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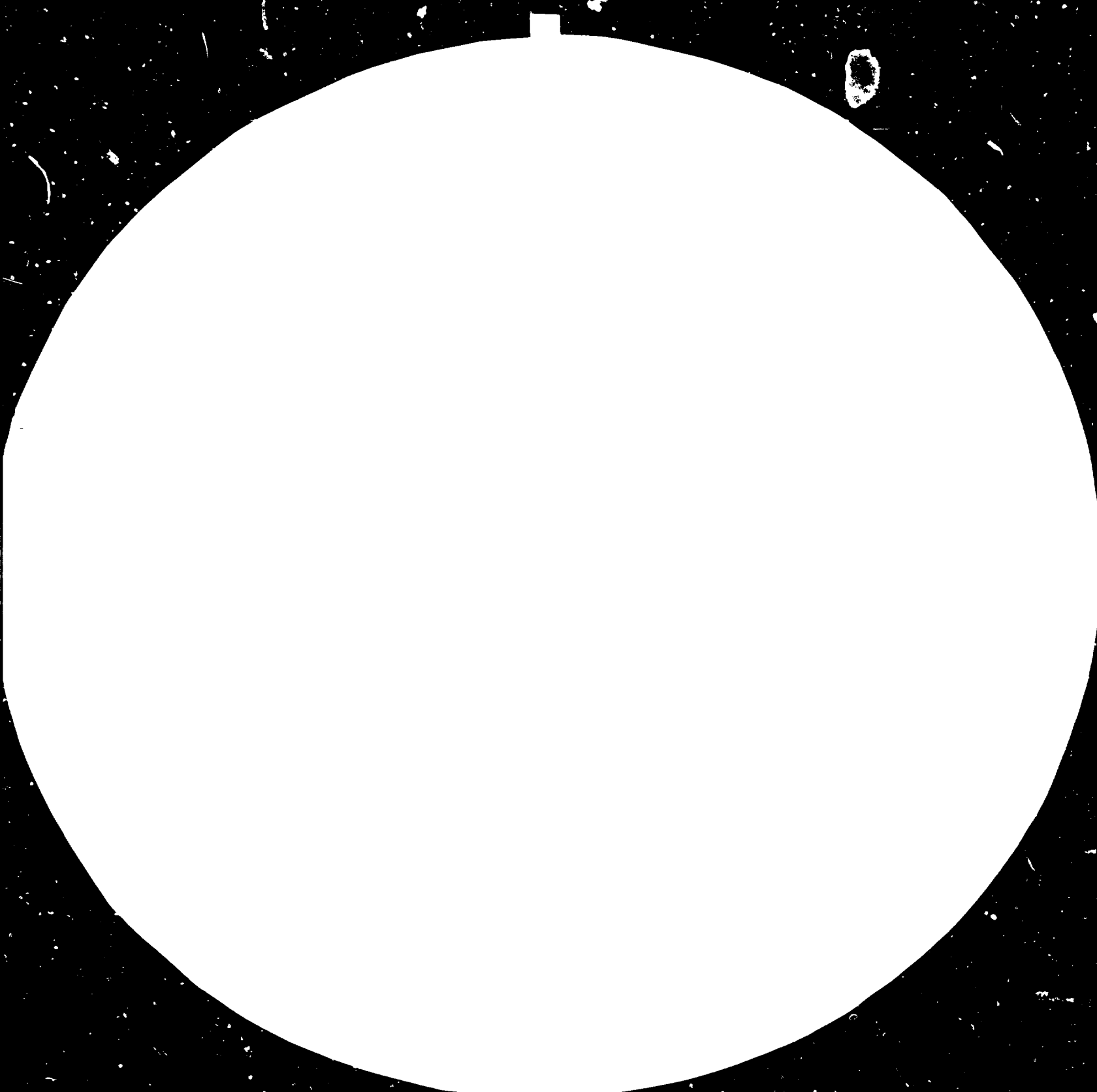

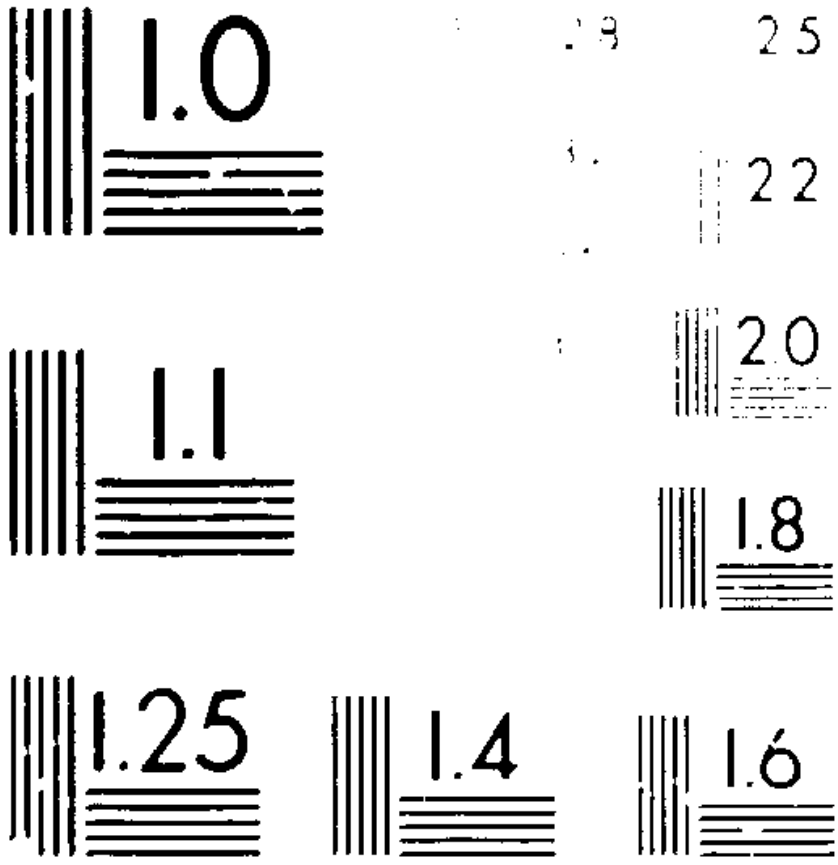
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COUNTRY PAPER - ZAMBIA*. (Agricultural machinery).

by

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1. INTRODUCTION

In order to clearly understand the pattern of agriculture and the trend for agricultural mechanisation in Zambia, it is necessary to understand how farmers are classified. In Zambia Agriculture has, hitherto, been classified into the following sectors:

(i)	Traditional Subsistance Farmers	-	60%
(ii)	Emergent Farmers	-	25%
(iii)	Commercial Farmers	-	15%

In order to work out the programmes which need to be planned for the second category and also to facilitate the evaluation programmes in terms of development objectives it is necessary to further breakdown the category of emergent farmers into three sub-groups namely middle-size emergent farmers, organised small-scale farmers and improved village farmers. The middle-size emergent farmer tends towards commercial farming by using more meehanised power and hired labour producing almost exclusive for the market, and has good potential for developing technical and managerial skills. The "organised small farmer" reflects the smallholder sector created by deliberate Government effort such as settlement schemes and rural reconstruction centres. The category of improved village farmer relies largely on draft animals and hand labour for cultivation.

Currently the strategy for agriculture centres around programmes geared to the development needs of these groups of farmers which have been identified. On implementation of ~~this~~ this strategy it is anticipated that the share of the traditional sector in the total cultivated area will be reduced from 78 per cent in 1974 to 51 per cent in 1983. Furthermore, the middle groups of emergent farmers will be raised from 18 per cent to 43 per cent in 1974/83 respectively.

It is important to mention that projections have been made for the demand for the agricultural commodities in the Third National Development Plan (see Appendix I) This demand will obviously reflect the extent to which mechanisation of agricultural machinery can be achieved.

2. THE AGRICULTURAL MACHINERY INDUSTRY - CURRENT STATUS

The agricultural machinery industry is oriented almost completely to distribution with repair and maintenance services rather than to manufacture. There are nine established suppliers who concentrate mostly on the large scale market and two parastatal organisation (Zamseed Limited and Zambia Co-operative Union) which supply the small scale farmers with ox-drawn equipment. Out of the nine organisations which distribute agricultural machinery including tractors and tractor implements three are parastatal organisations whose majority share holding is held by the Party and its Government (see Appendix II). None of these companies distributes hand operated nor oxydrawn equipment.

The demand for large tractors (i.e. 45 h.p. plus) is at present less than 1,500 units a year with appropriate implements and the annual demand for ox-drawn ploughs is about 15,000 units. We have yet to establish the real demand for low horsepower machines but the indications are that the market is a potentially good one.

Each supplier in the private sector as well as parastatal markets equipment in competition with each other and this results in the importation of a variety of different makes and types coming into the country. At the present time eleven (11) different types of tractors are distributed by nine(9) major companies.

While this may have advantages, particularly on the question of choice, farmers are more likely to be able to obtain exactly what they want rather than having to compromise with some inappropriate design, where back-up services

are required, e.g. likewith tractors for instance, turn-over per company is usually too low to support good repair and maintenance services in all areas where machines might be sold. The result is that while all the established dealers have reasonable base workshops in Lusaka, representation away from the capital is very scarce indeed.

The exception to this is A.F.E. Limited which, in addition to being represented on the line of rail also has three depots in the rural areas proper (Mumbwa, Kasama and Chipata). The rest concentrate along the line of rail.

On the other hand the Zambia Marketing Co-operative Union are represented all over the country in every district and all the farming areas. Even so distribution problems make it difficult to ensure a constant supply of both implements and spares at the times they are most in demand.

Very little of the machinery required by the large scale farmer is manufactured in Zambia. A plan to assemble tractors was shown to be economic only at demand levels higher than those which are likely to apply and consequently they could not compete pricewise with import parity. The project is however being currently persued.

Some engineering companies have attempted to manufacture disc ploughs but lacked the necessary expertise. Product quality did not come up to standard and consequently could not sell. Some companies manufacture ploughs and cultivators under licence which has proved successful and others produce maize milling machinery. Apart from this the requirements of the large farmers are met entirely from imports, 90% being imported. In the small farmer market one compnay has developed a single mouldbourd plough which was tested and found suitable at our Farm Machinery Research Unit and is now supplying the Zambia Marketing Cooperative Union. They have already moved to producing cultivators which are selling well. Other companies are making triangular harrows. (see appendix 4).

This upsurge of interest in production of ox-drawn implements is encouraging. An explanation to this trend is that the Government has attached priority to agricultural development to improve the economy. With the falling copper prices, the State has realised that the survival of the nation depends on the country's ability to diversify and to grow more cash crops.

This is the reason why even when it comes to foreign exchange allocations companies engaged in agricultural machinery distribution are getting better and bigger allocations. The copper industry still remains the main foreign exchange earner.

On the question of filling the power gap between oxen and the 45 h.p. machine the Government is encouraging activity in this field. More and more loans are being given to small scale farmers to buy simple low horse power tractors. During the last three years the Government has encouraged the importation of low horse power machines. The Ficher, Swaraj and M.F. 220 tractors are small horse power tractors which have been tested and have been recommended for use in Zambia during the last three years.

From the range of tractors on the Zambian market we can safely say that the established dealership has embraced the needs of the whole cross section of Zambian farmers.

3. AGRICULTURAL MECHANISATION AND ANALYSIS OF THE DEMAND FOR AGRICULTURAL MACHINERY

Mechanisation in the form of both animal drawn equipment and tractors has a long tradition in Zambia. The use of mechanised power prior to independence was confined to large commercial farmers, but a significant number of emergent farmers have also adopted the use of tractors and equipment. Application of mechanised power to agriculture has continued to increase. The use of draft animals has also been increasing throughout Zambia although 95% of the work animals continued to be located in Central, Southern and

Eastern Provinces (see Appendix 3). However, even with the increasing use of both tractors and animal draft, more than 75 per cent of crop output is still being produced by using hard methods.

In 1979 the total number of tractors in use in Zambia for crop production was estimated at about 3,800. Based on the assumption that while all the large commercial and middle-sized emerging farmers will use tractors as the main draft power it is estimated that there will be a requirement of 8,100 tractors by the end of 1983. It is also estimated that about 50 per cent of the area with the improved village category will also be cultivated with tractors.

In order to assist farmers who cannot afford to own tractors, the Ministry of Agriculture and Water Development, Projects Division, has been operating a Tractor Hire Scheme since 1975 with an initial complement of 450 tractors. Although the scheme has not been able to achieve desired results due to operational problems and difficulty in getting spare parts and trained manpower, the Government continues to operate it because of the importance of the scheme. Necessary steps are being taken to run it on an economic basis and more new machinery being introduced. It is only this year that machinery from Brazil worth over U.S. D. 9 million was bought for this unit.

In 1979 there were seventeen makes of tractors imported from fifteen different countries. This number has obviously increased now although most of the farmers use eleven makes of tractors representing nine agencies:-(as shown on Appendix 2). Government policy is to limit the number of tractor makes and models to those which have already been tested# tried and proven under Zambian conditions and to those agencies providing goods after sales service.

It is the Government's policy to encourage the supply of suitable, small, low horse power tractors for use by small and medium-size farmers. It is preferable that these tractors are in the range of

are in the rangeof 11 - 45 h.p. in size. There were no tractors in this range in 1979 which would economically be used on medium size holdings of about 30 hectares. However, at least four makes of small tractors have been introduced on the Zambian Market since 1980 as can be seen from Appendix 2.

Government has put a lot of emphasis on the need to import small simple tractors which should, whenever possible, have low horse power below 40 h.p., have an air-cooled engine, be capable of being hand started and have simple hydraulics. This is aimed at satisfying the demand for emergent farmers. The present demand for small simple tractors is in the region of 400 per year. This would need an injection of some Z K1.6 millin which is equivalent to Nine Hundred Thousand Pounds Sterling per year in foreign exchange.

In the recent years,the Government have put tremendous emphasis on agriculture and the related food production. It has introduced programmes such as the "LIMA" programme. the "Operation Food Production" programme - state farms which are aimed at encouraging all classes of farmers to grow more food. A lot of incentives have also been introduced for the benefit of the farmers. The result of these Government actions hashad tremendous impact on the requirement of tractors and tractor-drawn equipment. The total requirement of tractors by commercial farmers is about 1,200 tractors ranging from 40 h.p. to 120 h.p. This is more than twice as much as were imported in 1979.

3. (i) ANIMAL DRAWN EQUIPMENT

It is Government's intention to encourage traditional and small-scale farmers to use animal-drawn equipment particularly in Northern and North-Western part of the country. From the growth rate of work oxen as given in Appendix 3 it can be seen that there is a great demand for animal drawn equipment in 1993 compared to 1976.

To obtain the maximum benefit from draft animal resources it is required to import about 12,500 sets of animal-drawn equipment each year. To cut down the import bill Government is encouraging local manufacture of both animal-drawn implements and hand tools.

From Appendix 4 it can be seen that of the ten local companies which are capable and have the potential to manufacture animal drawn implements and hand tools the biggest and certainly most capable is Northland Engineering Limited. Should the factory be utilised to full capacity and with a possibility of expanding the engineering facilities this company can produce the country's requirements for Moulding board Ploughs, Ridger Ploughs, Cultivators, Harrows and Hoes.

In the absence of the demand from the local market Northland Engineering is arranging to export to neighbouring countries such as Burundi, Mozambique and Tanzania. In addition to this, Northland Engineering is currently engaged in developing other agricultural machines such as Rice Thrasher, Maize Shellers, etc.

4. PRESENT STATE OF ARTS - RESEARCH AND MANUFACTURING

(i) RESEARCH AND DEVELOPMENT OF AGRICULTURAL MACHINERY INDUSTRY IN ZAMBIA

As far as 1977, it was decided that an Agricultural Machinery Research and Development Unit be set in Zambia to look into farm machinery problems, to study the needs of Zambian Agriculture in respect of land, animal and engine powered equipment on a continuous basis, to investigate and collect information available from countries working on similar problems regarding agricultural equipment, to coordinate the introduction and construction of prototype tools and machines, to adapt existing desings and develop new ones suitalbe for Zambian conditions and to undertake operational and qualitative testing of these machines under various

agricultural conditions that occur in Zambia and advise on the provision of spares servicing, etc.

Research into crop production methods associated with the introduction of improved mechanisation and investigation into the farm management factors involved in the introduction of improved mechanisation and economic and social benefits could also be looked into. The Research and Development Unit does encourage and advises on local manufacturing of tools and machines and advises on the training of farmers and extension workers regarding farm machinery operating techniques. The Research and Development Unit in cooperation with the University of Zambia have already considered the following farm machinery equipment under the testing programmes.

a) Field test performance of the ox-drawn bar - this test was done to assess the performance of the four tool bars, together with various attachments available within conventional system of tillage, and to establish whether a tool bar is efficient in each of its rows, as the traditional equipment. Although the conventional implements and the pedestrian controlled tool bars (uni-bars) perform satisfactorily, it was obviously required a great deal more of operator skill and higher degree of ox-training than was available.

b)) Tinkabi tractors - To assess the performance of the Swaziland built Tinkabi tractors in conjunction with the implements available. No serious breakdowns occured although trouble was experienced with the flexible hydraulic pipes, exhaust pipe and draw bar, and mounting assemblies.

c) Hoe Testing Programme - Hoes were distributed to farmers and observations were made as to their field performance.

The following items have been submitted for field test at the Magoye Research Centre, Monze - Zig-zag Harrow, Triangular

Harrow, the Ox-Drawn Plough, Ox-Drawn Ridge, Ox-drawn Cultivators, Plough Shares and Mouldboard.

It is the Government's policyto have all new tractors and implements tested at the Research Centre before they can be imported or mass-produced.

4. (ii) MANUFACTURE OF EQUIPMENT

Some companies in Zambia have become engaged in the manufacture of agricultural equipments. Some of the equipments which have been manufactured so far are (Appendix 5).

1. Ox-Drawn implements - Ox-Drawn Ploughs
2. Horizontal Rota Type Maize Shellers
3. Triangular Harrows
4. Maize Mills
5. Water Bowsers
6. Trailers
7. Hoes
8. Cultivators
9. Ridges

To determine whether some of the equipment manufactured are suitable in Zambian conditions, tests are carried out at the Farm Machinery Research Unit, Magoye in Monze.

4. (iii) MACHINERY TESTING

The objective was to establish suitability by designing and construction under conditions of Zambia. The machinery being tested is subjected to sustain the programmes of work similar to what the user would require of it under similar conditions. This is done by the Farm Research Unit in Magoye, Southern Province. The machines including tractors are tested for two to six months depending on the items being tested.

5. LOCAL MANUFACTURE OF AGRICULTURAL MACHINERY AND IMPLEMENTS

(i) NORTHLAND ENGINEERING

As already mentioned this company is probably leading in the manufacture of animal-drawn agricultural equipment. They have the skill and engineering facilities to produce ploughs, cultivators, harrows and welded hoes to meet the country's requirement. There is no immediate demand to justify the production of ridger ploughs, cultivators and zig-zag harrows. Like other companies they too produce welded hoes only but are exploring possibilities of producing forged hoes which would cost K3.05 each.

Northland Engineering are probably the largest suppliers of Hammer Mills in Zambia. They have been producing them for the last nine years, and have sold 420 during the last four years.

Northland Engineering is now investigating the possibility of manufacturing tractor-drawn ploughs and other implements andmay get machinery from India to enable them to diversify.

(ii) SHONGA STEEL CO. LTD

This company produces hoes and draw bars for ox-drawn equipment for the last five years. It has the capacity for 300,000 welded mild steel hoes and 200,000 draw bars. It has no facilities to produce heavy duty forged hoes yet. It is a medium sized private company.

(iii) LUSAKA ENGINEERING COMPANY (LENCO)

They produce scotch carts and farm trailers. The specialise in sheet metal works and hence cannot produce harrows, cultivators, etc, with existing facilities They have the annual capacity of 2,500 scotch carts and 1,500 farm trailers. The actual demand for LENCO at the moment is one thousand of each type. This is a large parastatal company with big and well equipped

sheet metal workshops.

5. (iv) OTHER COMPANIES

There are of course other smaller companies producing animal drawn implements. Such companies as Walker Welding Repairs of Choma, M.D.M. Engineering of Kitwe, Prestige Construction of Lusaka and Steel Products of Mufulira are all small companies which do produce hoes and animal drawn equipment on a small scale (see Appendix 4).

6. POWER OPERATED AND TRACTOR DRAWN AGRICULTURAL MACHINERY AND IMPLEMENTS

More than 90% of Zambia's requirement of power operated and tractor drawn agricultural machinery and implements are imported into the country (Appendix ?) gives details of imported machinery while (Appendix 5) gives a list of companies which are based in Zambia producing a limited number of agricultural machinery.

These companies claim to have enough capacity to produce the country's requirement for harrows, cultivators, planters, ploughs, maize shellers, hammer mills and farm trailers But of course we would be talking in terms of less sophiscated machinery. They have however succeeded in meeting the country's requirement for farm trailers. Zambia does not import farm trailers.

It should however be pointed out that all these companies are engaged in other acitivities other than the production of agricultural implements/machinery In fact it is safe to say that their involvement in agricultural activities is only about 25 per cent of their operations. These companies claim that should the Government ban the importation of less sophistated implements they have the ability and resources to meet the country's requirement.

6. (i) IMPORT AND EXPORT OF AGRICULTURAL EQUIPMENT

Appendix 2 gives details of tractors which are imported in Zambia. At present all tractors required in Zambia are imported from mostly Europe and Asia. The heavy agricultural tractors and associated implements are imported from Europe while the smaller tractors and associated implements are imported mainly from Europe and Asia. Most ox-drawn implements are manufactured in Zambia (Appendix 4 gives a list of companies producinng ox-drawn implements).

Between 1976 and 1980 an average of 689 tractors were imported into Zambia annually. In 1981 however over 19,000 tractors were imported. The reason for this is that the Zambian Government had negotiated with various developed countries to assist in the Operation Food Production Programmes. Under this programme developed countries particularly from the Eastern Block participated by giving grants and loans under which tractors were bought. These tractors are used in state farms and Zambia National Service.

The demand for agricultural tractors and implements is likely to continue increasing due to the Government's emphasis on agricultural development. The countries annual requirement is estimated at 1200 tractors (40 h.p. to 120 h.p.) and about 400 tractors below 40 h.p. together with a complete range of tractor drawn implements. (see appendix 2 & 6).

7. ENGINEERING AND METAL WORKING ACTIVITIES

As already mentioned there are companies ranging from large to small which produce agricultural machinery and implements and they are self-contained as there is minimum operational arrangements between two or more companies. However, due to lack of demand these companies operate at about 25 per cent utilisation in as far as agricultural machinery production is concerned. These companies have medium to small machine shops, tool rooms, etc, but do not have foundry, forging and

heat-treatment shops.

There are however a good number of big companies which have engineering facilities which can be used in the production of components to be used in agricultural machinery industry. Zambia Railways(Kabwe) and TAZARA (Mpika) have very big and well equiped foundry, forging, heat treatment and Blacksmith workshops which have a 60 per cent - 70 per cent utilization. Also the Lutanda Foundry and Engineering Limited, P O Box 20516, Kitwe, have facilities which can be fully utilised on agricultural machinery industry. What is needed is proper arrangements and projected planning in the production of components to be used in the manufacture of agricultural equipment and these components can be produced to the specifications as may be needed. The Copper Mines have tremendous potential in this respect.

8. REPAIR AND MAINTENANCE FACILITIES

All the companies dealing in the importation and distribution of agricultural machinery and implements have their own maintenance systems. The majority have large workshops capable of handling most complicated jobs and engine overhauls in Lusaka at their Head Offices and service the rest of the country from a central point. This makes after-sales service quite expensive for the farmer as very long distances have to be covered even for simple jobs and the farmer pays for transport and mechanics travelling time in addition to other usual expenses. So far it is only A.F.E. Limited a parastatal organisation which has six (6 No.) branches and branch workshops strategically located at Choma, Mazabuka, Chipata, Mumbwa, Kabwe and Kasama, to serve the areas around them to provide more efficient and cheaper after-sales service. All the companies have modern technologies and skills as all of them are agents for some international companies.

Although the Zambia Marketing Union has the monopoly to sell ox-drawn and hand operated implements and spare parts, it does not provide any repair or servicing facilities. Maintenance of these is done by another parastatal company called Rucom

Industries Limited which has workshops throughout the country, i.e. in all districts.

9. AGRICULTURAL MACHINERY INDUSTRY - POLICY

The Ministry of Agriculture and Water Development in conjuction with the National Commission for Development Planning and the Ministry of Commerce and Industry are responsible for agricultural machinery industry and related basic engineering and metal-working industry. As mentioned earlier, the Agricultural Machinery RFsearch and development Unit looks into farm machinery problems and studies the needs of Zambian agriculture in terms of hand, animal and engine powered equipment. It also coordinates the introduction and construction of prototype machines, adapting existing designs and develop new ones suitable for Zambian conditions.

The Government encourages local production of agricultural equipment as much as possible. However, due to limited resources and lack of skilled manpower and specialised equipment#machinery it is not immediately possible to be self sufficient in this respect and consequently Zambia will continue to import a wide range of tractors and related implements.

In order to develop the agricultural machinery industry the Government is encouraging investments by private firms including foreign owned companies and enters into financial agreements with interested countries in the line of local agricultural machinery production. Enterprise level cooperation between countries is also encouraged.

10. STRUCTURE OF TRADE IN AGRICULTURAL MACHINERY

At present no agricultural implements are exported although inquiries are being made to neighbouring African countries.

As regards the quantities imported from 1976 to 1981 a skeleton of information is given in Appendix 6. Unfortunately the information regarding the breakdown according to types and the actual cost involved is not readily

available. It is however, safe to say that most of the imported hand tools come from European and Asian Countries. Agricultural machinery for soil preparation#cultivation normally come from the country supplying tractors (see Appendix 2).

The Government is seriously considering the establishment of a factory to assemble#manufacture different ranges of tractors. A comprehensive study is to be made before a decision as to what type#make of the tractor to be locally manufactured. It is hoped that the tractor plant will also be producing a range of tractor drawn agricultural implements and that low horse powered tractors and implements will be produced for the small farmer.

11. PROBLEMS AND CONSTRAINTS AFFECTING THE AGRICULTURE MACHINERY INDUSTRY AND AGRICULTURAL MECHANIZATION

The main problem encountered is on the supply side and in particular the lack of adequate foreign exchange. It is already pointed out that the bulk of Zambia's requirements of agricultural machinery are imported. Due to lack of foreign exchange only a limited number of equipment is imported and mainly for the commercial farmer who can readily pay for items once in the country. The small scale farmer has to depend largely on human labour since he cannot readily get the small simple tractor which is in short supply and cannot easily raise the funds to cover the cost of same without being financed.

Even for locally made implements such as ox-drawn and hand-operated equipment lack of foreing exchange to bring into the country the necessary essential materials makes production limited. So that even when the small scale farmer has the money, he cannot buy his requirements and he is therefore forced to hire from co-operatives and other Government institutions. But even with hired machinery and implements the demand for them is so high that the small scale farmer cannot get them in time for the season. In Zambia the problem is not demand but supply of agricultural machinery.

12. PROSPECTS FOR 1980s

Farmers are looking forward to brighter and better 1980s. This is because the Government has already identified agriculture as one field needing priority attention. Farmers are given incentives to grow more and encourage small scale farmers to mechanise their operation wherever possible and grow more too. Quite a lot of money is being poured into agriculture and it is anticipated that the 1980's will see a lot of implements on the market. This will however mean that developed countries will be called upon to assist to raise the foreign exchange needed in form of loans.

There is need for Covernment to channel some money into setting up different plants for the manufacture of advance agricultural implements and equipment. There should be a detailed feasibility study done to establish the pros and cons for setting up a tractor manufacturing (and not merely assembling) plant. Local manufacture of various agricultural equipment#implements must be encouraged during the 1980s in order to meet the objectives on agricultural production. According to Third National Development Plan (1979-83) the strategy for rural development is to raise the productivity of the masses particularly that to subsistence farmers and villagers in order for them to grow cash crops. To do this, simple machines and animal-drawn implements and hand tools rather than tractors and other sophisticated and expensive machines are to be used. Incentives would also be given to private entrepreneurs, cooperatives or parastatals, willing to produce such equipment. Also to be examined is the possibility for producing various kinds of irrigation equipment.

13. TRANSFER OF TECHNOLOGY ON AGRICULTURAL MACHINERY IN ZAMBIA AND OTHER DEVELOPING COUNTRIES

The barriers to communication and technology transfer are still very strong. In fact historically, poor communications and imperfect markets have obstructed the free transfer of appropriate agricultural technologies in most developing

countries. Traditional hand tools of which in the 19th century there was a wide range well suited to local conditions, disappeared in most parts of developing countries particularly Africa as mass produced alternatives were imported from the West.

This change brought with it certain disadvantages. Only a few of these imported tools were designed for condition in the developing countries and most have proved physically ecologically and economically inappropriate. In case of Africa, it is only in recent years that serious attempts have been made to produce in Africa tools designed specifically for local conditions, building on both imported and indigenous experience.

An example is in Eastern Africa where during the colonial period local manufacture of hand tools by village blacksmiths was discouraged in order to secure a colonial market for the limited and now familiar range of hoes, forks and cutlasses made and designed in Europe.

As mentioned earlier - on although most developing countries in Zambia and other African countries still depend heavily on imported agricultural equipment from the developed world many of these imports are of high cost, inappropriate to the countries needs, difficult to maintain in remote rural areas and that they could to a large extent be replaced by locally manufactured alternatives.

This dependence on imported technology has some adverse effects on the agricultural development in Zambia and other developing countries. Because of the inappropriateness of the technology, it is usually observed that the imported agricultural machinery become unserviceable in a matter of few years because of lack of proper service facilities including spare parts. This becomes a drain on the country in that the funds earmarked for agricultural development are channelled to replace the defective machinery which is written off before its expected life span just because of lack of proper service facilities.

We are aware of the problems of foreign exchange which all developing countries are experiencing. By replacing a machine much earlier than expected is a drain on the meagre foreign exchange of a developing country and consequently this has a retarding effect on the development of agriculture.

Free importation of technology from the developed countries has another adverse effect on the developing countries' agricultural development. Because of insufficient negotiating power most developing countries become dumping grounds in that not only are obsolete technology exported by developed countries to developing countries but the developing countries are flooded with too many types of machinery for one function. This results in improper service facilities and does result in increasing an import bill for spare parts - another drain on foreign exchange. An example is that in Zambia there are at least nine companies distributing eleven (11) different types of tractors.

One other point worth mentioning here is that the surest way in which developing countries can obtain agricultural equipment appropriate to their needs is to make it themselves. This should be and in fact is one of the Governments objectives. It is with this realisation that developing countries are continuing to encourage local manufacture of agricultural equipment. For example, in 1960 there were less than ten (10) factories in East, Central and Southern Africa manufacturing a restricted range of agricultural implements, but by 1981 there was a wide range of tools produced in about thirty (30) factories spread through every country of the region, and these are all tools appropriate to low-cost, small farm operation. In addition to this, initially, the designs used were derivatives of the tools previously imported but now some smaller workshops are now producing more original designs based on local research and better suited to local conditions.

There are of course constraints to local manufacture. Local manufacture or assembly of imported designs of complex equipment is generally arranged under licence or in agreement with

the original producers. But with simpler low cost agricultural tools "pirating" - manufacturing in the defiance of, or in the absence of design patents - is much more commonly practiced.

Although "pirating" is the fastest way of getting access to designs it frequently leads to an unsatisfactory end product more inferior to the original design.

Developing countries should be encouraged to enter into exchange agreements - where by a developed country provides the technical know-how and equipment to set up factories in the developing countries which would produce agriculture machinery&tools to suit the local conditions of the developing countries. Should there be any cost in such agreement it should be more than adequately covered by the insurance that the copy wil perform as well as the original design.

A major technical constraint in Zambia is the need for high quality materials in some important components. For example cultivation equipment such as hand tools and ox-ploughs need high quality steel for soil-contacting parts and in most cases in developing countries and Zambia local steel mills cannot yet fully meet this demand or they are not there. Milling and pumping equipment needs durable sealed bearings for which demand is still insufficient to justify local manufacture and as a result some parts have to be imported. This in its - self affects the potential to manufacture otherwise good local design.

Another major constraint to local manufacture is economical. This is the size of the market. In most developing countries the market that an individual factory can penetrate without assistance could be too small to justify mass local manufacture and this is the situation in Zambia.

Regional trade in the agricultural equipment is a tool which can facilitate technology - transfer among countries which may have common boundaries, common language, similar natural resources etc. This concept is not new. In Africa for

example in the colonial and the immediate post-colonial period two regional groupings functioned: the Central African Federation and the East African Community. As you are no doubt aware these groupings each gave markets for three countries to factories in one of the countries. They also used road and rail infrastructure that linked the countries effectively and played a big part in serving the regional markets the Preferential Trade Area (PTA) is the most recent of these groupings in Africa.

The most common existing constraints on regional trade are logistical, financial and political. In the past, these contributed greatly to the break up of regional trade and must be examined carefully when setting a regional trade agreement.

From the discussions outlined above, it is easy to see that in Zambia and most developing countries and certainly in African countries technology is not appropriate. But these developing countries have realised this fact and are doing everything possible to change the imbalance.

14. INDUSTRIAL DEVELOPMENT POLICY-STRATEGY DURING THE THIRD NATIONAL DEVELOPMENT PLAN

The country's policy-strategy for industrial development during the Third National Development Plan has been designed within the broader policy of lessening the country's dependence on the mining sector. The manufacturing or industrial sector is, in this regard, envisaged to play a key role in the diversification as well as restructuring of the economy during the plan period and in the long term.

In view of the cardinal role the manufacturing sector is expected to play towards the overall policy of economic diversification, the policy strategy for the sector postulates rectifying the present lop-sided development of the sector and redressing the existing policy bias in the favour of capital-intensive techniques. The major objectives of the industrial development strategy are therefore as follows:

(i) to promote import substitution and export-orientation by establishment of industries based on maximum utilisation of local agricultural and other raw materials.

(ii) to pursue an intergrated approach towards industrialisation by establishing industries which are closely linked with each other and by utilising all agricultural by-products and wastes;

(iii) to pay special attention to choice of technology having regard to factor endowment and size of the domestic market;

(iv) to attach highest priority to the development of small-scale and rural industries particularly:-

(a) small-scale industries in both the manufacturing and non-manufacturing sectors;

(b) agro-industries, food-processing industries, and industries for the manufacture of simple agricultural implements and tools;

(c) village industries including those run by self-employed persons using family labour and simple tools requiring minimum investment;

(v) converting existing assembly plants into manufacturing plants by increasing the number of stages of production giving priority to the fullest utilisation of the existing industrial capacities by arranging adequate supply of raw materials and inputs while at the same time paying due attention to cost control and maintenance of capital equipment;

(vi) providing for the establishment of essential capital goods industries.

Given the above policy objectives, a number of priority industries have been selected for emphasis during the Plan period. These industries include agro-industries copperbased industries, fertilisers, sulphuric acid, mining equipment, agricultural tools and implements, cement, ceramics and prefabricated

building materials.

Notwithstanding, the predominant role of the parastatal sector the plan provides for private investment, both domestic and foreign through various incentives under the Industrial Development Act in order to enable the private sector to play its rightful role at the present stage of the country's industrial development. The Act does not therefore discrimate against any investor, domestic or foreign or foreign provided certain requirements regarding transfer of technology are fulfilled and all such investments are directed into the priority industries listed above. In this context joint ventures between foreign and local investors are encouraged by assuring the former remmitance of profits and fair treatment.

15. SCIENCE AND TECHNOLOGICAL DEVELOPMENT POLICY

The Party and its Government recognise the close link between science and technological research and a technological policy in general. The extent to which science and technology is applied for social and economic development of the country as a whole depends on the extent to which a science and technology policy is integrated in the overall national policy for socio-economic development. The Party and its Government thus considers science and technology as one of the five priorities of human endeavour. In this regard the following are the general objectives of the Science and Technology policy:

(i) To strengthen research activities of all research institutions (seience and technology research ; impact of science and technology on cultural, social and economic barriers on generation*diffusion of endogenous and foreign technologies) by establishing mechanism(s) for identification of research priorities and for adequately coordinating and rationalising resources investment plans for science and technology research.

(ii) to promote greater contacts between research institutions and the production sector to achieve greater rate of utilisation of research results in the production sector.

(iii) to strengther extension services in agriculture and industry to facilitate greater diffusions andsapplication of research results and other acquired technologies in the production sectors.

(iv) to increase the national capacity for selection and acquisition . of high cost technology and for monitoring its performances and impact on cultural and socio-economic development of the nation.

(v) to monitor and assess the impact of new and emerging technologies in industrialised countries on the socio economic development of the nation.

(vi) to coordinate research activities of various institutions and to popularise and publicise the role of science and technology in the overall development of the nation.

(vii) to strengthen science technology teaching in schools and to increase and improve laboratory#technical workshop facilities in science and technology based de departments of technical colleges and schools of the University of Zambia so as to increase the number and improve the quality of scientific and technological, including allied professions, personnel.

(viii) to establish adequately rewarding and seperate career structure for science and technology based prefessions, including research, in the public sector (civil service, parastatal and statutory organisations) to facilitate retention and contribution of such personnal in the development of the nation.

16. INVESTMENT POLICY WITH RESPECT TO:
AGRICULTURAL MACHINERY

The Investment Policy with respect to the agricultural machinery in Zambia is basically determined by the objectives outlined in the agricultural sector of the country. Looking at the development plans of Zambia it will be seen that agricultural development is recognised as a priority area and means

of achieving national development. Among the agricultural sector objectives are the achieving of self-sufficiency in staple foods to provide raw materials for agro-industries and to increase agricultural products for exports.

In achieving these objectives the country has to first and foremost overcome the prevailing socio-economic and technical constraints affecting the Zambian farmers of all categories in different magnitudes. But a basic problem is that the various categories of farmers are limited to expanding hectarages in the absence of any machinery. Consequently this negatively affects the objective of increasing production. However even in the event of a farmer increasing hectarage there is the other problem of harvesting. All these call for improved machinery and this machinery at least has to suit each farmer's category.

In recognition of the foregoing the Government has undertaken deliberate efforts and measures in farm mechanisation. Farm mechanisation has been in the form of both animal draft power and tractors. In the use of animal draft power work oxen schemes are implemented. This is considered to be a key factor in the traditional or small-scale farming sector. In obtaining the maximum benefit from the animal resources, sets of draft animal equipment are purchased. In addition local manufacture and maintenance and repairs of agricultural equipment in rural workshops is encouraged.

The use of tractors and equipment in agricultural development is ever an important aspect in farm mechanisation. Unlike prior to independence then mechanised power was confined to large commercial farmers at present emergent farmers have adopted the use of tractors and equipment. The Government has been encouraing the use of incentives in encouraging mechanised agriculture. For example tractors and equipment are imported duty free. In addition depreciation allowances are continually offered. Furthermore the Government since 1975, has been operating a "Tractor Hire Scheme" in order to assist farmers specially small-scale farmers who cannot afford to own a tractor.

Another important aspect regarding investment policy with respect to agricultural machinery is the existence of the Land Development Service (LDS) under the Department of Agriculture. The LDS maintains a fleet of light and heavy machinery for land clearing throughout the country. Currently the Government has decentralised its operations to make it more effective and services readily available for farmers.

Irrigation is a strategy which has also been featuring prominently in our efforts of attaining agricultural development objectives. For example, in the Third National Development Plan the following principles were to govern the strategy for irrigation programmes.

(a) small-scale schemes using simple methods and requiring small capital investment. The main motive for this strategy is to build irrigation skills in farming community in order that they eventually adopt more advanced and productive techniques.

(b) medium sized irrigation schemes to be established where feasible in each district.

(c) large-scale irrigation schemes being restricted to the cultivation of some specialised crops, such as sugar cane, rice, wheat, fruits, vegetables and tea.

17. SUB-REGIONAL AND INTERNATIONAL CO-OPERATION

"Recognising" the vital importance of regional economics co-operation to enable countries to meet common problems while acceleration their progress and development, Zambia is intensifying its efforts to foster greater collaboration at international, regional and sub-regional levels. This is borne out by its active participation in several international and regional organisations including the Economic Commission for Africa, the United Nations and its specialised agencies, the Commonwealth, SADIC and many other multilateral or bilateral economic arrangements.

Zambia recognises the importance of sub-regional cooperation in the agricultural field and encourages and accepts the idea of countries in a given area coming together to determine the best possible way of cooperating in the manufacture and distribution of agricultural machinery. Zambia continue to look forward for co-operation with its neighbours such as Zimbabwe, Tanzania, Malawi, etc, and other African countries such as Rwanda, Burundi and Kenya to name but a few. With proper planning there is no reason why a tractor manufacturing plant cannot be set up in say, Zambia to supply tractors to the area around Zambia, another plant for implements can be set up in Zimbabwe while a plant to specialise in the manufacture of various spare parts can be set up in Tanzania.

This sort of arrangement would need extremely careful planning and coordination and each country affected would have to review their economic and political policies to make this a reality. It is no doubt that subregional cooperation in the agricultural machinery production is a brilliant idea although quite a good number of learned people doubt whether it would actually work, particularly for African countries. It is therefore the mechanics of implementation which should be deeply invol- explored. The tendency for most, if not all, African countries is to encourage as much as possible local production of agricultural machinery. This is probably due to the immense problems most countries have getting foreign exchange to import finished machinery. It is this protectionist policy and the difficulty, logistically of organising planning inter-regional projects which makes sub-regional cooperation not easy to achieve.

Zambia has had some experience regarding the cooperation between neighbouring countries. Zambia and Tanzania have achieved a lot by successfully accomplishing joint projects such as Tanzania Zambia Pipeline (TAZAMA), Tanzania Zambia Railways (TAZARA), Zambia Tanzania Road Services (ZAMTAN). This makes Zambia to believe that further achievements can be made at sub-regional level in the field of agricultural machinery production.

It is important to note that where two developing countries have established joint ventures, there is usually a third developed country supporting and financing such ventures. It is therefore necessary that for sub-regional cooperation to be established in Africa in the field of agricultural machinery industry, there may be a need for a developed "donor" country's involvement.

Enterprise level cooperation among small industries in developing countries should be encouraged. There should be areas of specialisation so that one industry concentrates on making a component of relatively big machine while other enterprises make the rest of the requied components. Similarly one enterprise may concentrate on making one type of implement say ox-drawn implement(s) while others make a different type(s) of implements e.g. tractor drawn implements.

Another area of cooperation is related to marketing. While some companies may specialise in production others should concentrate on marketing these products and to carry out after sales and maintenance services. If this is done the country would save on duplicated investments - resulting in better utilisation of capital.

There should also be better cooperation between a small enterprise in a developing country and an international company from a developed country. The international company can provide technical know-how which the company from a developing country can provide local financing and infra-structure. This way both companies would benefit while developing an undeveloped country.

19. RECOMMENDATIONS:

In view of the foregoing, I wish to recommend the following line of action:

1. The existing companies dealing in the manufacture of animal drawn and hand tool implements be given Government support and financial assistance to expand and

improve on their operations in order to make the country self-sufficient in this field.

2. Similarly, local companies capable of production tractor-drawn implements be given financial assistance to import suitable machinery to enable them produce high quality implements to suit local conditions so as to cut on the import bill for these implements.

3. United Nations Industrial Development Organisation should perhaps consider giving financial assistance and technical know-how to enable a group of African countries to set up industries and start producing (not assembling) more sophisticated agricultural machinery starting with small simple tractors.

4. There is great potential for sub-regional cooperation between Zambia, Zimbabwe, Tanzania and Malawi in the agricultural field. I feel this should be explored.

5. A jointly financed research and testing station for agricultural equipment for Central Africa would be ideal and should suppliment item (4) above.

6. In order to implement these recommendations it would be necessary to invest heavily in training of the personnel involved in the production of agricultural machinery to give them necessary skills for various skills for various lines of productions. On the job training in well established factories and formal engineering training in agricultural machinery industry would be essential.

7. Enterprise-level cooperation between developing countries and developed countries should be encouraged.

REFERENCES:

1. Third National Development Plan (1979-83)
2. Central Statistics Office - Lusaka
3. Interviews with respective companies
4. National commission for Development Planning Office of the President.

APPENDIX I

SCHEDULE OF DEMAND PROJECTIONS AND ESTIMATES OF PRODUCTION FOR IMPORTANT AGRICULTURAL COMMODITIES

COMMODITY	1976 TOTAL MARKETED PRODUCTION (METRIC TONS)	1983.	
		TOTAL INTERNAL DEMAND (METRIC TONNES)	ESTIMATED PRODUCTION
Maize	750,057	1,483,000	1,700.000
Rice	2,097	15,000	15,000
Wheat	3,948	190,000	48,000
Barley		40,000	16,000
Sweet Potatoes & Potatoes		54,000	100,000
Cassava		Not Available	41,753
Dry Beans		21,000	30,000
Groundnuts (in shells)	9,460	93,000	94,000
Sunflower Seed	16,097	32,000	32,000
Soya Beans	990	6,500	6,500
Tea	9.0	1,200	650
Coffee (ground)	31.6	400	400
Seed Cotton	3,885	22,000	32,000
Virginia Tobacco	6,262	Not significant	12,000
Burley Tobacco	212	"	1,100
Oriental Tobacco	3	"	315
Beef	15,917	74,370	53,460
Pork & Bacon	3,500	8,000	12,000
Poultry Meat	21,471	26,000	33,000
Eggs	181 million	5,000	13,000
Milk (litres)	12.7m	92 million	38.150m

APPENDIX 2

SCHDUEE OF TRACTOR REQUIREMENT IN ZAMBIA

S/NO	NAME OF COMPANY	TRACTOR TYPE	H.P. RANGE	ANNUAL REQUIREMENT	(AVE) ACHIEVEMENT %	IMPORTED FROM	IMPLEMENTS	
							IMPORTED %	LOCALLY MADE %
1.	A.F.E. Ltd (P)	John Deere	53-275	Over 200 Units	25	West Germany	90	10
2.	Power Equipment	Masseys Ferguson	47 hp 160 hp	475	12	UK/Italy France	80	20
3.	Duly Motors (P)	Ford	50 120	300	15	U.K.	90	10
4.	Transcontinental	International Harvestor	45-130	200	40	U.K./USA W. Germany	95	05
5.	E.W. Tarry (P)	Kubota/ Leyland	30-81	200	10	U.K./Japan	98	02
6.	Amiran	UTB/ Universal	50-75	200	15	Romania	90	10
7.	Industrial Distributors	Escort	35-48	200	35	India	100	0
8.	Tata (Z) Ltd	Swaraj	20-50	250	28	India	80	20
	Prago(Z) Ltd	Zetor	50-160	won't give	information			
	9 companies	11 different types of tractors		2025	25%		90	10

"P" - indicates a parastatal company in which the Party and its Government has majority share holding

APPENDIX 3

SCHEDULE OF WORK OXEN IN ZAMBIA

PROVINCE	1976 SITUATION			1983 PROJECTION		
	Total Number of Male (All Ages)	Total Available Castrated Males Over 3½ Years Old	Estimated Number of Castrated Males Trained For work	Total Number of Male (All Ages)	Available Castrated Male Over 3½ Years	Estimated Number of Castrated Males Trained
Copperbelt	3	0.6	0.6	4.6	1.8	1.8
Central/Lusaka	89.6	19.6	15.7	104.0	22.9	20.6
Western	148.2	32.8	6.6	174.0	38.2	11.5
Southern	286.8	63.0	50.4	330.0	72.4	65.2
Eastern	74.4	16.3	14.7	85.0	18.7	17.8
Luapula	2.8	0.6	0.5	4.5	1.8	1.8
North-Western	10.1	2.2	0.9	14.0	4.8	3.4
Northern	29.0	6.5	0.7	36.0	9.5	4.8
TOTAL	644.9	141.6	752.1	752.1	170.1	126.9

APPENDIX 4

SCHEDULE OF ANIMAL DRAWN IMPLEMENTS AND HAND TOOLS MADE IN ZAMBIA

S/No.	Implement(s)	Manufacturer	Address	Eng. Facilities	Remarks
1.	Mouldboard, Ploughs, Cultivators, Harrows (zig zag) Ridger Ploughs	Northland Eng. Ltd.	Box 71640, Ndola	Adequate facilities to produce enough for the country and capable of expansion if given Government support	Production capacity of 25000 M/B ploughs 25000 Ridger ploughs 10000 Custivators 10000 Harrows 40000 Hoes (welded)
2.	Harrows, Plough Parts Cultivators Hoes and Axes	Walker Welding Repairs	Box 214, Choma	Facilities Limited to production of very few implements	Small operation with less than five employees
3.	Harrows, Harrow draw bar Ridger Parts	MDM Engineering Ltd	Box 21997 Kitwe	Limited machinery	Medium size operation capable of improvements and expansion
4.	Hoes, Shovels, Scotch Carts	Prestige Contruction Limited	Box 31085 Lusaka	Limited facilities	Only welded hoes produced
5.	Hoes	Steel Production	Box 32 Mufulira	Limited facilities	Only Welded hoes produced
6.	Hoes, Harrow Draw Bars	Shonga Steel Ltd.	Box 30977 Lusaka	Has capacity to produce more than 300000 hoes and 3000 draw bars per annum	May go into production of forged hoes but this needs considerable investment in terms of equipment
7.	Hoes	Kafushi Rice Project	Box 80247 Kabwe	The facilities under utilised capable of producing a lot more	Have produced 23000 hoes by end of 1980
8.	Scotch Carts	LENCO (Parastatal Company)	Box 33455 Lusaka	Good sheet metal workshop engineering facilities	Capacity to produce 2500 scotch carts & 1500 farm trailers. Present demand 1000EA.

APPENDIX 5

SCHEDULE OF POWER OPERATED AND TRACTOR DRAWN AGRICULTURAL MACHINERY MADE IN ZAMBIA

S/No.	Type of Machinery	Manufacturer	Address	Engineering Facilities	Remarks
1.	Harrows, Cultivators Planters, Ploughs	Turning & Metals (Private Co.)	Box 31608 Lusaka	Modern engineering facilities available	Capable of producing enough for the country but presently not doing as well due to poor demand. Only farm trailers produced in large quantities
2.	Farm Trailer Seed Sorters (Maize graders)	Mitchell Cotts & Co.(Private Co.)	Box 70077 Ndola	Has capacity for unlimited number depending on availability of motors, reduction gears from U.K.	Produces 20 annually on the average. Can produce ox-drawn equipment if there was demand. Have large workshops in Mufulira
3.	Hand Maize Shellers Hammer Mills	All Metal Engineering(Private Co.)	Box 31359 Lusaka	Has modern engineering facilities	Second largest producer of Hammer mills and has capacity to expand its operations
4.	Hammer Mills	Northland Engineering(Private Company)	Box 71640 Ndola	Have nad suitable engineering equipment for last 9 years. Want to produce tractor drawn implements as well.	420 mills sold in the last four years. Largest supplier of Hammer mills in Zambia
5.	Hammer Mills,Eodder Choppers	Re-United Engineering(Private Co)	Box 32653 Lusaka	Suitable equipment e.g. lathes, grinding machines precision equipment to make agricultural equipment and spare parts	40 mills per month. Are developing other machines like the rice thrusher, maize shellers maize shellers, stockfeed mixers etc.

APPENDIX 6

SCHEDULE OF AGRICULTURAL MACHINERY IMPORTED INTO ZAMBIA FROM 1976-1982

Sitc Code and Unit	Item Description	1976	1977	1978	1979	1980	1981
7211110 No.	Ploughs (Single mould Board)	1009	2652	13269	11549	1901	-
7211190 No.	Ploughs (Other)	162	1455	1359	2742	728	-
7211310 No.	Cultivators	308	3031	189	313	333	2236
7211320 No.	Harrows	258	761	911	252	740	-
7211200 No.	Planters and Seeders	262	141	3273	246	672	2823
6951900 No.	Hand Tool Equipment, Agric.	46690	299142	95046	26736	183822	-
7861430 No.	Trailers, Other Nes	44	62	-	25	33	-
7212410 No.	Shellers	70	84	45	53	62	-
7271010 No.	Maize Grinders	138	42	17	54	217	-
7220000 No.	Tractors	811	692	684	619	639	19170
7212200 No.	Binders, Reapers and Harvestors	26	15	16	14	46	-
7212310 No.	Thrushers	4	1	1	13	8	-
7212490 No.	Agricultural Machinery, Other	119	12	33	164	1065	-
7211100 No.	Ploughs	-	-	-	-	-	573
7212210 No.	Combine Harvesters, Thrushers	-	-	-	-	-	1680
7212290 No.	Harvesting, Thrushing Machines, Other	-	-	-	-	-	136