

CHAPTER 10

AN OVERVIEW OF AGRICULTURAL MECHANIZATION STRATEGIES IN ZAMBIA

by

G.M. Silumesii & N.G. Musonda

INTRODUCTION

Zambia shares its borders with Zaire and Tanzania in the north, Malawi and Mozambique in the east, Zimbabwe, Namibia, Botswana in the south and Angola in the west. It occupies 75 million hectares of the Central African Plateau, most of it lying at an elevation between 900 and 1,400 m above sea level. Zambia lies between the 8 and 18° South latitudes and longitudes 22 to 34° East. It enjoys a sub-tropical climate comprising of three distinct seasons. The hot dry season occurs between August and November during which temperatures rise to between 27 to 32°C. A wet warm season from November to April follows with temperatures averaging 22°C. This is followed by a dry cool season between April and July when maximum temperatures vary between 15 and 27°C, and nights with frost may occur in places. Zambia has an annual rainfall distribution that increases from below 600 mm in the south west to above 1,600 mm in the north near Zaire. Based on the rainfall patterns, Zambia has been divided into three major agro-ecological zones. Zone I constitutes those areas with mean annual rainfall of up to 800 mm. Zone II has mean annual rainfall of between 800-1000 mm. Zone II is the main agricultural potential area of Zambia. Zone III is the high rainfall area with annual rainfall above 1000 mm. Because of the very high precipitation in this area, soils are highly leached and therefore acidic, limiting their productivity.

Zambia's economy is predominantly based on mining. Its mineral exports in 1977 (97% of which was copper) accounted for 97% of the total exports. This fell to 88% in 1984 (GRZ/CSO, 1986). Of the US \$1.2 billion export earnings of 1988 for example, more than US \$1.0 billion was from copper exports alone (EIU, 1990). Agriculture on the other hand has been a very minor contributor to the GDP especially at the time of independence. Its contribution has however risen steadily from 8.2% of GDP in 1965 to about 18.9% in 1989 (GRZ/CSO, 1990). The per capita GDP has been decreasing from K382 in 1977 to K270 in 1990 at constant 1977 kwacha.(GRZ/CSO, 1990,1986). This decline has been attributed to the low price of copper which by 1990 had become a mere 25% of its real value in 1970 (Wood et al., 1990). Coupled with it were the soaring costs for oil imports and all

manufactured products. A rapid decline in the economy (about 3% per annum up to 1984) followed (GRZ/CSO, 1986). The cost of production including agricultural production, increased (ILO, 1987) as the means to sustain that production were declining. Consequently, Zambia is going through hard economic times. The population is increasing at a rate above 3.5%. Urbanization is expected to reach 70% by the year 2010. The rural productive population will at that time be less than 15%. Zambia faces a challenge of an ever decreasing agricultural population attempting to meet the food needs of an ever increasing urban population in a declining economy. This paper is an overview of the mechanisation strategies that Zambia has taken to meet this dilemma.

HISTORICAL BACKGROUND

Pre-Independence

Before independence, the majority of Zambia's population relied mainly on subsistence agriculture (Wood et al, 1990., Dodge. 1977). Among the British colonies of Central and Southern Africa, Zambia's contribution to the colonial economy was seen to be its rich copper mines whose deposits extend into the Shaba (Katanga) Province of Zaire. The exploitation of these minerals required the creation of a copper based economy in which the inhabitants were to provide the required large labour reservoir. To achieve this, various schemes were instituted including a head tax (*Musonko*) where every male was expected to pay cash tax every year. This cash tax could only be earned by working for the colonial government, mining companies on the Copperbelt of Zambia, or on settler-owned farms. This was the beginning of the migration to the urban areas. This migration of mainly males also started the gender imbalance which is very evident in many outlying provinces of Zambia such as the Luapula and Western Provinces where women form a majority of the remaining population (LWMP, 1990). The 1980 census (GRZ/CSO, 1986) figures confirm that Copperbelt, Lusaka and Central Provinces which constitute the urban areas of Zambia have more males than females (Table 32).

Whereas labour migration to South African mines depleted rural districts of able bodied males needed in agricultural activities, the internal migration to the Copperbelt created an extra political dimension to the socio-economic life of the country. Large concentrations of economically and politically active populations were being created. The movement for Zambian independence was started on the Copperbelt. This strength that the urban centres in Zambia wield, and in particular the clout which Copperbelt town centres exercise up to now in the country's political and economic life is probably the most significant factor in shaping the agricultural policy of independent Zambia (Dodge, 1984).

TABLE 32: Sex Ratio by Province, 1980

PROVINCE	NUMBER OF MALES PER 100 FEMALES
Central	101.2
Copperbelt	105.5
Eastern	87.7
Luapula	91.1
Northern	90
Lusaka	103.8
North-Western	90.9
Southern	95.6
Western	83.4
TOTAL ZAMBIA	95.8

Source: Central Statistical Office, 1986, Lusaka

As stated earlier, Zambia's main economic activity during the colonial period was the production of copper. The infrastructure was developed to support the mining of copper. Agriculture for the white settler population was a minor activity. Nevertheless the settlers were guaranteed protection from African competition. Even where Africans attempted to enter the commercial market, a price differential was paid for maize produced by white settler farmers over that by African farmers (Dodge, 1977). Africans were left to carry on with subsistence/traditional agriculture as their involvement in commercial agriculture was feared would degrade soils irreparably (Wood et al, 1990). Traditional agriculture included shifting cultivation, which grew increasingly difficult for the women to practise once their husbands (who normally clear new land) had gone to work for the copper mines. Women were therefore forced either to continuously use the same fields whose fertility had been exhausted, or only till a very limited area. Women therefore often tilled the same land repeatedly for progressively lower yield (Milimo, 1985)

White maize to feed the urban population of the Copperbelt was to be grown by white farmers along the line of rail. Any short falls that occurred were to be met by imports from white farmers of the then Southern Rhodesia whose production was supported by good climate and good soils (Dodge, 1977). African participation in commercial agriculture was to be limited to working for white farmers on large commercial farms to earn their head tax. These commercial farms were initially tilled using oxen. Operators of these oxen were expatriates from Zimbabwe and South Africa.

The Colonial government's effort in encouraging African agriculture started after the Second World War. In late 1946, following G.F. Clay's 1945 report "*Memorandum on Post War Development Planning in Northern Rhodesia*", the African Farm Improvement Scheme was introduced for Central and Southern Provinces to provide subsidized purchase of ox-drawn equipment and extension services. The scheme included working out crop pricing mechanism. Equipment supported by this scheme included ploughs, cultivators, wagons and scotch carts. The scheme was introduced amidst an ox-drawn technology brought to the Africans at the beginning of the century through the work of altruistic missionaries in the Southern Province of Zambia. Milimo et al. (1990) reports that it was not in the commercial interest of white farmers to transfer this technology to Africans as this would bring unwanted competition in the agricultural sector. However, agricultural mechanization began to be adopted by the African farmer more after these incentives were introduced, particularly in traditionally cattle keeping areas of Southern and Central Provinces and in Mbala and Isoka area of Northern Province (Milimo, et al. 1990). Use of oxen in Ndola before independence, mainly by the Shona settlers from Zimbabwe has also been reported.

TABLE 33: Maize Production by Province in 1989

Province	1989/90 in 000 bags	%
Central	2573	21
Copperbelt	558	5
Eastern	3149	26
Luapula	429	4
Northern	1147	9
Lusaka	425	4
North-Western	254	2
Southern	3194	26
Western	411	3
TOTAL ZAMBIA	12140	100

Source: Ministry of Agriculture, Early Warning Unit, Lusaka, 1990
Official Crop Production and Sales Data

The production of maize by African farmers in the Southern Province of Zambia increased following adoption of draught animal technology. Maize production from the Tonga Plateau of the Southern Province increased almost four times in fifteen years up to 1933 (Wood, et. al, 1990). The technology adoption itself was principally assisted by a very buoyant market for maize in the large

population centres of the line of rail and the Copperbelt in particular. However, because of this technological advantage, Southern Province maintained its lead in maize production up to the time of independence. At independence up to 80% of the marketed maize was produced by white commercial farmers mainly from the Southern Province.

Post-Independence Strategy

At independence, Zambia inherited an agricultural sector consisting of a highly mechanized commercial sector and a very large subsistence sector. Shortly after independence in 1964, about half the 1,200 white settler farmers left the country for the then Rhodesia (now Zimbabwe) and South Africa (Dodge, 1977). The newly independent state of Zambia had an agricultural sector whose major crop was maize, 80% of which was produced by white farmers, half of whom had now left the country as a reaction to the territory's independence. The new government then faced the responsibility of ensuring uninterrupted production of maize and cheap access to that maize in order to maintain stable copper production. Copper consisted of 97% of Zambia's exports. At independence the world copper market also provided Zambia with one of the most buoyant economies on the continent.

The government sought to achieve reliability in the supply of maize by creating a new class of African commercial farmers whose presence in the country would be assured. This class of farmers would have been created by providing large subsidies to costs of land clearing, purchase of tractors and implements, purchase of inputs like fertilisers and other chemicals, and provision of credit in order to ensure production of cheap maize. To provide for this new cadre of African farmers the government adopted a mechanisation policy where the state encouraged massive importation of agricultural machinery (Table 34) as there were virtually no factories of agricultural machinery in Zambia at the time. This was feasible then as Zambia had sufficient export earnings to finance importation of tractors and other equipment.

Land clearing units were set up to undertake subsidized land clearing for all those wishing to start farming. These units were later transferred to the National Service of the Defence Forces thus restricting easy access to performance data thereafter. The government also sought to secure the supply of maize by itself going into agricultural production. Large state farms and parastatal bodies were formed to engage in agriculture. These ventures are still there (Sindazi, 1987), even though their performance is far below the initial expectations.

In the field of agricultural training, Zambia built a technical level Natural Resources Development College (NRDC) for training Zambians in the field of agriculture. At craft level, the Monze and Mpika Colleges of Agriculture were

opened up to train agricultural assistants. In the field of Agricultural Engineering, graduates of the NRDC had the highest qualification available in the country until the first group graduated with BSc. degree in agricultural engineering from the University of Zambia in 1990. At professional level, the University of Zambia started producing graduates of agricultural sciences with some basic knowledge of agricultural mechanics in the middle of the 1970's. It was not until 1986 that Agricultural Engineering was transferred to the School of Engineering of the University of Zambia.

TABLE 34: Schedule of Farm Tools and Equipment Imported into Zambia 1970-79

Year	Mould board	Cultivator	Ploughs	Harrows	Planter	Handtools	Tractors
1970	3097	508	983	1238	439	107888	686
1971	1412	708	728	672	7835	231580	1174
1972	735	947	350	1353	303	12453	782
1973	5754	526	371	371	221	106959	893
1974	1125	180	343	368	390	483310	696
1975	23	545	885	621	98	102196	777
1976	1009	308	162	528	262	46690	811
1977	2652	3031	1455	761	141	299142	692
1978	13269	189	1359	911	3273	95046	684
1979	11632	1229	1968	6183	109	26416	947

Source: Regional Project on Farm Tools and Equipment Technology, Basic Needs and Employment, ILO/FIN/78/RAF/2

The policy of tractorisation was favoured because of its perceived capability of increasing the productivity of the African farmer. Justifiably, this was possible then. Zambia was in a position to pay for such costs from its copper earnings. Besides, the over-valued currency which was linked to the British Pound supported such moves by making imports cheaper. The policy though appearing pragmatic in intent, was flawed in concept. The negative result of this policy was that no alternative methods of mechanization were pursued.

There were also positive developments resulting from this policy. Zambia emerged with three distinct categories of farmers in this period. These groups were identified according to the size of land they cultivated and the targets of their production. The largest group consisted of subsistence farmers tilling up to two hectares. In 1980, these numbered about 610,000, down from 623,000 in 1971.

The objective of subsistence farmers is to produce for home consumption. Whenever the yields are above average, a little surplus may be sold for cash. The second group of farmers comprises, the emergent farmers. This group in Zambia is defined to include all those farmers who till between two and 40 hectares of land, and whose main purpose for farming is the market. These sell between 50 and 100% of their produce. In 1980, they were estimated to be about 90,000 such farm families. Above forty hectares, the farmer is classified as a commercial farmer. In terms of the technology used in production, the subsistence farmer uses hand tools only. The emergent farmer uses oxen, tractor power, or hiring such services for working the farm. The commercial farmer runs a very highly mechanized farming operation, heavily dependent on imported technology and inputs.

EFFECTS OF ECONOMIC DECLINE

Following the end of the 1973 Middle East war, the oil prices began to rise, the copper prices began to fall as a result of declining economic activities in the major world industrial centres. Coupled with this was the technological substitution of copper wire which was taking place during the late 1970s. A falling value for the only major export commodity, and the soaring costs for its oil imports and all manufactured products caused a very rapid decline in the economy (about 3% per annum up to 1984) (GRZ/CSO, 1986). The cost of production including agricultural production, rose (ILO, 1987). The government began to subsidize the high cost of living using the accumulated foreign reserves and external borrowing in anticipation of a recovery in copper prices. The urban population which in 1963 was only 20.5% had now increased to 30% and was also more politically conscious. In the interest of political stability the government offered massive subsidies on food production inputs including milling companies. Agricultural equipment, fertilisers and other chemicals, handling and transportation of the agricultural produce, the milling and distribution of the maize meal were all subsidized in order to keep maize flour prices low. Dodge, (1977) estimates that the subsidy on maize alone to be in the region of 110% of the value paid to the farmers.

As Zambia's economic condition worsened, the country could no longer afford to import all the spares for the large variety of agricultural equipment that had entered the country either through the open market or through donor assistance programmes. A survey undertaken in 1985 indicated that at least 23 makes of tractors alone were in use in the country (Tembo, 1985). The land clearing units established in every province could no longer maintain their equipment. Tractor owners had no more spare parts available (Milimo, 1985. GRZ, 1990). Agricultural inputs like fertilisers could no longer easily be imported due

to lack of hard currency. Faced with declining agricultural production, balance of payment problems and pressure from the donor community, Zambia reviewed its agricultural mechanization policy. In 1985, a sub sector study was undertaken through the funding from Swedish and Dutch Governments. Their recommendation was for increased utilization of the oxen technology. Many studies prior to this Dutch/Swedish study had shown that in circumstances of the worsening economic situation in Zambia, cultivation by oxen had become more competitive than tractor cultivation. (See Table 35). A study by IRDP in the Northern Province even claimed that the area cultivated increased by between 20 and 30% within two years of purchasing oxen.

TABLE 35: Tractor versus Oxen for Land Preparation Costs in 1980 Based on Analysis

Farm Size ha.	Cost/ha. Kwacha	Break even Yield/ha 90kg Bags of Maize
Tractor ploughing		
20	678	50
50	451	33
100	375	28
Oxen Ploughing		
4	312	23
6	283	21
8	269	20

Source: FOA/UNDP, 1981 (1 Kwacha approx. US\$1.25 in 1980)

OXENIZATION POLICY

For the first time in independent Zambia a specific policy on mechanisation was enunciated for inclusion in the National Development Plan (1986-90). The old tractorization programme was to be officially dropped and replaced by oxenization policy. However farmers with sufficient resources for investment in capital intensive farming were to be encouraged. In fact to assist these farmers, the number of tractors makes would be reduced to three, concentrating in the power range of 35 to 40 hp. Effort was to be made to establish local manufacturing/assembly plants for the few selected makes FAO estimated that there were 4500 tractors in the country in 1989. The government itself retained some of the programmes of machinery hire services like the land clearing services now under the National Service. The FAO for example continued funding another

such unit in the Eastern Province upto 1990. The structure of agricultural engineering department in the Ministry was rearranged, requiring graduates of agricultural engineering to become Provincial Agricultural Engineers. Positions of

TABLE 36: **Estimated 1985 Numbers of Implements**

Implement	1985
Ox-ploughs	110000
Ridgers	30000
Cultivators	20000
Ox-carts	10000
Hoes	3000000

Source: GRZ, 1985 - Ministry of Agriculture and Water Development, 1985
Investment Plan, Animal Draught Power

District Agricultural Engineers were to be filled up by NRDC graduates. Based on 1985 estimates (Table 36) of oxen drawn implements, targets for different ox-drawn implements were included as shown in the Table 37. Institutions dealing in any aspect of agricultural engineering, such as the Research Centre at Magoye in Southern Province, the Department of Agricultural Engineering at the University of Zambia, Kasisi Agricultural Training Centre were all to be involved in the implementation of the new policy. In the changed economic times, oxen technology had now become more competitive than tractorization. In retrospect, this was the same policy (though slightly modified) which the colonial government implemented in the late 1940's through the African Farm Improvement Scheme in the Central and Southern Provinces, which had a measure of success and now was being tried for the whole country 20 years after independence.

TABLE 37: **Projected Annual Market for Implements (with Village Workshops)**
(Total for the Country)

Implement	1986	1987	1988	1989	1990
Ox-ploughs	13851	12978	13388	15133	17269
Ridgers	2000	2000	2000	2000	2000
Cultivators	1500	2000	2500	3000	3500
Ox-carts	1000	1500	2000	2500	3000
Hoes	200000	200000	200000	200000	200000

Source: GRZ, 1985 - Ministry of Agriculture and Water Development, 1985
Investment Plan, Animal Draught Power

IMPACT OF TRACTORIZATION

The tractorization programme in Zambia was not a complete failure. Statistics show that the number of commercial farmers increased by 38% between 1970 and 1988. A number of African farmers entered commercial farming as a result of government subsidy schemes (Table 38). Subsistence farmers decreased by 0.5% per annum during 1969 to 1980. The middle group of farmers also increased by over 13% (Wood, 1984). Area cultivated by commercial farmers has increased by almost 48% between 1965 and 1988 (GRZ/CSO, (1990). Large parastatal estates producing a variety of crops such as sugar, coffee, wheat, or tea using highly mechanized methods were started during this period. These schemes are still operating. The total land under cultivation almost doubled from the 1980 levels to just over 1.0 million hectares by 1989 (FAO, 1990), while total cereals output has more than doubled during the same period. Average yields peaked in 1988 at 1710 kg/ha.(FAO, 1989).

TABLE 38: Summary of Area, Production and Sales of Maize by Commercial Farmers

Crop	No. of Holdings	Holdings Reporting	Area Harvested	Total Production 90 kg bags
1940-41	-	-	13729	173000
1945-46	-	-	19797	395000
1950-51	-	-	39783	467000
1955-56	-	-	47383	956000
1960-61	-	-	42700	1427000
1965-66	-	-	71689	3413868
1970-71	1090	846	39940	2020400
1975-76	1527	1096	103650	4647840
1980-81	1835	1569	67860	3044772
1985-86	1972	1463	67739	3500140
1987-88	2115	1577	74763	3231122

Source: Central Statistical Office, Lusaka, September, 1990
Agricultural and Pastoral Production (Commercial Farms)

Under pressure from the donor community subsidies on agricultural machinery for the private farmers were removed. However, the producer price for maize remained so low that it became uneconomical for commercial farmers to continue maize production. Many of them switched to growing high valued crops such as soya beans and wheat. The amount of wheat produced in 1989 increased by 1360% over the 1976 figure of 3,459 tonnes (FAO, 1990). At the same time the slowly rising producer price for maize was perceived by peasant and

emergent farmers to be high enough to make maize cultivation profitable at their level of inputs. The government encouraged this trend by supporting small farmers using credit schemes mainly administered through government banks like the Lima Bank, National Commercial Bank and through the Zambia Cooperative Federation (ZCF). Commercial banks also joined in the credit support to small scale farmers on the strength of credit guarantees offered by the government. The success of this policy by the government is evident. In 1990, 80% of the marketed maize was produced by the peasant and emergent medium scale farmers, a reversal of the 1964 production ratios, when large scale farmers dominated the production of maize.

This worked in favour of the government whose aim was to keep maize meal prices as low as possible for political stability. Government sensitivities towards the price of maize meal is justified. When the government attempted to remove subsidies on the price of maize meal in 1986, food riots erupted on the Copperbelt and the capital, forcing the government to rescind the decision. The donor community was at the time urging removal of all subsidies from consumption items. Four years later, the government again attempted to remove the subsidy on maize meal. Again the decision was met with violent protests by the large urban population which had then (1990) swelled to 50% of the total population. This time the protests went further by demanding political reforms. The government conceded to political change but maintained the reduced maize meal subsidy as a long term good for the country. The maize subsidy is to be phased out by 1992. How then does a government faced with such a volatile urban population which is forecast to reach 70% by the year 2010 plan to provide sufficient food to this rising population (estimated at 3.67%), and especially so, cheaply?

THE CHALLENGE

In Zambia, most small scale farmers already use hybrid seed. This is as a consequence of the government's efforts through its extension and financial programmes which promoted the use of hybrid seed with fertilizers under its *Lima* programme. This programme was a deliberate effort to introduce small scale farmers to modern and hopefully commercial ways of farming (Wood, 1984). The results of this programme include relatively high (by African standards) yield levels which peaked at 30 bags per hectare in 1988. From these results, any additional benefits obtainable from using seed technology appear to have already been exploited by the largest group of farmers in maize production. Another possibility that could increase production would be the use of fertilisers. Here again small scale farmers are all, by and large, using chemical fertilisers (Table 39). For the levels of production, intensification may already have been achieved when yields per hectare are considered.

TABLE 39: Fertilizer Consumption 1978-87 (In Metric Tonnes)

1978	130077
1979	145368
1980	196361
1981	218790
1982	217751
1983	165796
1984	143891
1985	211179
1986	190703
1987	243825

Source: GRZ Statistical Office, 1989. Bulletin

Zambia's increasing urban population will continue to depend on the food product produced by an ever diminishing rural population whose productivity should of necessity increase drastically. In the year 2010, only 30% of Zambians will live in the rural areas. Of these, 50% will be in the dependent age group (below 15 and above 65 years of age). This labour force will be mainly women according to current demographic data. At present levels of productivity, only 60% of the total population will be fed. Conversely, the farmer's productivity will need to increase by another 70% before the year 2010 if food self sufficiency is to be maintained. This can come up either by increasing the area under cultivation or by increasing the yield per hectare. Intensification through fertilizers and seed technologies has almost levelled off. The benefits from the fertilizers is expected to decrease with the removal of subsidies on fertilizers which is making it less affordable to the small scale farmers. Increasing area under cultivation is therefore the only viable alternative. This is possible through the promotion of the right technology to the small farmers. The technology that these farmers can afford to pay for profitably at the moment is oxen technology.

Under the current economic conditions obtaining in Zambia, a mechanization policy based on increased utilization of draught animal technology would seem to be the best option in the short term. Higher levels of technology would invariably mean importation, not only of the equipment, but also of the spares for that equipment on an uninterrupted basis. Given the current foreign currency shortages this may not be that feasible at the moment. However higher efficiencies in utilizing current tractor stocks could also contribute to increased agricultural production. Oxen technology would have the benefit of sustaining the available locally based ox implement manufacturing capability. Donors' willingness to support programmes that assists the "poorest of the poor" only made it easier to

choose this option. The Dutch government agreed to support the policy of oxenization for the National Development Plan Period 1986-90. The support of this mechanization policy was to cost \$17.6 million in foreign currency and K23,935,000 (equivalent to US\$500,000.00 in 1990) in local currency. At the end of the plan period it is expected that a total of 14,240 new farmers will have started farming with oxen becoming emergent farmers. The programme of oxenization would thereafter be self supporting according to the objectives of the project.

In the 1989-93 National Development Plan, the government policy on mechanization is that oxenization must be encouraged. A series of measures have been instituted using, among others, Dutch financial and personnel support. An Animal Draft Power Project has been operating since 1986 whose task it is to develop the use of animal power for all stages of food production, from tillage operations to food processing. The projects tasks include the promotion of the manufacture of ox-drawn equipment at established industries, establishment of village workshops to service the farmers' equipment and some support to private production of oxen for use in Animal Draught Power Programme. The programme aimed at increasing the number of trained pairs of oxen by 12,527 (Table 40), benefitting some 14,240 farmers directly. An extra 12,650 hectares of land would come under cultivation as a result of the oxenization programme. The programme also includes training of animals, training of private commercial animal trainers, and blacksmiths.

TABLE 40: Target Numbers of Trained Pairs of Oxen by Province, 1985-1990

Province	1985*	1986	1987	1988	1989	1990
Central & Lusaka	14461	15907	17498	19248	21173	23291
Copperbelt	660	792	954	1140	1368	1642
Eastern	18911	21275	23934	26926	30292	34079
Luapula	235	284	344	416	503	609
Northern	2096	2389	2724	3105	3540	4036
North-Western	145	265	482	877	1597	2906
Southern	47995	50394	52914	55937	59278	62984
Western	4991	5490	6039	6643	7307	8038
TOTAL	89494	96796	104885	114292	125058	137585

Source: GRZ (MoA), 1985, Animal Draught Power Investment Plan. Ministry of Agriculture estimates

*Estimated actual numbers existing as of 1985

NEW STRATEGIES

To strengthen the oxenization programme Zambia obtained from the EEC and Sweden foreign currency support for the local manufacture of agricultural equipment by private companies, most of which is in animal power technology. However, this support extended to the manufacture of other agricultural inputs provided the companies could raise adequate cover in local currency. From 1990 steel imported into the country for the purpose of manufacturing agricultural equipment was exempted from customs and excise duty. This step removed a major inconsistency which made imported equipment cheaper than that manufactured locally. Even with these incentives, companies are still unable to use more than US \$20 m, made available for this purpose. The reason was, as part of government's effort to limit excess liquidity in the economy very stringent credit and banking regulations limiting borrowing by companies and lending by banks were instituted. Here again is an example of a well-intended agricultural mechanization policy being drastically affected by fiscal policy measures.

A third component of Zambia's strategy in providing food for its rapidly growing population is by shifting its focus to the emergent farmers. These are the farmers in-between the traditional peasant farmers and the commercial farmers. It is this group that has shown the potential and capacity to expand agricultural production. This class of farmers use oxen and sometimes tractors in their operations. This focus is intended to ensure that government resources will be used where they will produce maximum results. It should be noted that Zambia's expenditure on agriculture is still low. Starting with 3% of annual budget in 1965, it reached 19% in 1989. The target is for expenditure on agriculture to reach 30% by 1990.

Fourthly, Zambia has now realised that maize cultivation has been over stressed. This has tended to encourage maize cultivation at the expense of other crops even in areas which are marginal for maize. In the last few years farmers encouraged to cultivate crops like sorghum and millet in drought prone areas which are better suited to such crops. Commercial production of these crops has been increasing since 1981 (GRZ/CSO, 1990). Between 1981 and 1989 production of sorghum and millet increased by 130 and 18% respectively. Conversely, in areas of medium and high rainfall, production of maize is being promoted. Sometimes this is concurrently being done with the oxenization package. The results of this strategy has resulted in the Eastern Province increasing its maize output to surpass Southern Province which was hitherto referred to as the "maize belt of Zambia". The success of the oxenization programme will be measured by the increase in oxen sold and used for agriculture in those areas where cattle rearing has not been part of the culture of the people. Evaluation of the performance of the project has not yet taken place. Therefore, no information is yet

available on its contribution to the Zambia's quest for food self-sufficiency.

The final strategy adopted by Zambia in its efforts to provide cheap maize meal to the largely urban areas has been the introduction of hammer mills. More than 90% of maize produced in Zambia is milled by large industrial milling companies. These companies are now either owned by parastatals or by the cooperative movement. In 1986 following the food riots, the government nationalised the milling companies and handed them over to parastatal companies to operate. At the end of 1990, transport and handling subsidies alone amounted to about 74% of the price of maize meal. To reduce this, hammer mills have been provided through government and donor support to every community that requests one (including District Councils) with as low as 10% down payment on the cost of the mill. The maize marketing monopoly by cooperative movement was discontinued. Consumers could now buy maize directly from farmers and mill it into maize flour for consumption without going through the large industrial milling companies. The milling companies on the other hand have also been permitted to obtain their maize supplies directly from farmers instead of through the Cooperative Unions (or National Agricultural Marketing Board before them). Therefore through this measure of liberalisation of the maize marketing coupled with the hammer mill programme, it is hoped would effectively lower the cost of maize meal in Zambia. Already hammer mills are being installed in the urban areas on the line of rail including the politically volatile Copperbelt towns.

SENSITIVITY TO MONETARY POLICY

Zambia's strategies for sustaining the food supplies for an increasingly urban population remain vulnerable to other policy considerations. For example, the 1990 policy on money supply negatively affected the strategies enunciated above. Firstly, the acquisition of oxen, ploughs, cultivators, animals, and other inputs like chemicals and seeds are all made on credit from commercial and government banks whose credit ceilings have been severely curtailed. As a consequence Zambia is expected to import maize in 1991 (GRZ, 1990) because the area planted is far less than the minimum required for self-sufficiency. This has affected both commercial and peasant farmers who use hybrid seeds requiring fertilisers. Secondly, the Zambia Seed Company, hitherto the sole marketing agency for seed in Zambia was unable in 1990 to buy all seed from seed growers due to lack of credit. Hence seed distribution was poor during the 1990/91 planting season. Most commercial farmers run on operational credit obtained from commercial banks seasonally. During 1990, coupled with the liberalisation of maize marketing, the Zambia Cooperative Federation which is charged with the nationwide buying and distribution of crops (maize) could not obtain credit for the purchase of crops and payment of trucking charges, resulting in poor collection rates to safe storage

of the 1989/90 crops. In the short term this monetary policy seems to stifle the seemingly good strategies of agricultural policy of the government. This illustrates the fact that agricultural mechanization strategies can only be part of the overall strategy to provide sufficient food to the country.

CONCLUSION

Zambia's adoption of increased utilization of draught animal power as a policy was not a selection of possible affordable alternatives but rather the only option which is affordable and for which external funds were available for launching it. Research has shown that it would be cheaper for the small and medium emergent farmer to use oxen than to use a tractor at current economic conditions. Such research, on the other hand, has not conclusively shown the success of such a programme as Zambia has now adopted. Tractorization as a policy could not be sustained by direct subsidized importation because of weakening economy like Zambia's. Its effectiveness as a short term strategy (comparatively speaking) for raising food production has been demonstrated over the last two decades. But it is also very sensitive to economic pressures and external trade. A tractorization policy for Zambia should encompass assembly or manufacture of tractors and its implements in Zambia not only for the Zambian market but also for other countries in the regional groupings like SADCC or the PTA if it is to remain viable and self sustaining. It still offers a better chance to the country for meeting the growing food needs of the rising urban population. Oxenisation if accepted by the Zambian farmers will form a stable agricultural base for the rural community, but in terms of providing future security for food production a higher level technology will be required. Optimization of oxen productivity coupled with a decreasing rural population will soon outstrip the usefulness of oxenization in meeting the growing food needs. Tractors have the capacity to increase the area of tilled land over very short periods. Zambia can buy time with oxenization as she waits for her economy to pick up. Food production is affected by many other factors like price, credit, markets, extension, and other incentives.

From a mechanization point, Zambia presents an interesting case. For its export earnings it relies on mineral exports, and insignificant agricultural products. Agriculture has been used to produce food and other commodities for the internal market and the importation of agricultural inputs has been financed through funds obtained from exporting copper. Compared to other African countries Zambia uses relatively higher doses of fertilizers and other biochemical inputs in her agriculture and as we pointed out earlier she has perhaps reached the plateau in terms of exploiting these technologies. She will have thus to adopt a more extensive type of agriculture rather than an intensive one. With a decreasing rural population and increasing urban one, this will mean increased reliance on mechanized agriculture.

The current oxenization policy is essentially a holding action and Zambia would have to evolve a policy whereby there is an efficient medium and large farm sector, which optimally utilizes the agricultural mechanization inputs, to produce not only food but agricultural export crops which should eventually replace copper as the main foreign currency earner. It seems there are no options other than following such a policy. Further as the copper mines are depleted, it will be necessary for the country to find alternative employment opportunities for a majority of its urban population. It is unlikely that such a politically conscious, and comparatively skilled labour force as the one found in the Copperbelt will readily agree to move into handtool or animal powered agriculture even though there is land. Zambia therefore faces hard choices in the next 2-3 decades in so far as agricultural mechanization is concerned. Let us hope that current efforts (though late) of training competent manpower for agricultural mechanization will provide the country with the required expertise to choose the right option.
