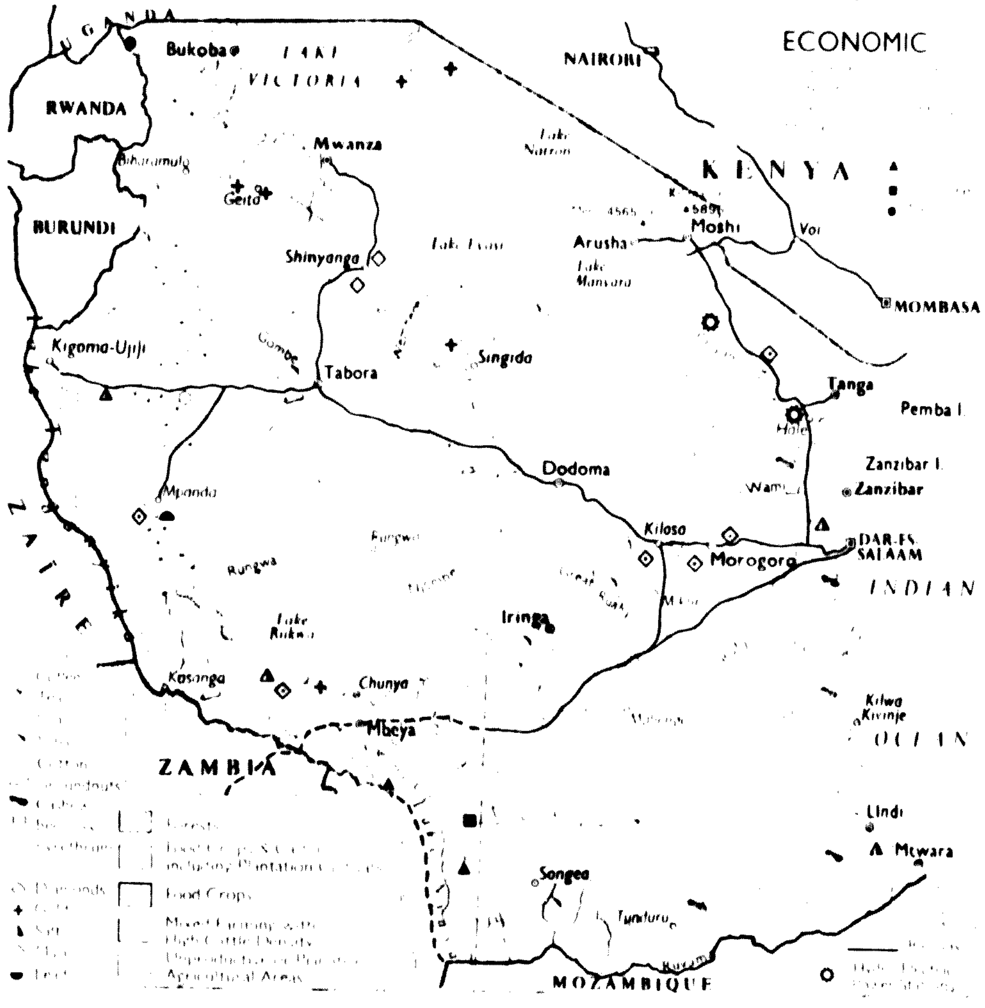
1.	Hoes	} Main Items of UFI's Present Manufacturing Programme
2.	Ploughs	}
3.	Plough Shares	(3)
4.	Axes	
5.	Pangas	
6.	Sickles	
7.	Harrows	
8.	Muttocks	
9.	Shears	
10.	Wood Splitting Wedges	
11.	Slashers	
12.	Spades	
13.	Agricultural Forks	
14.	Shovels	
15.	Treck Chains	
16.	Cultivators and Spares	(1)
17.	Ridgers and Spares	(2)
18.	Wood Handles	
19.	Seed Drills	(4)
20.	Agricultural Knives	
21.	Agricultural Scissors	
22.	Shellers	
23.	Secateurs	
24.	Strappings, Seals, Baling Hoops and related equipment	
25.	Rakes	
26.	Hammer Heads	
27.	Cyclone Fencing Materials	
28.	Adzes	

(1), (2), (3) and (4): Items probably feasible for large-scale local production in the near future (demand building up)

Geographical Location of Suggested Pilot Regions

Arusha

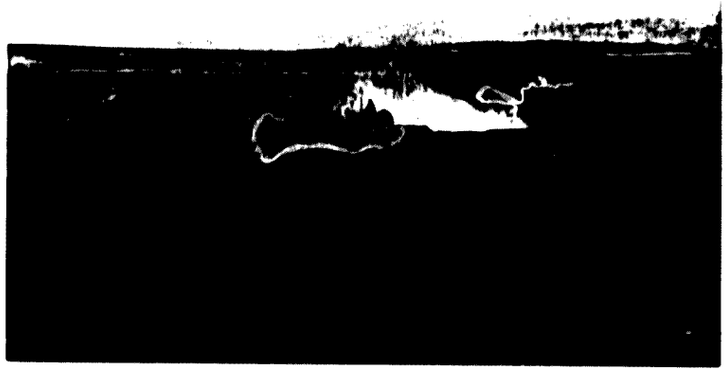
Dodoma



Extent of Uncultivated and Unproductive Land in Tanzania

Cattle Herd in Poor Grassland of Tanzania

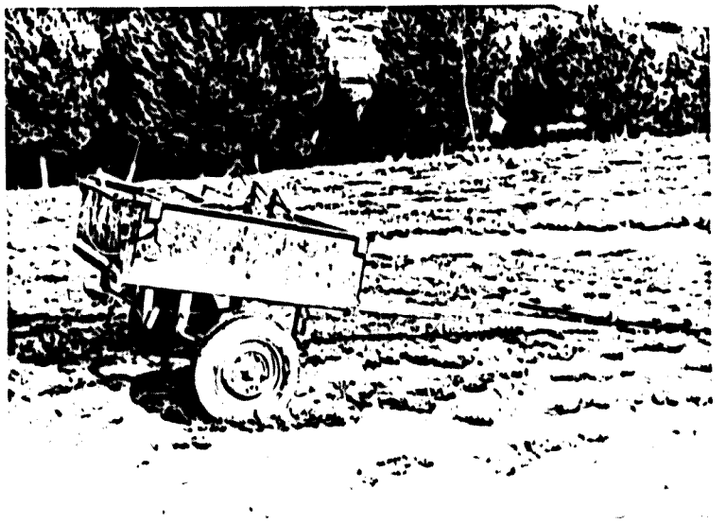
Tractor Station in Fertile District of Arusha Region



Tractor Ploughing in Fertile District of Arusha Region

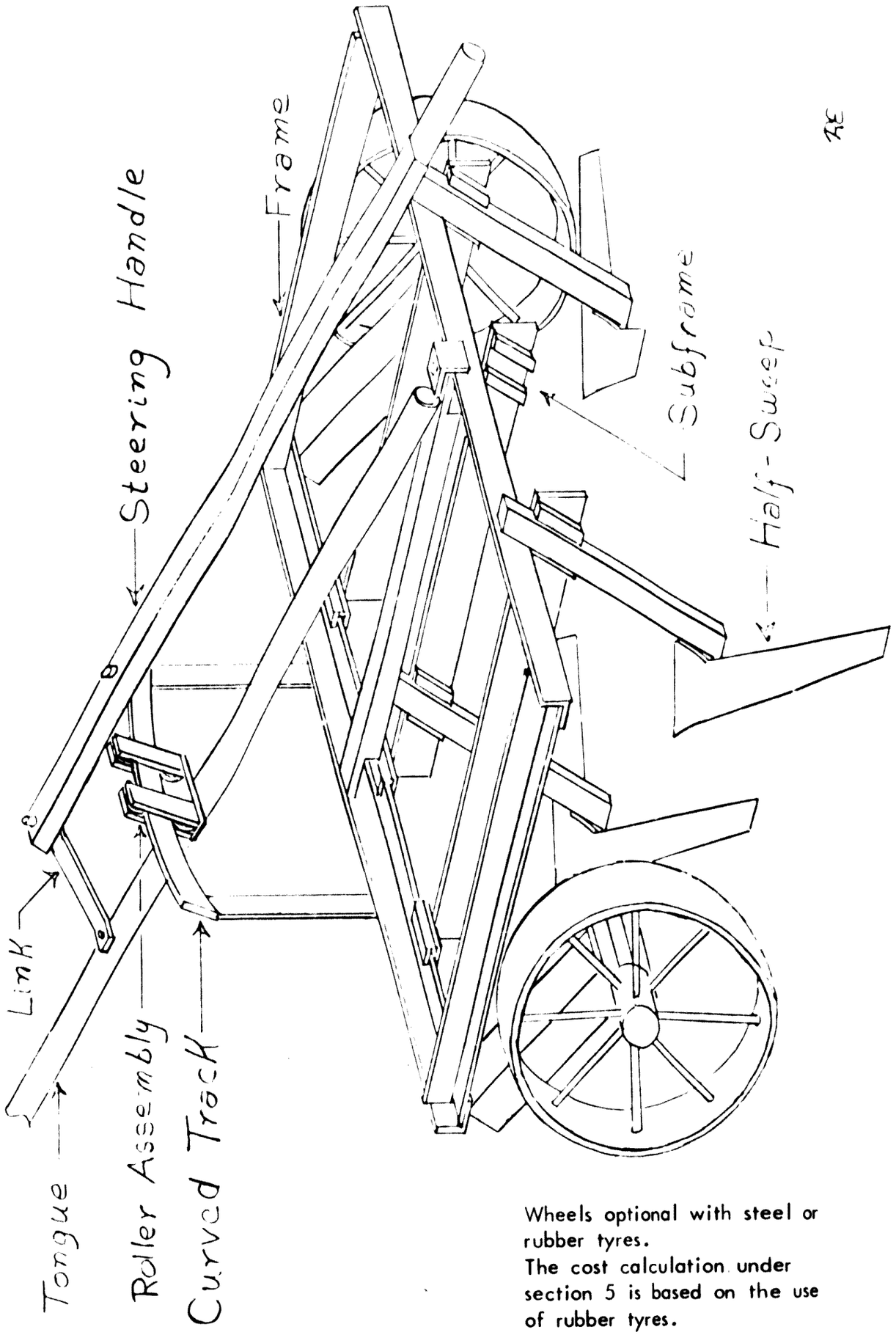
Ox-Ploughing
(Botswana)

Donkey-Cart
(Botswana)

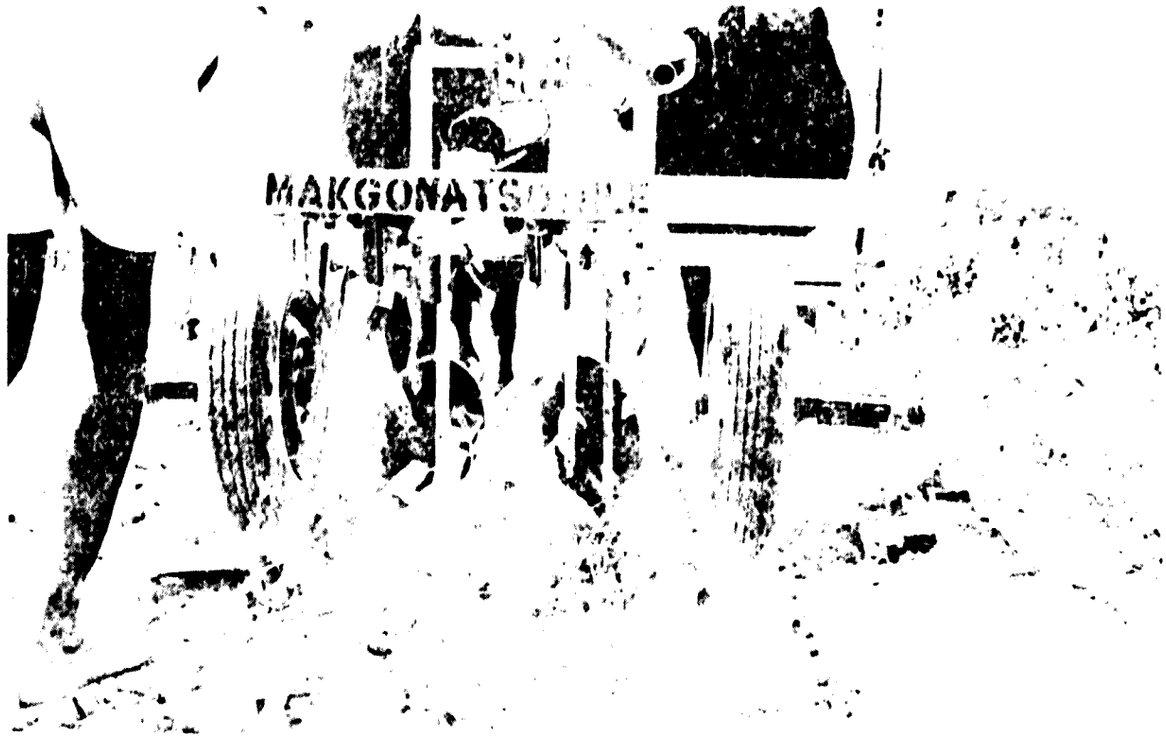


Ox-Cart as Used in Lesotho

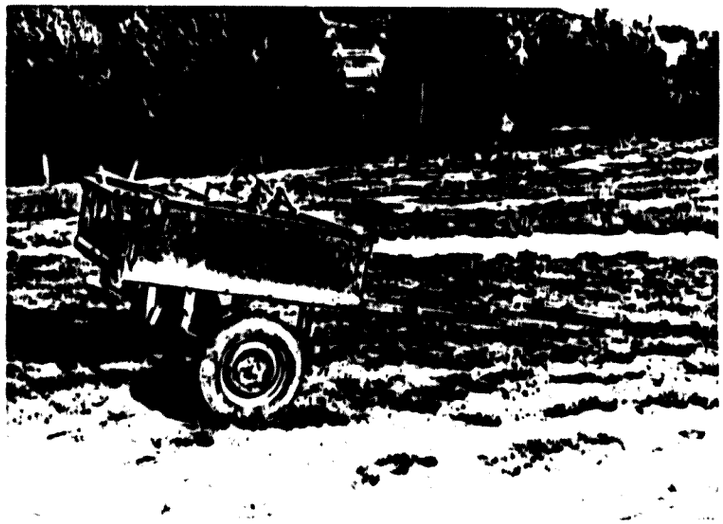
Needs iron wheels in Tanzania to protect against thorns

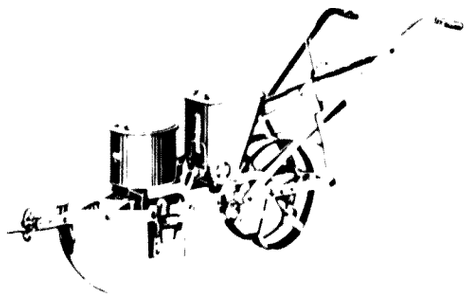


Wheels optional with steel or rubber tyres.
The cost calculation under section 5 is based on the use of rubber tyres.

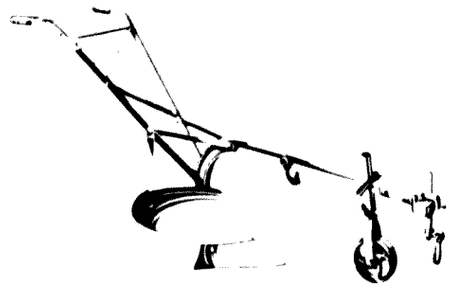

MAKGONATSO


MAKGONATSOTH

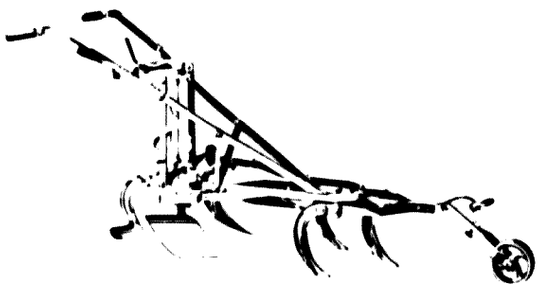




Planter

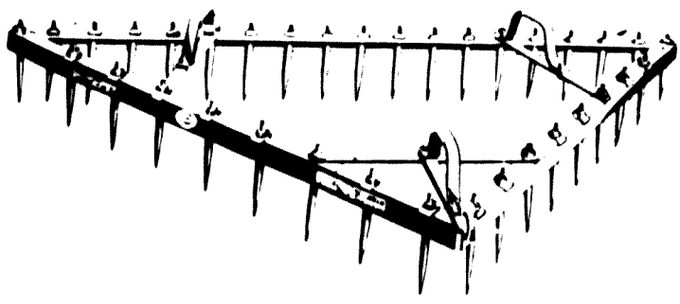


Plough

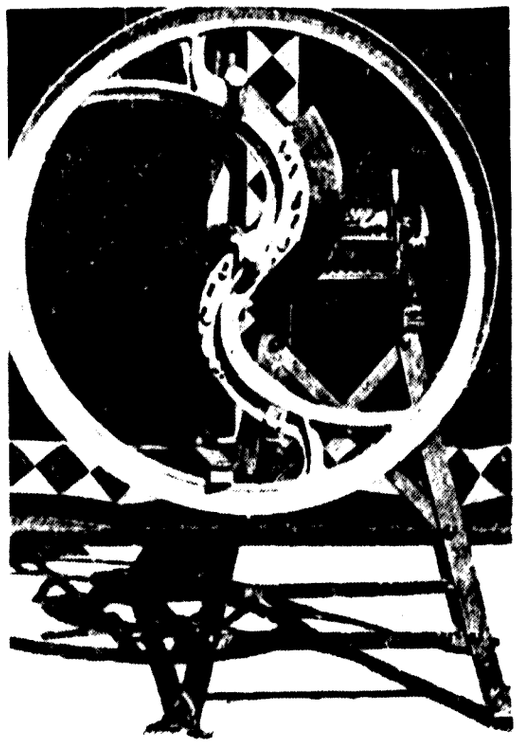


Cultivator for tough conditions

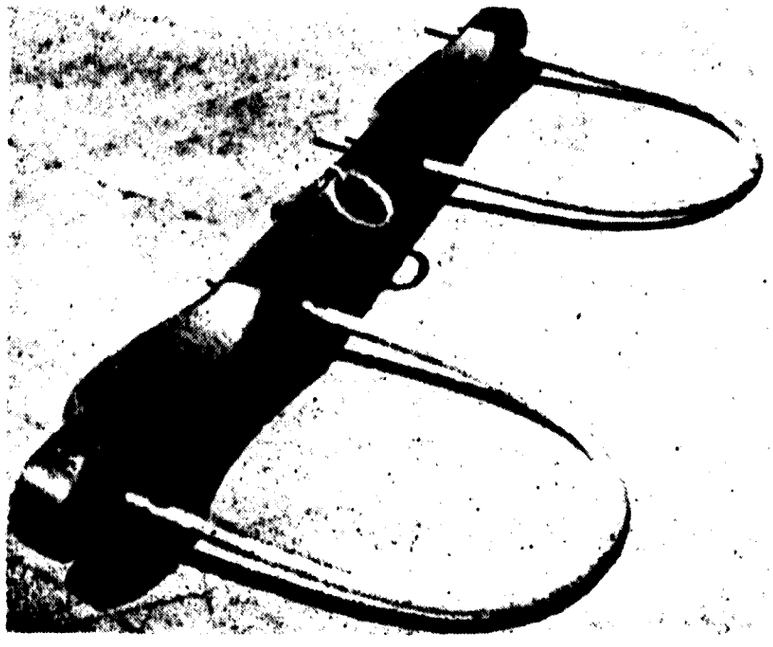
Light cultivator



Harrow



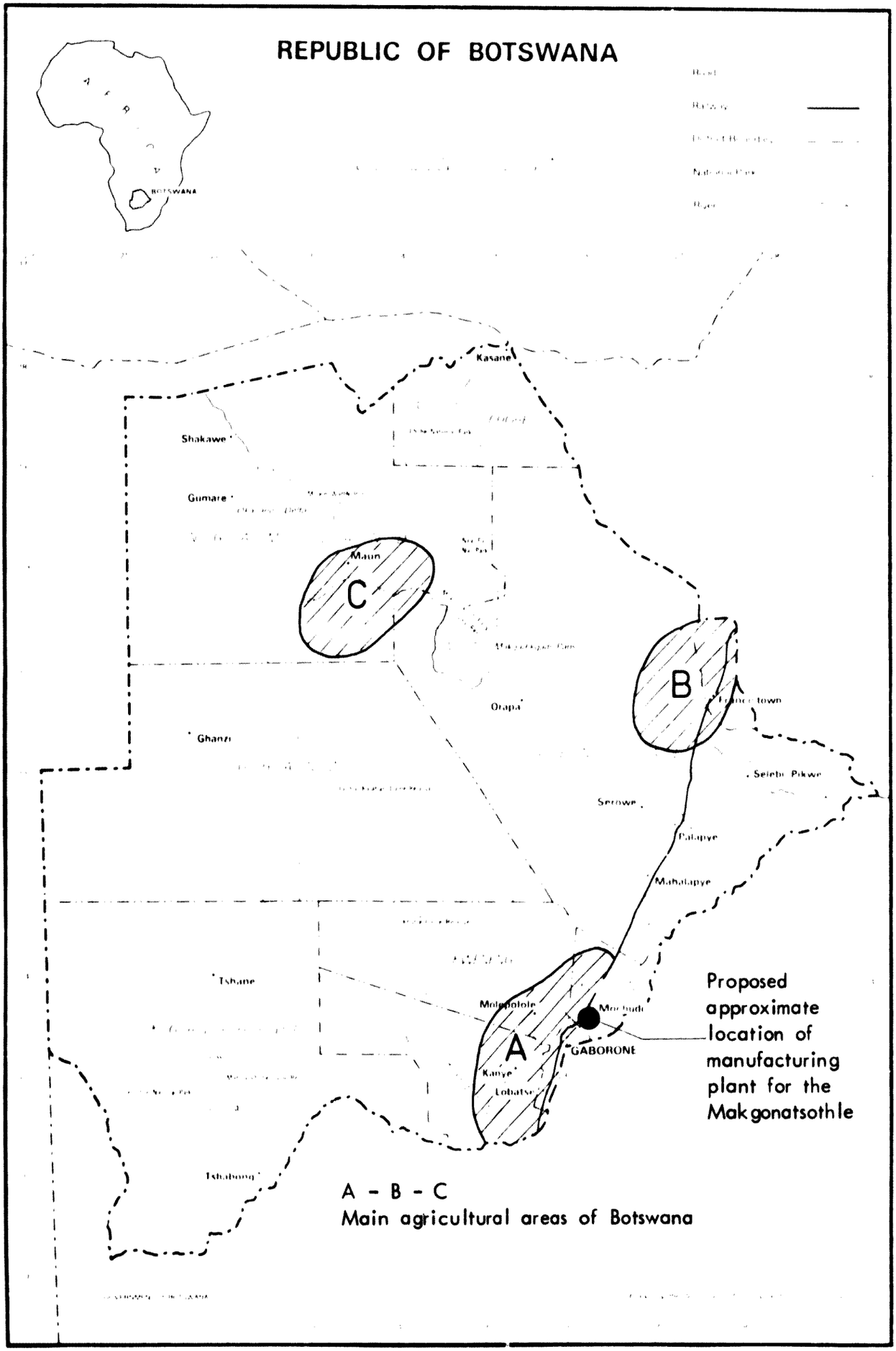
Hand-Operated Chaff or Fodder Cutter



Yoke for two Bullocks

Weeder

Hand Seeder


REPUBLIC OF BOTSWANA
BOTSWANA
Kasane
Shakawe
Gumare
Maun
C
B
Orapa
Francistown
Ghanzi
Selebi Pikwe
Serowe
Palapye
Mahalapye
Tshane
Molepolole
A
GABORONE
Kanye
Lobatse
Tshabong
Proposed approximate location of manufacturing plant for the Makgonatsothle
A - B - C
Main agricultural areas of Botswana

Ox-drawn sledges . . . a sign today of yesteryear.

Secondary Tillage in Lesotho

Tractor-Contractor Station in Lesotho
Windmill Waterpump in Background

1) Quarterly Statistical Bulletin 1974, Tanzania

2) Economic Bulletin Vol. VII No.1, Bank of Tanzania

3) Feasibility Study for a Farm Machinery and Implement Plant (Mbeya), National Development Corporation Ltd., New Delhi, India

4) LIDEP Information leaflet 1975, Tanzania

5) UNIDO Report IND/792/3563, Mr. Taneja, Dar es Salaam

6) FAO-UNIDO Caoperative Project Report DP/URT/74/006/A/01/12

7) FAO Mission Report URT 74/006/01/12

8) Statistical Abstract 1974, Botswana

9) Agricultural Survey 1970/71, 1971/72, 1972/73, Botswana

10) Investment Opportunities in Botswana, Ministry of Commerce and Industry, Gaborone

11) The Mochudi Toolbar, Agricultural Information Service, Gaborone

12) The Versatool, Ministry of Agriculture, Gaborone

13) Mochudi Farmers' Brigade: Progress Report 1974-1975

14) Creating Employment in the Main Villages, Conference Paper 1975, Molepolole, Botswana

15) Annual Report 1974, Kgatleng Development Board, Botswana

16) Botswana Development Corporation Ltd., Gaborone (various information leaflets)

17) Annual Statistical Bulletin 1973 and 1974, Bureau of Statistics, Maseru, Lesotho

18) Poverty eats my Blanket, Government Printer Maseru, Lesotho 1975

19) Agricultural Statistics 1950 - 1960 and 1965 - 1970, Bureau of Statistics, Maseru, Lesotho

20) Thaba Bosui Rural Development Project, Annual Report 1974/1975 and Quarterly Reports

21) Thaba Khupa Oecumenical Centre - Farm Institute 1974/75 Prospectus

22) United Nations, Statistical Yearbook 1969 - 1974

23) UNIDO Monographs: Engineering Industry; Small-Scale Industry

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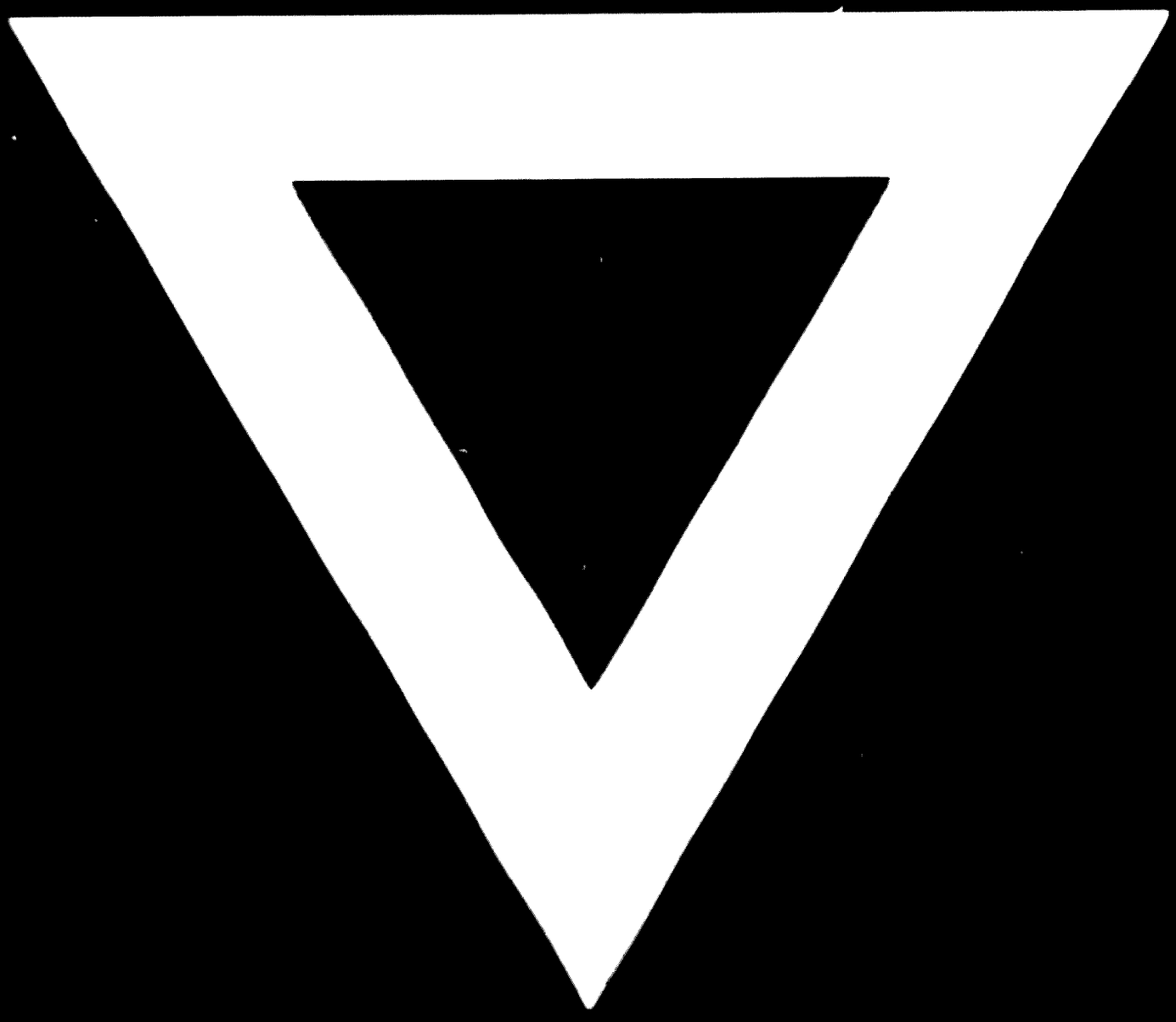

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