

5. STATEMENT OF DEVELOPMENT POLICIES 1987-1996

STATEMENT
OF
DEVELOPMENT
POLICIES
1987–1996

Produced by
OFFICE OF THE PRESIDENT AND CABINET
DEPARTMENT OF ECONOMIC PLANNING AND DEVELOPMENT

Printed by the Government Printer, Zomba, Malawi

Chapter 4

AGRICULTURE AND ANIMAL HUSBANDRY

Policy and Strategies

4.1 The overall objective is to enhance the social welfare and income of the agricultural community and the prosperity and stability of the nation as a whole by means of both improving self-sufficiency in food products and expanding and diversifying export receipts from agricultural produce. This will be pursued subject to the avoidance of a deterioration of Malawi's natural resources, serious maldistribution of agricultural incomes, and over-dependence on volatile external trade flows. While the strategies to be followed in pursuit of these policy objectives cover a wide range of activities and address a number of distinct producer groups, many of them are related if not interdependent.

4.2 In relation to producer groups, these can be seen as two broad blocks, smallholders and estates. The former is broken down into three sub-categories, namely the 35 per cent of smallholders with less than 0.7 hectares who cannot, with present technology, satisfy their own subsistence requirements from their holdings and even with modern technology these will remain dependent on off-farm income; the 40 per cent of smallholders with between 0.7 and 1.5 hectares who, with current technology, normally satisfy their subsistence requirements and have the potential for modest cash crop sales; and the remaining 25 per cent with over 1.5 hectares who are commonly already involved in cash cropping. Generally, the objective is to improve income through intensification of production but each of the three sub-sector will have a different approach.

4.3 For the first group, where off-farm income will remain necessary, the emphasis will be on improving food production with low-cost but effective input and introducing small livestock enterprises. For the middle group, the emphasis will be on increasing food production yields by attacking a number of specific constraints thereby releasing land for cash crop output. For the final group, the emphasis will be on the intensification and diversification of cash crop production by means of improved extension advice, ox-mechanization, credit access, and marketing services. All smallholders will in fact benefit from research, extension, credit, and with the exception of the smallest farms, marketing services, but the programmes for developing these services will include different components targeted at each of the three smallholder categories. All groups, but particularly the first two, would greatly benefit from the introduction of a maize variety that is both high yielding and acceptable to the majority of the population.

4.4 For the estate sector, the central objective will be to boost foreign exchange earnings by diversifying into a wider range of commodities, thereby reducing Malawi's vulnerability to the fluctuations in world prices for tobacco and tea. The emphasis here will be on developing new extension, credit and marketing services, all self-financed by the producers as a group. This sector is seen as having management and resource capability to spearhead the introduction of new crops and will be encouraged by a combination of specific pricing and other incentives.

TABLE 4.1: SMALLHOLDER CHARACTERISTICS, 1984/85

	National Total or Average	Hectarage					
		0-0.5 %	0.5-1.0 %	1.0-1.5 %	1.5-2.0 %	2.0-3.0 %	3.0+ ha %
Number of Holdings.. ..	1,300,000	23.0	32.3	20.0	10.9	9.8	4.2
Cultivated Area	1,488,000 ha (1.14 ha farm) Average	6.2	20.9	21.3	16.3	20.5	14.8
Share of Households headed by Women ¹	28.0 Average	42.0	34.0	24.0	18.0	10.0	8.0
Share of Maize Planted with improved seed	10.0	2.0	2.0	6.0	8.0	15.0	25.0

¹ 1980/81 figures.

Source: Ministry of Agriculture.

TABLE 4.2: ESTATE STATISTICS, 1985

Main Crop	No. of Estates	Planted Area (ha) to the main crop	Average Area Planted/ Estate (ha)
Tea	28	16,800	600
Sugar	2	15,200	7,600
Flue-cured Tobacco	488	16,200	33
Burley Tobacco	3,036	31,500	10
Coffee	58	3,200	55
Sub-total	3,612	82,900	23
Others (approx.)	500	n.a.	n.a.
TOTAL (APPROX.)	4,100	n.a.	n.a.
Total area under leasehold and freehold		605,000*	148*

*Including other crops than the main crop, and woodlots, fallow, and unutilized land.

All figures include estates awaiting processing of their lease applications.

Source: Ministry of Agriculture.

4.5 The strategies to be pursued for each individual functional component can be summarized as follows:

RESEARCH

4.5.1 undertake programmes on the development of the right type of seeds of maize, groundnuts, cotton, cashew nuts, irrigated wheat, rice and beans/legumes, high priority being given to the development of maize seed that is both high yielding and acceptable to the rural communities;

4.5.2 continue the present research activities in tea and tobacco undertaken by the respective parastatal/trust and expand Government research into a range of other estate crops including cotton and coffee;

4.5.3 reorganize the administration of research in the Ministry into commodity and adaptive field research teams and rationalize the research station network;

4.5.4 move the focus of smallholder related research toward integrated farming systems with closer research/extension/farmer liaison, and devote more attention to the promotion of findings;

EXTENSION AND TRAINING

4.5.5 continue the present block extension system for smallholders, focusing on improving the technical ability of, and logistical support for, existing staff;

4.5.6 design and execute different extension messages for different sizes of small-holdings and ecological zones and pilot a system of extension centres manned by graduates capable of giving tailor-made advice to farmers;

4.5.7 continue programmes of farmer training and retraining of extension workers;

4.5.8 undertake a number of special promotional campaigns including an intensification programme for the medium-sized smallholders, soil conservation, the planting of existing composite varieties of maize, and the consumption of *mgaiwa* (simple pounded maize);

4.5.9 introduce a specialist extension service for the estate sector, funded by the industry;

INPUT SUPPLY

4.5.10 sharply expand the provision of resources for smallholder credit and the arrangements under which it is administered so that all regions and even the smallest farmers can have access to it;

4.5.11 improve the long-term credit facilities available to the estate sector and review the possibility of introducing a land bank;

4.5.12 continue the operation of the National Seed Company of Malawi and expand smallholder seed production;

4.5.13 increase the proportion of smallholders using fertilizer from 23 per cent to 60 per cent by 1996 by means of extension and credit facilities, provision of a wider range of credit packages, a wider range of input bag sizes, encouragement of the use of high analysis fertilizers and a review of current recommendations;

4.5.14 review existing fertilizer supply arrangements, establish a national stockpile to ensure reliability of supply and reduce recurrent subsidies;

4.5.15 where economically viable, extend the electricity supply grid to cover areas occupied by estates;

MARKETING

4.5.16 encourage Malawian traders to be involved in the marketing of smallholder crops other than cotton and tobacco, delineate clearly the various roles of the Government, ADMARC and the private sector with respect to marketing of smallholder crops, and monitor the impact of private trader participation in such areas as credit recovery, food security, and the geographical distribution of income from agriculture;

4.5.17 continue pre-announced fixed producer prices;

4.5.18 have the price of maize fixed at a level where marketed production is expected to satisfy

domestic demand including the requirements of the strategic grain reserves with other crop prices determined by export or import parities, as appropriate;

4.5.19 investigate the case for offering specific price incentives for new crops as a means of encouraging diversification;

4.5.20 improve the maize supply "early warning" system and participate in a maize supply security system for the SADCC group of countries;

4.5.21 review the existing and possible alternative arrangements for selling tea and tobacco to assess the opportunity for improving foreign earnings;

4.5.22 develop marketing strategies in a range of specialist export crops including spices, tree nuts, fresh fruit, cut flowers and vegetables;

REGULATION AND CONTROL

4.5.23 review the case for, and administration of, current controls on smallholder production of tobacco, guar beans, etc., and on estate production of burley tobacco;

4.5.24 limit any expansion in the hectareage devoted to estates to areas without serious land pressure, or where a special development (e.g. outgrower scheme) is proposed, and where land pressure does exist encourage the splitting and sub-leasing of existing underutilized estates;

4.5.25 increase and co-ordinate the resources devoted to ensuring that the estate lease-holders honour their covenants in such areas as tree planting and soil conservation;

4.5.26 introduce estate lease registration and planting of the trees on a portion of the estate land as a criteria for influencing the issue of tobacco production licences;

CROP DEVELOPMENT

4.5.27 as a first priority, increase maize yields by means of a mix of research, extension, input and credit supply, marketing and processing improvements;

4.5.28 increase production of rice for the domestic and regional markets by introducing new varieties, rehabilitating existing and developing some new irrigation schemes, and reviewing milling and marketing arrangements;

4.5.29 encourage the production of sorghum in areas subject to variable rainfall and gradually introduce the mixing of sorghum flour with wheat flour for bread making;

4.5.30 tackle existing potato problems, in particular virus infection, seed production, and storage;

4.5.31 encourage the inter-planting of legumes with other crops, and clarify the market potential of the guar bean;

4.5.32 encourage the growing of sunflower and soya bean as a source of vegetable oil and animal feed;

4.5.33 place a heavy emphasis on increased production of groundnuts, especially the oil nut varieties; wherever possible introducing new varieties as long as it does not jeopardize the objective of maize self-sufficiency;

4.5.34 further improve tea yields and modestly expand hectareage for smallholders in the South and estates in the North;

4.5.35 encourage the expansion of coffee hectareages, both for smallholders and estates;

4.5.36 undertake a major effort to improve estate tobacco yields and drying and handling efficiency;

4.5.37 develop a package of recommendations for the tobacco smallholder, introduce smallholders to burley production, and research opportunities to produce more labour intensive tobacco (e.g. oriental);

4.5.38 diversify some of the irrigated sugar areas into such crops as cotton and vegetables;

4.5.39 assess the viability of outgrower schemes for a number of crops including macademia nuts, fresh fruit and vegetables, rubber, and mechanized cotton;

4.5.40 encourage the introduction of cashew nut production as a new opportunity for smallholders in certain areas;

4.5.41 assess the viability of irrigated wheat production, particularly where estates have access to mains electricity;

IRRIGATION

4.5.42 rehabilitate a number of the small existing schemes and offer technical advice to a number of small new self-help schemes, encouraging gravity rather than pump-fed schemes;

4.5.43 undertake a full study of the phased execution of a new 20,000 hectare project in the Lower Shire Valley;

4.5.44 promote viable irrigation for estate tobacco, wheat and tea production;

4.5.45 clarify the institutional arrangements for future small and large schemes, avoiding any situation requiring recurrent subsidy, explore and implement, if feasible, small-scale irrigation schemes that can be managed using minimal capital expenditure;

LIVESTOCK

4.5.46 encourage smallholders to undertake mixed farming, with specialized livestock units limited to serving the domestic urban market;

4.5.47 continue Government programmes in disease control, extension, research, credit and the distribution of improved stock-breeds, eliminating subsidies on the latter two items and reducing recurrent costs overall where possible;

4.5.48 eliminate the remaining price controls on meat and improve the marketing arrangements and facilities for both beef, particularly in the North, and small ruminants;

4.5.49 undertake research on both fodder production systems and how best to control overgrazing;

4.5.50 encourage estates to utilize crop residues and underutilized land to produce beef and milk;

4.5.51 restructure the Malawi Milk Marketing (MMM) organization and the state dairy farms into a new parastatal and increase domestic production of milk to replace imports;

AGRO-INDUSTRY (also see Chapter 8)

4.5.52 confirm the viability, and then execute the blending of all fertilizers within Malawi, encouraging, where possible, the use of domestic raw materials;

4.5.53 pursue the apparent possibilities to introduce food processing for a range of crops such as oilseeds (solvent extraction), coffee (instant), guar beans, cashew nuts, cassava (starch), fruit (semi-processing), dhal and sorghum (flour); and

4.5.54 urgently investigate the possibilities for improving the efficiency and reliability of processing seed cotton, rice, and animal feed.

4.6 Implementing the above strategies will be a formidable challenge for the Ministry of Agriculture and the other concerned agencies. Certainly, considerable thought will need to be given to refining the actions required and allocating responsibilities. Maintaining momentum in the execution of these will require allocating responsibilities and

TABLE 4.3: AGRICULTURAL OUTPUT AND TRADE, 1984-1986
(⁰⁰⁰ metric tons)

	Production 1984/85	Imports 1985	Exports 1985	ADMARC Purchases 1985/86
Maize	1,473.0	—	46.0	271.6
Rice, Paddy	34.3	—	0.6	10.7
Sorghum/Millet	32.6	—	—	0.5
Wheat	3.8	27.1	—	0.5
Malt Barley	—	2.6	—	—
Cassava	209.3	—	—	—
Potatoes	81.0	—	—	—
Pulses	28.1	—	11.4	17.0
Oil Seed and Beans	3.2	2.6	—	0.7
Groundnuts, oil type	2.8	—	—	0.6
Groundnuts Confectionary	59.5	—	19.2	17.5
Edible Treenuts	1.5	—	1.5	0.1
Fruits, Vegetables	387.0	—	—	—
Sugar, Refined	150.6	—	142.6	—
Tea, Made	40.0	—	39.6	—
Coffee	3.5	—	3.5	—
Tobacco, Burley	30.4	—	30.4	—
Tobacco, Flue-cured	22.3	—	22.3	—
Tobacco, Smallholder	17.5	—	17.5	20.2
Cotton	33.4 (seed)	—	3.6 (lint)	32.7
Rubber	0.4	—	0.3	—
Guar beans	3.6	—	—	1.2
Tung nut	1.0	—	0.4	—
Certified seeds	4.8	—	0.3	6.3 ¹
Meat	26.2	—	—	—
Milk	96.7	17.8	—	—
Eggs	2.3	—	—	—
Hides and Skins	6.4	—	0.6	—
Tallow	—	6.8	—	—
Fertilizers	—	112.2	—	64.9 ¹

¹ ADMARC sales to smallholders.
Source: Ministry of Agriculture.

the retention of a well staffed institutional structure.

Background

4.7 With a wide range of both soils and climatic conditions, Malawi is capable of growing a broad range of crops. Economic conditions have, however, strongly influenced the content of agricultural output, maize and cassava dominating domestic food production and tobacco, tea and sugar dominating the cash crop sector (see Table 4.3). The sector as a whole dominates the economy, employing 85 per cent of the labour force, producing 37 per cent of the GDP and accounting for 90 per cent of export earnings but the structure of the sector is very diverse. First, the tenurial arrangements split the sector into smallholder and estate sub-sectors. Agricultural activity on traditional tenured or customary land is defined as smallholder whereas estate production occurs only on leasehold or freehold land. This classification dictates the type of tobacco that can or cannot be legally grown, the access to subsidized inputs, credit institutions and extension services, and the marketing channels that must be used. Broadly, the Government infrastructural network including ADMARC is only available for smallholder use.

4.8 The main crops grown by smallholders are maize, sorghum, pulses, cassava, potatoes, groundnuts, rice, cotton, fire-cured and sun/air cured tobacco. The main crops grown by the estate sub-sector are tea, sugar, and flue-cured and burley tobacco; the production of the estate varieties of tobacco have normally been restricted to this subsector. But the legal distinction between the subsectors is rather misleading as it does not define the production structure. Smallholder production ranges from subsistence to highly commercialized small farms. Estate production varies from very large vertically integrated sugar production and processing units to small estates producing less than one hectare of tobacco. Within the estate sub-sector, there is a particularly wide range of farm size, management, structure, and productive capacity.

4.9 Two hybrid production systems also exist in the sugar industry where smallholder outgrowers produce sugar-cane for the estates who purchase and process it, and in the tobacco industry where tenant farmers are engaged to work on leasehold land to produce burley tobacco. In these systems, the smallholders or tenants use the estate infrastructure for marketing, credit and extension. The bulk of Malawian agriculture is rain-fed. Despite the availability of large water resources, only

20,000 hectares are currently irrigated, 15,000 hectares on two large sugar estates and 2,800 hectares on Government settlement schemes set up over a decade ago. The balance are smallholder schemes which have met with varied success.

4.10 Some 80 per cent of smallholder production is not commercially traded, most of it being subsistence food. Although data are not comprehensive, the indications are that such production has more or less kept pace with population growth, but largely by means of expansion of hectarage rather than by increased yields. The marketed element of smallholder production fluctuates quite widely from year to year, influenced by growing conditions, disease, and price incentives. All the evidence suggests that there is a clear production response by smallholders to increased gross margins on individual crops. Between 1980 and 1985, the margins for maize were relatively high and the marketed surplus more than trebled from 82,000 tonnes in 1979 to a peak of 300,000 tonnes in 1984. But generally, at least until 1983, the prices offered by ADMARC on smallholder crops were not conducive to rapid expansion and the estate sector production of tobacco, tea, and sugar took a growing share of total cash crop production and exports. These three items now account for more than 80 per cent of Malawi's agricultural export earnings. However, the prices of these commodities are highly volatile, and for sugar and burley tobacco exports are constrained by quota arrangements, external in the former case and domestic in the latter. Therefore, for some years, a relatively high priority has been accorded to the promotion of export diversification.

4.11 Much of the agricultural community's marketed surplus is consumed within Malawi. There are, however, still a number of substantial agricultural imports which potentially could be replaced by domestic production. These include wheat, vegetable oils, animal feed, rubber and dairy products. Malawi's difficulties with its international trade routes, a real national penalty in so many ways, should be a stimulus for this import substitution.

4.12 Malawi's livestock population is relatively small—about a million cattle, a similar number of sheep and goats, about 250,000 pigs and between 10 and 14 million chickens. It is oriented solely towards supplying the domestic market with meat and dairy products. The majority of beef cattle are found in the Central and Northern regions, raised by smallholders by traditional methods. The Government, together with a parastatal, the Cold Storage Company, organize the marketing and slaughter of cattle for the urban markets. Goat, pig and

chicken are important sources of meat in rural areas and domestic production more or less satisfies urban consumption. Most of the organized pig and poultry production is in the hands of large commercial producers. In recent years, the Government has tried with some success to stimulate local dairy production by breeding high quality stock and setting up a special marketing board. One parastatal feedstock company, Grain and Milling Company (GRAMIL), attempts, not always successfully, to supply the whole animal feed market. Disease, price controls, and the lack of marketing facilities have also constrained the subsector. Price control as a constraint will be removed in view of the proposal to wholly decontrol meat prices.

4.13 Continued expansion and diversification of agricultural production has long been seen as central to improving Malawi's prosperity but a number of important factors continue to constrain the rate and manner by which this can be achieved. These constraints include a lack of technical and economic information on particular crops and how they would be best grown in Malawian conditions; the lack of an efficient and effective machinery to deliver this information to the individual producer; problems in efficiently supplying smallholders with their inputs and marketing their output; problems in ensuring the adequate, appropriate and timely provision of credit; and problems in ensuring that incentives exist both to use scarce land resources efficiently and to avoid abusing a fragile natural resource.

4.14 Agricultural research in Malawi is undertaken by four organizations, the Department of Agricultural Research in the Ministry of Agriculture, the University of Malawi, the Tea Research Foundation, and the Tobacco Research Authority; the latter two are funded by levies on the respective individual crops. The two specific commodity research bodies have been relatively effective in developing recommendations appropriate for at least the estates. But the Government's research effort has suffered from a lack of technical capacity, heavy research station overheads, dispersal of effort between too many projects, and a lack of appreciation of smallholder knowledge requirements.

4.15 These problems in turn have had a bearing on the quality of the extension messages which limited the effectiveness of extension services and farmer training. The structural framework for these services has been developed over a number of years. It is a multidiscipline integrated system decentralized into a tier of 8 Agricultural Development Divisions (ADDs), 28 Rural Development

Project Areas (RDs), and 180 Extension Planning Areas (EPAs). Apart from certain restricted parts of the Southern Region (Mwanza, Balaka, Mulanje, and Zomba), the whole country has been progressively covered by the National Rural Development Programme (NRDP). The programme has invested heavily in a range of economic and social infrastructure and related service and extension staff. The agricultural extension service has been built up to 1,700 field assistants, or one to 800 farmers, plus specialist support at the RDP level. During the 1970s, considerable efforts were made to encourage smallholders to group themselves into clubs for the purposes of both hearing the extension message and administering credit. The credit arrangements remain and there are now 8,100 of these clubs. However, in 1981, the extension approach changed to a block system in an attempt to reach all smallholders, whether or not they were club members as club members tended to include only the wealthier smallholders.

4.16 Available evidence suggests that the impact on smallholder productivity of this NRDP approach has not as yet been as substantial as envisaged at the time the programme was being initiated. Given the substantial investment that has been made in NRDP and the recurrent costs of operating this rural network, there is a serious concern to increase system impact as quickly as possible. But much of the apparent reluctance to increase production cannot be blamed on the producer's lack of technical knowledge as such. Frequently, the reasons for not adopting recommendations appear to be a lack of cash or credit access to finance purchases of inputs and the sharp increases in the prices of the necessary inputs (seed, fertilizer, pesticide, etc.). For the smallholder, credit availability is a function of the institutional arrangements and the volume of resources that the Government can make available. Commodity inputs such as fertilizers are the responsibility of ADMARC and, in recent years, a combination of increased landed costs and the impact of the fertilizer subsidy removal programme have raised considerably the prices of this commodity.

4.17 Most formal marketing of smallholder crops is undertaken by ADMARC. Its 1,400 permanent and seasonal markets provide access for the majority of smallholders to a market where they are, in principle, assured disposal of their crops at fixed prices announced at the start of the planting season. In legal terms, ADMARC is only a monopoly buyer for smallholder tobacco and cotton but they have become involved in buying, transporting, storing, cleaning, grading, milling, shelling and arranging for domestic sale or export of some 18

different commodities. Private traders play an important role only in certain crops such as rice. This system is seen as having provided a stable pan-territorial environment for the smallholder which permitted the easy recovery of credit, the cross-subsidization of crops or inputs, and the means for accumulation of capital for investment in agricultural related activities (e.g. processing). This system appeared to work well until the mid-1980s when a combination of misinvestment, very high operating costs and a sharp drop in ADMARC's income from tobacco had sharply reduced its ability to satisfactorily perform its primary functions. In recent years, a programme of restructuring the organization has been underway, crop pricing decisions have been made by the Government, subsidies on inputs have been steadily withdrawn, and special financial arrangements introduced for the import of fertilizer.

4.18 The estate sector has had different marketing arrangements. It has the freedom to independently arrange the import of necessary inputs, can market its own produce, and obtains at least seasonal credit through the commercial banking system. Medium-term credit has, however, generally not been available from either the state or the banking system in recent years.

4.19 An increasingly important constraint is land itself, its availability today and its quality in future. Land pressure, particularly on customary land in the Southern and Central Regions, has been increasing in recent years with decreases in average family plot size and reductions in areas left fallow. Some 35 per cent of smallholders now have 0.7 hectares or less which is not enough land to support a family. Some areas, particularly in the Northern Region, still have significant areas of unutilized customary arable land but for socio-cultural and financial reasons, resettlement into these areas is rarely possible. This means that smallholder development must primarily involve intensification of production and that the land under use must not be allowed to deteriorate. For the estate sector, the situation is rather different. Here, the low-cost of leasehold land has not encouraged full utilization. Indeed, only a quarter of the land allocated to the 4,000 estates (1985) is planted at any one time.

4.20 Both customary and estate land, but particularly the former, are threatened by soil degradation and erosion. This is being caused by the indiscriminate cutting of tree cover, pasture overgrazing, continuous monocropping, and the expansion of cultivation into areas particularly prone to erosion such as steep slopes. Generally, the situation has not reached an irreversible stage but it is

accepted that determined action will be necessary now if this position is to be held. Serious degradation has, however, occurred in certain hilly areas such as Ntcheu and most of the Southern Region.

The Decade Ahead

4.21 The strategy which will be pursued over the next decade will involve production intensification, import substitution and export development, smallholder support, soil conservation and introduction of sizeable irrigation programmes. The need to produce more food and cash crop surpluses from a limited supply of land determines the requirement for intensification. The clear link between net agricultural foreign exchange earnings and future economic prosperity determines the priority to import substitution and export development. The need to attempt to ensure a reasonable equitable distribution of the benefits of development determines the weight that must be attached to smallholder support. The real threat of serious degradation of Malawi's natural resources through misuse of the land determines the need for action on soil conservation. The paragraphs below set out first, how the various instruments available to the Government will be used in pursuit of these strategies; second, how individual crops relate to these strategies; and third, how irrigation, animal husbandry and agro-industry will be utilized in support of these strategies.

4.22 The NRDP will continue in order to support the smallholder sector all over the country. RDPs will be implemented for the four areas which have not yet been covered. However, in order to minimize implementation problems experienced in the past, the RDP will increasingly concentrate on components directly related to agricultural production and marketing. In those areas where the RDPs have been completed or are on-going, the NRDP will go into a phase of consolidation by fully utilizing the now established infrastructure to improve the agricultural support services such as research, extension, training, credit and marketing. However, evaluation of NRDP will continue so as to identify which elements of these support services are least effective and require improvement.

RESEARCH

4.23 Through applied and adaptive research, the Research Department of the Ministry of Agriculture will continue to provide the means of solving the technical and economic problems facing producers of all food and cash crops. Exceptions to this will include tea, tobacco, and coffee each of

which have their specialized non-governmental research bodies. However, the next five years will see substantial re-orientation and rationalization of the Department's efforts. The recently established Agricultural Research Council will set clear national research priorities and keep these priorities and programmes under regular review. Initially, the priorities will include maize, groundnuts, cotton, cashew nuts, irrigated wheat, rice and beans/legumes. Efforts will be made to introduce, as soon as practicable, a new variety of maize that is both higher yielding than the traditional variety and stores and pounds well. The structure under which research is organized will be moved from research stations to commodity and adaptive research items. The research station network will itself be rationalized with a smaller number of more sophisticated units.

4.24 Improving the current rather weak relationship between farmer knowledge requirements and research programme design will also require some institutional changes. All ADDs will get small Adaptive Research Teams and the linkages between research, extension and farmer groups will be formalized. More attention will be devoted to the technical and socio-economic analysis of farming systems, the effective dissemination of findings, and the assessment of the impact of particular extension messages. The current Research Department services relating to plant production and quarantine and seed testing and control will be continued. The current research activities on tea and tobacco undertaken by the respective non-governmental research organizations will continue. Research by Government into a range of other estate crops such as coffee will be expanded.

EXTENSION AND TRAINING

4.25 It is accepted that Malawi's smallholder extension and training services are not generally influencing significant increases in farmer productivity. The causes include an inability to offer farmers the knowledge and support packages appropriate to their circumstances; the limited experience, technical knowledge and motivation of many of the extension workers; and problems in providing adequate logistical support to these extension workers. The general block extension system will be continued but attention will be devoted to improving the messages, the technical ability of the existing staff, and their level of basic logistical support.

4.26 Between 1988 and 1995, a substantial share of extension effort will be devoted to an intensification programme for medium-sized smallholders

(0.7-1.5 hectares). The objective of this programme will be to improve maize yields in order to release land from traditional subsistence cultivation of maize to production of cash crops. The programme will address the special problems facing the middle-sized small holdings. It will emphasize simultaneous intensive maize cultivation and cash crop introduction, input financing, and the aversion to risks incurred in entering a more sophisticated production system. It will be based on targeted and time-limited input subsidies and other incentives to introduce highly productive input packages and ease farmers' access to credit. A number of alternative packages will be tried on a pilot basis in selected EPAs before a full-scale campaign is launched.

4.27 Parallel to the continued block approach, a new system of Extension Centres will be piloted from the early 1990s. This will be staffed mainly by qualified diplomates or graduates and the centres will be located in agriculturally advanced areas with a view to replacing the block system, at least for the larger smallholders involved in cash cropping. It is hoped that such a system will be both cheaper to operate and, with tailor-made advice for each farmer, much more effective than the current system.

4.28 Special farmer training courses will continue with strong emphasis on nutrition, soil conservation and assisting women farmers. About one-third of all smallholder farm families are headed by women and the proportion is almost 50 per cent for the smallest units. Furthermore about two-thirds of the persons engaged full-time in training are women. In view of this development and given the fact that the number of smallholders with small land holdings is rising, particular extension packages will be designed to raise significantly the productivity of such farmers. For nutrition, the value of legumes and *mgaiwa* will be stressed and, in relation to soil conservation, an effort will be made to integrate this concern into a set of agronomic messages which, taken together, have an attraction for the farmer.

4.29 For the estate sector, a specific Estate Extension and Training Service will be established. It will attempt to improve the general standard of estate management, initially concentrating on the smaller tobacco estates and any opportunities for the larger estates to diversify into new crops. After an initial period, the service will be fully funded by the estate sub-sector itself, Government sharing responsibility for determining the policies of the institution.

INPUT FINANCE AND SUPPLY

4.30 It is planned to increase the coverage of seasonal credit from the current level of 16 per cent of smallholders (212,000 units) to between 25 per cent (425,000 units) and 33 per cent (560,000 units) by 1995. The total credit funds required, in 1987 prices, will be double the present level. Achieving these targets will require the consolidation of the various existing credit funds into one national credit fund, and strengthening the existing credit administration arrangements at Ministry headquarters, at the ADDs and at the field level. In relation to the latter, where possible, responsibility for assessing seasonal credit-worthiness and follow-up of repayments will be transferred to established credit clubs. Special efforts will be made to reach the smaller smallholder units, reviewing credit packages and other input supply arrangements to meet their particular needs. The administration of medium-term loans will be reformed to ensure more rapid processing and reliable supply of related inputs. The bulk of responsibility for this will be transferred to the ADD level.

4.31 To encourage a higher standard of land preparation, planting and weeding for the larger farmer, seasonal credit will be made available with a cash component to cover labour, ox, and equipment hire charges. This should hopefully encourage the introduction of oxen hiring practices as few farming units are large enough to justify an ox-team and equipment solely for their own use. The existing level of credit subsidies of about K1.5 million a year will be reduced by raising interest rates, by making arrangements to earn interest on idle credit funds, and by introducing effective but simple bonus and penalty systems to encourage early loan repayment. Where high quality tailor-made extension advice is available, the fixed input packaging system will not be applied.

4.32 While the larger units in the estate sector have access to the commercial banking system, this has not generally been the case for the medium and smaller units. For these, the Government is now providing funds for a scheme operated by the commercial banking system for medium-and long-term credit, but it has yet to be significantly utilized. After this scheme has been in operation for an initial period, the case for converting the fund arrangement into an agricultural development bank will be reviewed.

4.33 The Government will continue to ensure that smallholder inputs such as seeds, fertilizer and pesticides are made available to meet demand. Most improved seeds are produced by the National Seed Company of Malawi. Recently, in an attempt

to provide a quality seed at a lower cost, the Government has initiated seed multiplication on smallholdings under the supervision of ADDs. This programme will be expanded but will be carefully monitored to ensure that unit production costs do not exceed those of the National Seed Company of Malawi.

4.34 Currently, smallholders consume approximately 70,000 tonnes of fertilizer a year and this volume is expected to substantially increase over the next decade. The target is to increase the percentage of smallholders who use fertilizer from the present 23 per cent (1987) to 60 per cent within 10 years. Up to 1982, fertilizer was procured, distributed and sold by ADMARC but, because of problems with this arrangement, a special Government unit took over this function. During recent years, the cost of fertilizer to the farmer has also risen sharply due to currency depreciation, increasing overland transport costs, and as a consequence of a policy decision in 1983 to phase out all subsidies on this item over the five years to 1988. In this situation, minimizing the cost and maximizing the availability of fertilizers has assumed a greater importance. A number of specific actions will be taken to facilitate this. Farmers will be encouraged to switch to high analysis fertilizer, and from 1988, Malawi will start to blend its own fertilizers from a combination of imported materials and local materials such as phosphate and lime. A buffer stock will be established as an insurance against logistical risks and to facilitate savings in procurement and transport costs. Future institutional arrangements for smallholder fertilizer storage and supply will be designed during 1987.

4.35 Related to these developments, changes in the extension message will include a revision of fertilizer recommendations in relation to climatic zone, soil type, crop rotation, and type of farmer. This will include examining systems of integrated crop nutrition, combining the use of chemical fertilizer with organic farming practices and agroforestry. There has also been a specific packaging problem in the past where only 50 Kilogramme bags were available. Smallholder packages will be made available for the use of the small farming units.

4.36 Under the fertilizer subsidy removal programme, the smallholder consumer was expected to be paying the full cost of his fertilizer by 1988. In view of the recent sharp increases in the landed cost of fertilizer, this time horizon will be extended. Fertilizer requirements for the estates have been supplied at full costs, largely by one company, Optichem. This arrangement is expected to continue. One other input which can have a dramatic impact

on an individual estate is access to mains electricity supply particularly if irrigation is a technical option. The viability of the electrification of districts occupied by such estates will be assessed during 1987 and 1988.

MARKETING

4.37 A combination of a series of problems relating to the operations of ADMARC and the recent lifting of most of the regulations on the growing of cash crops has created increasing pressure for liberalization in the marketing of cash crops. Initial moves have already been taken to encourage the private sector to become involved in the marketing of smallholder crops (other than cotton and tobacco). A number of ADMARC's more marginal buying points are being closed, and a differential crop pricing system has been introduced which offers private traders a higher price at an ADMARC depot than the minimum prices guaranteed to smallholders at ADMARC primary buying points. This withdrawal of ADMARC from certain areas of activity in favour of the private sector will be undertaken gradually and will be monitored to ensure that gaps in marketing services are not created, that credit recovery arrangements are adequate, and that geographical income distribution is not distorted to an unacceptable degree.

4.38 Producer prices for smallholder crops will continue to be used as a means of encouraging the efficient distribution of resources. In addition, the relative structure commodity prices will be one of the mechanisms for sending appropriate production signals. Prices of products in which Malawi is not self-sufficient will be fixed in accordance with import parity and prices of export crops in accordance with export parity. The maize price will be used to attempt to ensure that the marketed surpluses equal domestic demand, plus the accumulation of an appropriate strategic reserve. In this case, neither import nor export parity prices will be appropriate. Trial and error will have to be relied upon to find the appropriate balance. The strategic grain reserve which has been established will be used as a buffer to absorb production fluctuations between good and bad years and thereby stabilize the price, both in commercial and informal markets. The "early warning" system used by the Ministry of Agriculture to assess current year maize output will be improved and made more comprehensible to assess both stock requirements and opportunities for foreign trade in relation SADCC co-operation in food security.

4.39 Storage capacity, both for fertilizer stocks and for commodities, will require augmentation, particularly in the food deficit areas. Planning for this is being undertaken.

4.40 The Government will continue to leave the estate sector very much to organize its own marketing systems, both for the traditional crops and for any new crops such as perishable fruit, cut-flowers and vegetables. There may, however, be some exceptions to this. For example, special incentives or assistance may be offered where new marketing systems have to be built, risky crops with long gestation periods need to be encouraged, or economies of scale are required before a crop becomes an attractive proposition to the individual producer. Also where a system for crop marketing does not appear to realize its potential foreign exchange earnings or make reasonable net payments to the producer, the Government may become involved. For some new crops, developing marketing strategies will be a useful function to perform but it is not foreseen that Government or a parastatal should become directly involved in the execution of such strategies.

REGULATIONS AND CONTROL

4.41 For many years, smallholders have been legally constrained as to the type of tobacco they may grow. They cannot grow either flue-cured or burley tobacco, although for some years some projects have attempted to introduce a limited number of farmers to the growing and processing of both of these types of tobacco. There appears to be a relatively buoyant market for the type of burley produced by Malawi. As the investment required is relatively low and many individuals have gained experience as tenant farmers on burley estates, the basis for banning smallholder production will be the subject of a critical review. The objective will be to develop a *modus operandi* which will enable smallholders to participate. The volume of estate production of burley is currently also controlled by means of licences and quotas. This was introduced as an attempt to stabilize widely fluctuating prices. There is a clear danger in this situation that other producers will take advantage of Malawi's restraint and increase their market share. The case for these restrictions will be regularly reviewed. The Government will, however, continue to fix the minimum prices paid by estates to tenants in order to ensure that the latter receive a reasonable income. The tenant/landlord relationship will itself also be reviewed to improve the conditions of service of tenants. In particular, the existing machinery for redressing disputes will be strengthened and made more efficient. In relation to crops, there are also a few restrictions—for example on smallholder production of guar beans. Again, the case for retaining these restrictions will be regularly reviewed.

4.42 Over the last 10 years, the Government has permitted the estate sector to expand rapidly, leasing large areas of what had been customary land at very low rentals. Often, the new estate owners did not have the management or financial resources to exploit their holdings. The result has, therefore, been that, in some areas, increasing pressure on the remaining customary land exists next to heavily underutilized estate lands. In future, new estate leases will not be granted in areas of high land pressure, except in the case of experimental estates introducing a new product which will benefit the surrounding smallholders in the long-term. Also in such areas where underutilization is apparent, splitting or sub-leasing estates will be encouraged. Leases, now normally 21 years, will not be renewed on seriously underutilized land. Estate leases have precise covenants on such matters as land utilization, husbandry practice, soil conservation, and tree planting. However, the resources available to Government to police these covenants are limited. Responsibility currently lies with the Department of Lands and Valuation. Over the next five years, the Department will develop a capacity to co-ordinate the policing of lease covenants using the extension staff in the Department of Agriculture and Forestry where this is possible. Estate lease registration will be one factor influencing the issuing of tobacco production licences.

4.43 One concern in lease compliance will be enforcing the standard covenant that 10 per cent of the hectareage should be devoted to forestry. This is one important strand in the priority policy of trying to reverse the deforestation of Malawi. Another strand is to encourage one of the major consumers of fuelwood, tobacco estates, to improve the efficiency with which they consume the resource. The efficiency of most tobacco curing barns could be substantially increased for a relatively small investment. In future, possibilities for using barn efficiency as one of the criteria influencing the issue of a tobacco production licence will be explored.

4.44 Land pressure, particularly in Southern and Central Malawi, is making the traditional systems of allocating land to smallholders less tenable. This and a number of other land policy matters will be a subject of studies over the next five years (see Chapter 19). One of the subjects of investigation will be the possibility of a programme for redistribution of underutilized land.

CROP DEVELOPMENT

4.45 *Maize*: Although the volume of maize required is essentially limited by domestic demand, it is important to increase the current relatively

low levels of maize yields in order to ensure that subsistence producers realize adequate food production. Resources that would otherwise be devoted to subsistence production could then be devoted to cash crop production. Consequently, this will enable those farmers producing maize as a cash crop to increase their income. But for the subsistence farmer, the need for inputs and the level of yields in the field are not the only issues. He is also concerned with processing, storage and taste characteristics. Thus, changing from traditional smallholder growing patterns involves a comprehensive approach. The better availability of credit and input supplies and an improvement in the quality of the extension message should address the primary agronomic constraints. Research will also be required into areas such as the milling and storage problems associated with high yielding maize.

4.46 The development of higher-yielding maize varieties will continue as a research priority. Meanwhile, the use of composite seeds will be encouraged and major campaigns will be undertaken in this regard.

4.47 There will be a substantial intensification project directed primarily toward boosting maize yields among medium-sized smallholders. For these and most other smallholders, the longer-term objective will be to increase farmer income from efficiently integrated subsistence/cash crop farm units, where the cash crop may or may not be maize. Support services will be geared toward this.

4.48 *Rice*: The main producing areas for both irrigated and rain-fed rice are the lakeshore, Karonga, the Lake Chilwa plain and the Lower Shire Valley. Yields are relatively low and a substantial share of output is consumed by the producers—the balance sold to ADMARC and private traders. There are medium- to longer-term prospects of good export markets and in the medium-term, the objective will be to ensure that domestic demand is met and there is a surplus for export. The Government will continue to release new rice varieties appropriate to local conditions and will take action to rehabilitate the existing irrigation schemes, and where viable, develop new ones. ADMARC's milling arrangements are currently very costly. The arrangements will be reviewed with the objective of trying to increase producer prices.

4.49 *Sorghum and Millet*: These grains, mainly grown in the North, or the lakeshore, and in the Lower Shire Valley, are largely used for local brewing. A small marketed surplus of about 1,000

tonnes is used for commercial brewing. An attractive potential for an increase in demand seems to be in the use of sorghum flour as a substitute for imported wheat for the baking industry. A 25 per cent substitution can be made without affecting taste or baking characteristics. Such substitution will be promoted.

4.50 *Wheat and Barley*: Wheat consumption has reached 35,000 tonnes and is rising at 8 per cent a year. Some 90 per cent of this is imported, costing K16 million a year in foreign exchange. Despite past efforts, domestic smallholder rain-fed production has declined to minimal levels. Most of the local production of 3,500 tonnes, therefore, comes from two irrigated estates. Malawi has the ecological potential to produce about 30,000 tonnes and it is planned to achieve this by a combination of introducing wheat as a winter crop on the 650 hectares of smallholder irrigation schemes. Wheat will be promoted as a dry season crop on flue-cured tobacco estates which can get access to mains electricity for irrigation. Some 2,000 tonnes of barley a year are imported for the brewing industry. The agronomic problems are similar to those for wheat and barley would compete with wheat for the irrigated land available.

4.51 *Cassava*: After maize, cassava is Malawi's most important food crop. An estimated 200,000 tonnes a year is produced on 73,000 hectares. Most commercial trade is undertaken by the private sector. It is envisaged that cassava will retain its present role in the farming system but there have been recent problems with pests and research on close substitutes such as yams will be carried out. Marketed production could be boosted if a viable starch factory is established.

4.52 *Potatoes*: Both sweet and Irish potatoes are produced, largely in the Central Highlands, both for subsistence and private sale to urban consumers. Production is in the order of 60,000-100,000 tonnes a year. Production suffers from constant virus attacks and the quality of seed is generally low. Research will be undertaken to improve seed multiplication. Research is currently being undertaken on some potato storage problems.

4.53 *Pulses*: Beans are grown widely, usually in a mixed stand with maize, whereas peas are grown almost entirely in the South. Production has fluctuated but is currently around 40,000 tonnes. Good potential exists, particularly for interplanting with local maize where it reduces the requirements for fertilizer. There is some export potential to neighbouring countries. The semi-arid areas of the Lower Shire Valley produce about 2,000 tonnes of

guar beans a year. These beans have a variety of industrial uses but have to be processed. Currently, semi-processed guar is marketed but this will be the subject of review to assess the potential for both this and fully processed guar.

4.54 *Oilseeds—Beans and Edible Seeds*: Apart from the major oilseeds, groundnuts and cottonseed, a number of others are grown, but of these, only sunflower is of any significance at present with production at about 2,000 tonnes a year. Sunflower is suited to most areas of Malawi and there are reasonable markets both for exports, and domestically, as a substitute for imported vegetable oils. Production will be encouraged through the promotion of high yielding varieties and more attractive producer prices. Soya beans also have a good potential, particularly for animal feed, and this will also be promoted.

4.55 *Groundnuts*: Both confectionary and oilnuts are grown in Malawi. They are used both as a domestic source of protein and as a source of cash income. Sales fell from 40,000 tonnes a year in the 1960s to 10,000 tonnes a year in early 1980s. Recent price increases appear to have stimulated a sharp rise in production for sale. Yields are low and the potential for increasing output from existing hectareage is high. Groundnuts are very suitable for use in a mixed rotation with unfertilized subsistence crops. Export prospects for the confectionary nuts will be kept under review. But efforts will be made to raise output of oilnut varieties.

4.56 *Horticulture*: The development of tree nuts will be focused on macademia and cashew nuts. Some 1,200 hectares are currently planted with macademia but some 16,000 hectares in the Nkhata Bay area are suitable and the high value to weight ratio and high return per acre make it an attractive proposition for expansion. It will remain basically an estate crop although the possibility of an out-grower scheme will be explored. Cashew nuts, which had traditionally been grown along the lakeshore, do well in poor soils and low rainfall and are an attractive smallholder crop where the income potential from traditional crops is low. This includes much of the Southern Lakeshore and Lower Shire Valley. Market opportunities appear favourable but domestic processing facilities will be required as and when substantial production expansion is achieved. The main production problems relate to disease control on which research is required.

4.57 *Spices* may offer some opportunities for smallholder diversification but a clear marketing strategy needs to be defined as a first step. Perishable fruit, cut flowers and vegetables is another

area where marketing is critical to success. Production for export, which has tremendous potential, can best be initiated by estate producers with smallholders linked in at a later stage. One project has already been started on land around Kamuzu International Airport. Improving the supply to domestic markets will involve some specialist advice and support to farmers in selected areas with high agronomic potential and easy access to urban markets. In certain limited areas the processing of fresh produce appears to have potential.

4.58 *Sugar*: This is currently produced on two large estates and one smallholder scheme which were developed in the 1970s. Unfortunately, in recent years, the price has been very low. For the foreseeable future, the world market price prospects are not very bright and the relatively profitable quota sales to the European Economic Community and the United States of America unstable—the latter was recently reduced. There is, however, a significant domestic market both for sugar and molasses, the later processed into ethanol and used as a fuel.

4.59 *Tea*: Of the 18,000 hectares currently under tea, 15,600 hectares are accounted for by 26 estates and the balance by 4,800 smallholders. Yields are already very high and there is little suitable land available for expansion. The smallholder scheme will be expanded by 600 hectares and efforts to further improve average yields will continue. The world market price prospects generally look reasonable. Increasing local value added by retail packing of tea for marketing under a Malawian label will be considered.

4.60 *Coffee*: Malawi has 4,500 hectares planted to coffee, 3,299 hectares on estates and the balance on 7,800 smallholdings operating under the wing of a Smallholder Coffee Authority. Exports reached 3,500 tonnes in 1985. Overall, some 10,000 hectares are suitable for coffee. Smallholder hectareage is planned to increase to 3,800 by 1995 and further estate investment is envisaged; priority will be given to realizing the potential. The export marketing strategy will emphasize direct contact with buyers, particularly in non-quota markets, rather than local auction. A small instant coffee plant would appear to be viable and this will be promoted.

4.61 *Tobacco*: Malawi produces six different types of tobacco, flue-cured virginia and burley which are almost entirely produced by estates, and dark fire-cured (Northern and Southern), sun/air cured and oriental tobaccos, which are limited to smallholders. Tobacco is Malawi's major foreign

exchange earner, sustains 4,000 estates and provides a cash income for 65,000 smallholders. Exports of flue-cured tobacco have increased in recent years to about 25,000 tonnes a year, or about 3.5 per cent of world trade. Yields are only about half the estimated potential and there is scope for further increasing the volume of exports. Production of burley has been rising rapidly to a mid-1980's level of about 35,000 tonnes, or 15 per cent of world trade. Yields have improved but still average only a third of the potential. Market prices are volatile but the particular type of burley produced by Malawi is generally in strong demand and future market prospects seem reasonable. Dark fire-cured tobacco output fluctuates between 10,000 and 20,000 tonnes a year but Malawi supplies over half of what is a decreasing world market and future prospects are not good. Yields are very low, an estimated 20 per cent of the potential. Over the next decade, attempts will be made to increase yields, enlarge leaf size and ensure a better curing capability. The market and yield situation is very similar for the sun/air-cured tobacco, although production, at only 1,000–2,000 tonnes a year, is much smaller. Production of oriental tobacco has been declining steadily for a number of years. Only 130 tonnes were produced in 1985. However, demand for the variety is high and potential for increased output exists.

4.62 The low yields throughout the industry will be addressed by a mixture of research by the Tobacco Research Authority and extension, largely by the proposed new Estates Extension Service. The particular problem of the declining market for the low-quality smallholder tobaccos will be addressed by reviewing the extension recommendations made on these crops, and promoting the expansion of smallholder involvement in the other tobaccos. This will involve expanding the flue-cured smallholders to produce burley and undertaking research and extension on those of the more labour intensive tobaccos such as oriental which do appear to have export potential.

4.63 Two other issues will require particular attention. These relate to the marketing of flue-cured and burley tobaccos and the industry's heavy and inefficient consumption of increasingly scarce fuelwood. In relation to marketing, Malawi has recently controlled the burley industry through a system of production quotas. The intention has been to maximize price stability and maintain product quality. But there are potential costs as well as benefits to this type of restrictions and the system will be the subject of an extensive review by 1988. The other marketing issue which again requires study is the question of whether the existing auction

system realizes the maximum returns to Malawi. The issue of fuelwood has two components, the first, the enforcement of the standard estate leasehold covenant that 10 per cent of the leased land should be planted to trees, and the second that estates should be encouraged to improve the efficiency of their curing barns. Action on both of these issues is mentioned above.

4.64 *Cotton*: This is effectively a smallholder crop, although since 1983, estates are no longer prohibited from growing it. Production, which seems very responsive to price, has fluctuated widely from 13,000 to 35,000 tonnes and while quality is high, yields are low. The agronomic potential is high with substantial appropriate but unutilized heavy soils available which may require mechanized techniques of production. Also a major research effort will be needed to address a number of current constraints (e.g. high pesticide costs, improved varieties, inefficient ginning) before this potential can be realized.

4.65 *Rubber*: The only estate in Eastern and Southern Africa is one at Nkhata Bay in Malawi. It currently produces 430 tonnes a year and will expand to 1,000 tonnes over the next few years. The area suited to rubber is 4,000–10,000 hectares around the existing estate. Expansion seems to be a viable prospect and, if feasible, an outgrower scheme covering about 3,000 hectares will be established.

IRRIGATION

4.66 Development in this sector will have a number of components. The existing rice schemes will be rehabilitated in such a way that in future they are entirely financially self-supporting. Where groups of smallholders want to establish new schemes, they will be given advice and assistance. Full-cost recovery will be expected and preference will be given to gravity-fed over pumped schemes and the use of work oxen rather than power tillers. A full feasibility study will be undertaken on a possible 20,000 hectare scheme in the Lower Shire Valley. Initial studies suggest that an investment of K91 million would provide 7,400 hectares of irrigated land by 1995, including a gravity canal to supply both the second phase of 13,000 hectares and the Sugar Corporation of Malawi (SUCOMA). Irrigation on existing estates, particularly for wheat, will also be promoted. A nation-wide survey has recently been conducted to determine potential for small-scale irrigation in the country. Finally, the institutional arrangements for planning and support services in this sub-sector require further delineation following the recent move of overall responsibility from the Ministry of Works and Supplies to the Ministry of Agriculture.

LIVESTOCK

4.67 For the smallholder sector, mixed farming is seen as the key, utilizing the many complementarities between crop and livestock production. The supply and training of work oxen will be emphasized, these being supplied to farmers at cost. Specialized livestock production systems will be directed towards supplying the domestic urban market. The Government will continue its support activities in disease control, extension, research, credit, and marketing. Disease control will give priority to east coast fever and trypanosomiasis in cattle, Newcastle disease in chickens, and African swine fever in pigs. Dipping programmes will be continued but operating costs will be reduced through rationalization. Animal husbandry extension will be given greater priority and more closely integrated with crop extension. Applied research will be done on fodder production systems and the availability of medium-term credit for the purchase of improved stock will be enhanced. However, subsidies will be withdrawn on such stock sales. Government farms and projects supplying cattle, sheep and poultry will cover their full costs through sales. In areas where commercial production is widespread, artificial insemination of existing cattle herds will be given a higher priority. Beef and milk production will be encouraged on estates as a means of using underutilized land and crop residues.

4.68 Developments in marketing will also be particularly important. The remaining controls on meat prices will be withdrawn by 1988, and the marketing facilities for transport, auction and slaughter in the North of Malawi will be improved. This will be undertaken on a financially self-supporting basis. The marketing arrangements for sheep and goats will also be improved, nationwide. The existing Malawi Milk Marketing organization has recently been formed into a parastatal organization and a high priority will be a rationalization of its operations so as to eliminate losses. Further expansion of milk output is foreseen, to the point where the bulk of dairy imports are eliminated. In many cases, this will involve the introduction of new forms of processing (e.g. UHT, milk powder). Opportunities for the introduction, by the private sector, of small milk processing facilities outside the major urban centres will be investigated.

4.69 Many of the individual developments in this sub-sector will require further investigation. A comprehensive National Livestock Development Plan will be produced in 1987–1988 which will address this.

AGRO-INDUSTRY

4.70 For the foreseeable future, this will remain

a dominant component of Malawi's industrial sector. Its expansion will form the bulk of industrial sector growth over the next decade and will make a direct impact on export earnings by increasing the value added in many agricultural exports. However, the impact of agro-industrial investment will be diversified. For some crops and animal products, the development of a processing capacity may be a prerequisite to production (e.g. guar bean). For others such a development offers an opportunity to boost production (e.g. starch from cassava), to increase value added and possibly also replace imports (e.g. instant coffee) or find new export markets (e.g. processed fruit). In some cases, the industry is concerned with inputs rather than outputs (e.g. agricultural tools, fertilizers). In all cases, development will necessarily involve close co-ordination between the Ministry of Agriculture, the Ministry of Trade, Industry and

Tourism and in some cases, parastatals such as ADMARC and MDC. Every encouragement will be given to involve the private sector in this area.

4.71 Two particularly important areas requiring attention are animal feed, where the inadequacy of the existing industry is a barrier to the development of the whole animal husbandry sector, and fertilizers which has a particular value and strategic importance. Local and foreign investment in the animal feed sector will be particularly encouraged. The Malawi Development Corporation is the designated lead agency in promoting the development of a domestic fertilizer industry and has been investigating a number of options. One of these involves importing urea and mixing this with domestically mined and manufactured sulphur, phosphorous and filler, and this will be pursued with renewed vigour.

Chapter 7

MINERALS AND MINING

Policy and Strategies

7.1 The overall policy objective for this sector is to maximize the economic benefit to the nation that can be realized from the exploitation of our mineral resources, both from existing and possible new ventures. This will involve public and private sectors in delineating, evaluating and, where viable, exploiting resources using appropriate technologies. The benefits will accrue in a number of forms including the diversification of the economy and the expansion of industrial employment, both directly and indirectly. There could be increased foreign exchange earnings, the substitution of domestic for imported materials, a reduction in excessive rates of depletion in other natural resources (in particular the substitution of coal for fuelwood) and a wider geographical distribution of industrial development.

7.2 This policy will involve taking action to:

7.2.1 implement an accelerated programme of mineral exploration and technical and commercial evaluation, combined with the active promotion of identified commercial opportunities to potential domestic and foreign investors;

7.2.2 undertake selective direct public or quasi-public sector investment in mining ventures, in particular where a strategic mineral is concerned, or where the private sector is unwilling to invest;

7.2.3 establish a systematic inventory of mineral resources, and collate this with the forecast pattern of future domestic industrial development and opportunities in international markets;

7.2.4 establish a package of appropriate incentives for foreign investment in the sector which recognize the unique nature of mining investment;

7.2.5 design and execute packages of financial assistance, training and technical extension services to viable existing and new small-scale mining ventures;

7.2.6 intensify the research and development effort concerned with the discovery, assessment, extraction, processing and marketing of minerals; and

7.2.7 strengthen the capability of the Department of Geological Survey, the Department of Mines, and the Mining Investment and Development Corporation to supervise, organize or undertake the activities listed above.

Background

7.3 This sector encompasses the exploration and assessment of mineral resources, mining and primary mineral processing. Responsibility for sector development lies largely with two Departments under the Ministry of Forestry and Natural Resources, the Department of Geological Survey and the Department of Mines. The Department of Geological Survey is responsible for geological mapping and the maintenance of national geological data, mineral exploration, mineral reserve delineation and geotechnical advice to public and private sector civil engineering works. It is also responsible for the administration of some of the legislation on minerals and mining; the maintenance of geological information and the dissemination of this information to the public and private sectors; the training of technical and professional staff, and applied research on the utilization of non-metallic minerals.

7.4 The Department of Mines is responsible for the promotion of both small- and large-scale mining and mineral processing ventures and the development of appropriate mining technologies. It is also responsible for the training of mining personnel, the administration of certain mining legislation including the monitoring and inspection of mining operations, and the collection of fees and royalties. In 1985, a fully state owned Mining Investment and Development Corporation (MID-COR) was set up with a responsibility to undertake mining ventures. It will also test and demonstrate to the private sector the technical, economic and financial viability of selected mining opportunities. It is particularly concerned with the further development of mining ventures regarded as of strategic importance and has the freedom to undertake either sole or joint ventures.

7.5 In 1981, a comprehensive Mines and Minerals Act superseded a variety of previous legislation.

It set out the basis of licensing for prospecting and mining, and the rights and responsibilities of the Government and investors. Small-scale and hand-digging operations are issued simple Mineral Permits by the District Administration. Simple medium-cost operations are regulated by non-exclusive prospecting licences and mining claims issued by the Commissioner for Mines and Minerals. These give the holders the right to undertake an agreed programme of work. Mineral rights, issued by the Minister, and comprising reconnaissance licences, and mining licences exclusive prospecting licences, and mining licences are appropriate for the more sophisticated medium- and large-scale exploration and mining operations. The system is designed to provide an attractive and secure environment to the investor a secure contractual environment, protection of the physical environment, some opportunity for local partnership in foreign-owned ventures, and a reasonable economic return to the nation from any development. Royalties, currently set at 5 per cent to 10 per cent, are payable on the gross value of the product.

7.6 The nation has available geological maps covering the whole of Malawi at a scale of 1:100,000. This, combined with a stream sediment geochemical survey, identified targets for detailed mineral exploration. An airborne geophysical survey in the early 1970s failed to identify significant mineralization but during 1975-1977 extensive groundwork delineated coal reserves at Ngana in Karonga, phosphates in Mulanje and Zomba, and sulphur at Chisepo in Dowa. An airborne survey in 1977 also identified a uranium deposit at Kayelekera in Karonga. Separate foreign investors undertook pilot processing of some strontianite/monazite deposits briefly in 1977 and a vermiculite deposit in 1976-1980, but did not proceed into full production. In the 1980s, additional coal reserves have been proven in the north of Malawi, glass sand and gypsum were discovered at Mchinji and Dowa respectively, and further prospecting has been undertaken for soapstone, vermiculite, graphite, rare earths, tin, ceramic clays, and phosphates. During 1984-1985, another extensive airborne geophysical survey was undertaken and interpretation is now underway to delineate targets for ground follow-up.

7.7 Until 1985, when small-scale coal mining was started by MIDCOR, the mining sector in Malawi had been restricted to limestone, sand aggregates and brick clay for building purposes, plus very small-scale operations concerned with gold and precious and semi-precious stones. Limestone has been quarried for cement production at Changalume near Blantyre since 1972. Cement production

peaked at 113,000 tonnes in 1979 and has since fallen, along with the level of construction activity, to 70,000 tonnes a year (see Table 7.1). There has been a small-scale lime mining industry for over 40 years. It produces about 2,000 tonnes a year but has suffered from problems of marketing and quality control for some years. No statistics are kept of the consumption of construction sand aggregates and bricks, but taking the level of licensed public and private construction activity in recent years, approximately K1.1 million a year appears to have been spent on these materials.

TABLE 7.1: CEMENT PRODUCTION AND SALES, 1972-1986
(tonnes)

Year	Production Quantity	Sales
1972	74,382	73,609
1973	88,774	84,595
1974	81,072	83,392
1975	103,972	102,305
1976	85,025	86,703
1977	93,986	93,093
1978	102,785	118,386
1979	112,989	150,720
1980	92,177	122,979
1981	77,926	92,220
1982	53,452	80,274
1983	70,318	72,382
1984	70,058	71,677
1985	61,672	66,652
1986	69,371	69,121

Source: National Statistical Office.

7.8 Gold production fluctuates sharply from year to year but reached 302 grams in 1986. It is undertaken in the Lisungwe Valley using simple panning techniques. A small gemstone mine producing sapphires and rubies has recently been re-opened by MDC in Ntcheu District. A pilot small-scale coal mining operation was started by MIDCOR in September 1985, at Kaziwiziwi in northern Malawi. In the first year of operation, some 5,000 tonnes representing about 12 per cent of Malawi's current level of consumption was raised and sold.

7.9 The levels of employment in mining and quarrying remained relatively static at about 600 for a number of years up to 1982 when a fall in cement production caused it to slump to 300. Since then, the employment of 100 workers in coal mining has slightly boosted the position. Most of the labour force is unskilled and employed in the private sector. But in recent years, the Government has invested in the training of geologists, mineral processing engineers and technicians, building up a compliment of 34 professional staff for the Department of Geological Survey and the Department of Mines.

7.10 The import levels of certain basic mineral commodities give some indication of the current pattern of domestic demand. Table 7.2 summarizes the position on the more major items where the raw materials are in abundant supply in Malawi.

The Decade Ahead

MINERAL EXPLORATION AND ASSESSMENT

7.13 Detailed geological mapping will be intensified both to improve the general understanding

TABLE 7.2: SELECTED MINERAL IMPORTS, 1977-1985
(Value: K'000)

Unit	1977		1980		1985	
	Quantity	Value	Quantity	Value	Quantity	Value
Salt tonne	11,930	961	12,970	1,579	72	29
Slaked Lime tonne	1,645	165	3,143	526	2,171	504
Cement tonne	159	41	30,629	2,934	15,646	1,225
Coal tonne	56,529	1,009	65,383	3,189	32,850	4,121
Sulphuric Acid Kg	51,137	32	473,203	558	202,515	288
Glass Products	—	1,253	—	2,562	—	2,449
Ceramic Products Kg	502,482	717	121,467	957	144,541	408

Source: Department of Geological Survey.

Salt is mined but only on a very small-scale. Deposits large enough to justify industrial mining are being sought. Some slaked lime is produced and there is scope for replacing all imports in due course. Normally, domestic cement production is adequate to meet local demand but in certain years such as 1980 demand from the construction industry was exceptionally high; in other years such as 1985, the factory faced particular production constraints.

7.11 Malawi has extensive proven coal reserves, 65 million tonnes at one deposit alone in the North (see Table 7.4). The existing MIDCOR mine is trying to demonstrate that coal from this deposit can be profitably extracted and marketed, but the key to this will be the cost of transportation. This is currently being explored. Malawi has extensive deposits of iron sulphides at Malingunde and Chisepo which technically could be exploited for the production of sulphuric acid, a basic input for a range of chemical industries such as fertilizers and paper pulp. A further input for fertilizer, rock phosphate, is also found in Mulanje. Sand of a quality suitable for glass-making has been delineated at Mchinji and Machinga and high quality ceramic clay deposits exist at Linthipe and Ntcheu.

7.12 The export of a number of minerals is potentially viable for a range of deposits such as corundum, strontianite, monazite, vermiculite and graphite. These, when processed, are relatively high value minerals and Malawi's position will therefore not inhibit their viability. Prospecting is currently being undertaken by foreign interests both for uranium deposits and for hydrocarbons in the Rift Valley.

of the rocks of Malawi and to assist in discovering additional mineral resources. More specifically, the mapping programme will cover—

- Northern Malawi granites and their potential for tin mineralization;
- Lake Malawi calc-alkaline granites and their potential for tin and tungsten mineralization;
- Southern Malawi carbonatites and their potential for rare earth mineralization;
- Karoo sedimentary and younger rocks in relation to their potential for a range of industrial minerals.

There will also be a specific programme to collate available geological data into investor packages which relate to identified potentially viable mining developments. Some of these data packages will feed into project feasibility studies.

7.14 The public sector will also concentrate its efforts on the assessment of reserves and grades of known mineral resources. But foreign investors will be encouraged to undertake detailed mineral exploration by offering a package of incentives including duty free importation of exploration equipment and the waiving of royalties on minerals sent for tests at the pilot stage (precious and semi-precious stones excepted). Private investors are expected to continue to show interest in the delineation of Malawi's uranium deposits and the identification of hydrocarbon deposits. The latter is of considerable interest to Malawi and the Government will make every effort to encourage private sector interests.

MINING AND MINERAL PROCESSING

7.15 The assessment of the viability of mineral exploitation will be an on-going concern of the

TABLE 7.3: KNOWN MINERAL RESOURCES

Mineral Deposit	Proven Reserves in tonnes	Resources (Not fully assessed) in tonnes	Estimated Current Domestic Demand	Export Prospects	Other Remarks
Coal ..	16 million	Over 800 million	45,000 tonnes per year	Low	13 coalfields mostly in Northern Malawi
Glass Sands ..	25 million	5 million	(See Table 7.2)	Low	Large deposits in Machinga and Mchinji
Limestones ..	20 million	600 million	10,000 tonnes (6,000 tonnes as lime)	Medium	Mostly metamorphic limestones
Ceramic Clays ..	15 million	5 million	(See Table 7.2)	Medium	
Vermiculite ..	1.6 million	10 million	100 tonnes a year	High	14 deposits discovered in Mwanza District
Bauxite ..	28 million		Nil	Low	Good potential for manufacture of refractories and aluminium sulphates for domestic requirements
Strontianite Monazite ..	Over 11 million	2 million in lake plain sands	Nil	High	High Rare Earth Minerals in Carbonatites especially at Kangankunde
Corundum ..	—	1.6 million	Nil	Medium	Good potential for manufacture of abrasives for domestic requirements
Graphite ..	35,000	200,000	20 tonnes a year	Medium	
Phosphates ..	350,000	2 million	significant, as part of compound fertilizers	Low	
Pyrite/Pyrrhotite (for Sulphur) ..	40 million	10 million	significant in chemicals and fertilizers	Low	
Kyanite ..	14,000	30,000	50 tonnes a year	Medium	

Source: Department of Geological Survey.

Government as new resources are discovered and economic and technological circumstances change. This will involve specialist feasibility studies undertaken by consultants or desk work by the two Government departments concerned. In a limited number of cases, specific pilot schemes would be undertaken by MIDCOR. Such pilot schemes will, however, only be undertaken where studies confirm economic and financial viability. The overall effort to assess and promote viable projects will be co-ordinated by MIDCOR, the structure, staffing and financing of which will be reviewed to ensure that these match the tasks that it is expected to perform.

7.16 The development of mining will reflect national economic priorities, in particular the gaining and saving of foreign exchange, the need to relieve the pressure on some of Malawi's depleted natural resources such as wood, and the stimulation of agricultural production. For some potential developments, more than one of these objectives may be realized, in particular coal and fertilizers. Certain developments appear to have particular potential in terms of their stimulus to other industries, e.g. mineral building materials.

7.17 Most potential developments will be dependent on the extent to which viable associated domestic manufacturing industries can be developed (fertilizers, paper, glassware, etc.) and for these the focus will be on feasibility assessment. In many cases, for both mining and associated manufacturing, small-scale technologies are likely to be viable, building up capacity as national and export demand increases (e.g. glassware, building materials). In other cases, development will be heavily dependent on institutional progress in such areas as quality control (e.g. lime) and marketing (e.g. semi-precious stones). Table 7.3 attempts to summarize the position on the exploitation of major mineral deposits.

7.18 Estimated coal reserves are summarized in Table 7.4. Until pilot production started in 1985, all coal consumed in Malawi was imported, largely from Mozambique and Zambia, although for some years supply has been erratic. Total demand is currently around 45,000 tonnes a year, half of which is accounted for by two industrial consumers, a cement factory and a textile plant. Currently, a considerable volume of wood is consumed in curing tobacco but, if and when coal becomes a competitive fuel for this purpose, consumption could rise by as much as 15,000 tonnes per annum. Broadly, if domestic coal can be produced and marketed at a competitive price, 1996 consumption is forecast

at 75,000 tonnes. The present MIDCOR underground mine at Kaziwiziwi and one being developed in north Rumphu represent a pilot scheme, training staff in simple mining techniques on a small but high quality deposit. If the annual production from these mines reaches 25,000 tonnes it is planned to operate them for a maximum of seven years to 1992. During this period, the viability of developing much larger but lower grade deposits at Ngana (also in the North) and Mwabvi (in the South) will be assessed.

7.19 For the mines in the North, this viability will depend not just on mine development and extraction costs but also the costs of transportation (over 400 km-500 km) to the bulk of consumers in or near Blantyre. Once viability is demonstrated, then an attempt will be made to attract private investment into a joint venture with MIDCOR. If these mining projects go ahead, the investment will total approximately K2 million a year between 1988 and 1992, rising thereafter to over K3 million a year. The pattern of output consistent with this would satisfy forecast domestic demand. Meanwhile, the possibilities for viable coal mining in the south of Malawi (at Mwabvi) will continue to be vigorously pursued in view of its proximity to industrial users. A high priority survey currently underway should provide the necessary data on this deposit by 1988.

7.20 Malawi currently imports over 110,000 tonnes of fertilizer a year, made up largely of mixtures of ammonia, nitrogen, phosphorus, and sulphur. The country has some significant deposits of sulphur and phosphorus and the capacity for further hydro-electricity generation (see Chapter 10) but the viability of a domestic manufacturing facility utilizing local raw materials has yet to be demonstrated. The possibility of importing ammonium for mixing with sulphates and phosphorous from local sources will be explored. This will be one of the potential opportunities of strategic importance which will be kept under regular review in the light of changes in domestic demand, import prices, and the development of new technologies.

7.21 While the construction industry currently supports local production of cement, clay bricks, and lime, the utilization of local clays in roof, wall and floor tiles and vermiculite in plaster board will be the subject of further development research. The existing small-scale lime industry will continue to receive technical support, particularly in production and marketing techniques. For those areas such as ceramics and glassware where there is a significant local market for a low-technology product, the Department of Geological Survey and the

TABLE 7.4: MALAWI COALFIELDS—COMPOSITE SEAM POTENTIAL, IN-SITU RESOURCES AND RESERVES, 1985
(million tonnes)

Coalfield	Category	Measured	Indicated	Inferred	Hypothetical	Speculative	Total
NORTHERN KARONGA							
BASINS							
Ngana .. .. .	.. 60 Sq km	15	50	20	N.A.	N.A.	85
Kibwe .. .. .	.. 15 Sq km	—	—	3	—	—	3
Lufira .. .. .	.. 6 Sq km	0.6	—	2	—	—	2.6
Mwankenja .. .. .	.. 52 Sq km	—	—	1	5	—	6
Kaporo .. .. .	.. 140 Sq km	—	—	—	—	300	300
RUKURU							
Northern Rukuru .. .. .	.. 150 Sq km	—	—	—	150	100	250
Nthalire .. .. .	.. 40 Sq km	—	—	—	—	15	15
Mwenwenya .. .. .	.. 16 Sq km	—	—	—	—	—	—
Sekwa .. .. .	.. 3 Sq km	—	—	—	—	—	—
NYIKA—CHIWETA							
Lingstonia .. .. .	.. 90 Sq km	0.3	0.8	0.2	19	100	120.3
Hara .. .. .	.. 40 Sq km	—	—	—	—	10	10
Henga .. .. .	.. 30 Sq km	—	—	—	—	—	—
Vvaza .. .. .	.. 100 Sq km	—	—	—	—	—	—
CHIKWAWA							
Lengwe .. .. .	.. 350 Sq km	—	—	—	—	10	10
Chiromo .. .. .	.. 100 Sq km	—	—	—	—	5	5
		15.9	50.8	26.2	174	540	806.9

Source: Department of Geological Survey.

Department of Mines will co-operate with the Ministry of Works and Supplies and the Ministry of Trade, Industry and Tourism in both undertaking industrial research and development and in drawing up and promoting viable schemes for local and foreign investors. The general incentives available for small businessmen (see Chapter 8) will be available for such schemes, specialist technical and training support will be available from the new technical institute and advice on commercial viability will be available from MIDCOR.

7.22 In the case of export minerals such as strontionite/monazite, uranium, vermiculite, bauxite, and corundum, the policy will be to encourage the private sector, and in particular multinational corporations, to invest in exploitation and exploration. This will involve the preparation and targeted promotion of special investment packages involving financially viable projects, some with joint venture participation with local interests. The analysis, preparation and promotion of these packages will require both technical and commercial expertise. This will give MIDCOR an important role in pulling together expertise from concerned agencies including the Department of Geological Survey, the Department of Mines, the Ministry of Trade, Industry and Tourism, the Malawi Development Corporation and the proposed technical institute. Existing individual gemstone miners will benefit from a recently introduced system of licensed buyers, and a gold exploration project is planned.

7.23 It is proposed to establish, by 1989, a modest technical institute and this will shortly be the subject of study (see Chapter 8). One of its functions

may be to undertake applied research into beneficiation and product manufacture from selected local minerals such as ceramic minerals and glass sands, using or developing appropriate technologies. It will also offer training in the application of these technologies to Malawians. The Department of Geological Survey and the Department of Mines will, in liaison with the Ministry of Trade, Industry and Tourism and MIDCOR, organize a priority programme of research for the institute in its areas of responsibility, and assist in the selection of candidates for training.

7.24 Virtually all mining and mineral processing industries, even on a small-scale, pose some threat to the environment. Environmental impact analysis will be required for all significant development, and where appropriate, penalties and controls will be introduced to contain the impact at acceptable levels.

FINANCIAL AND MANPOWER IMPLICATIONS

7.25 In 1987, the Department of Geological Survey and the Department of Mines, taken together employed 150 permanent staff, of which 34 were professional, and cost K1.2 million to operate. Implementation of the sector strategy will involve some expansion in staff and related recurrent costs, particularly in the Department of Mines and MIDCOR. Much of the investment project appraisal, packaging, and piloting, and the public sector mining investment, will be carried on the Development Budget. MIDCOR itself has particular financial and manpower problems. In order for it to fulfil its functions effectively, these will be addressed directly in 1987 and 1988.

Chapter 13

TRANSPORT AND COMMUNICATIONS

Policy and Strategies

13.1 This is basically a service sector but its role is not only one of meeting effective consumer demand, but also involves stimulating economic development and improving the economic and social cohesion within the country. Two elements of this role have particular significance. Firstly, as an economy heavily dependent on foreign trade, the availability of external transport links which are both dependable and not too costly, is crucial. This consideration has taken a very particular significance in recent years as Malawi's rail links to the Indian Ocean have ceased to function. Secondly, although Malawi is a compact and densely populated country, there are significant imbalances in the levels of economic activity and income within the country. Transport infrastructure will play an important role in the reduction of these imbalances. It is, therefore, not surprising that the sector has basically dominated development expenditure since Independence, often absorbing 30 per cent of the total. The result has been that Malawi is well on the way to acquiring a good basic framework of domestic transport and telecommunications infrastructure, notwithstanding the attention to improvements in external links in recent years.

13.2 The responsibility of Government in the sector is to build and ensure the efficient utilization of a network of infrastructure and services appropriate to the current and developmental requirements of the economy. Increasing utilization will have a particular priority. New public investment will be limited to projects which will directly further either this objective, the strategic requirement to maximize security and stability in international traffic movement, or the need to encourage balanced geographical development and national cohesion. There will also be a concern to encourage the efficient distribution of both domestic and international traffic between different modes of transportation, and the efficient provision of appropriate services by each mode—road, rail, lake, and air. The strategies concerned with these objectives will involve action to:

13.2.1 improve the efficiency of domestic public road, lake, rail, air, telecommunications and postal services and the inter-modal distribution of traffic by means of selective investment, operational adjustment, and tariff management—encouraging each mode to fix tariffs in relation to its relative costs;

13.2.2 encourage the development of efficient competitive transport services, minimizing regulation of this activity and controlling tariffs where absence of competition permits excess profits;

13.2.3 introduce specific support measures and incentives including training and credit to Malawian entrepreneurs proposing to provide a service deemed to be in the public interest;

13.2.4 stimulate the introduction of innovative new domestic transport services, particularly for rural areas, and both energy conservation and improved roadworthiness in commercial and private transportation;

13.2.5 support the rapid introduction of a Malawian international trucking industry capable of handling the bulk of external trade;

13.2.6 complete the main all-weather trunk road network as and when individual investments are justified;

13.2.7 increase the number of available external overland trade routes, including the completion of the Northern Corridor, and continue to investigate opportunities for improving the security or reducing the cost of external freight traffic;

13.2.8 selectively improve the secondary and district road network, and co-ordinate the actions of the various agencies involved in road construction;

13.2.9 review highway design standards and improve the efficiency of the maintenance of transport infrastructure by those public agencies responsible for maintenance;

13.2.10 maintain the rail network at minimum cost so that it will have the capability to participate in the new Northern exit route and take advantage of the Eastern exit routes to Nacala and Beira as and when they can be utilized;

13.2.11 undertake a modest programme of airfield improvement, improve the profitability of Air Malawi, replacing its fleet as appropriate, and review the position on airfield user charges, landing rights, and bilateral agreements;

13.2.12 improve the coverage, quality and efficiency of post and telecommunication services through a combination of investment, institutional reform and operational change;

13.2.13 strengthen the planning capability of the Ministry of Transport and Communications, centralize all road network planning in the Ministry, and enhance the co-ordinating role of the Transport Planning Unit in the Department of Economic Planning and Development.

Background

13.3 At Independence, the transport infrastructure that existed was very limited and heavily concentrated in the Southern Region. The Government gave the development of an all weather primary road network a high priority to meet growing demand for passenger and freight movement, to open up areas of the country which were particularly isolated, to correct an imbalance in investment between regions, and to stimulate agricultural investment and trade. The roads are classified into main, secondary, district and other, the first three groups making up 88 per cent of the total. In functional terms, the main and secondary roads effectively make up the country's primary road network, with the district and other roads acting as feeder systems to this primary network. Of this primary network, an increasing part has been bituminized to the point where the larger part of the basic grid has a high quality all-weather surface. This grid which services both domestic traffic between major centres and inter-regional traffic is dominated by two major North-South parallel routes, one on the plateau and the other on the lakeshore.

TABLE 13.1: GROWTH OF THE ROAD NETWORK, 1964-1985 (Kilometres)

	1964	1985
Bitumen—		
Main	431	1,885
Secondary		260
	431	2,145
Earth/Gravel—		
Main	9,697	859
Secondary		2,481
District		5,692
Others		1,039
	6,979	10,071
TOTAL	10,128	12,216

Source: Transport Planning Unit, Department of Economic Planning and Development.

13.4 The balance of the primary network linking these routes, both internally and with the road networks of neighbouring countries, consists of a series of roads of varying standards. This primary network is the responsibility of the Ministry of Works and Supplies. The district roads, which primarily act as feeder roads to the primary network, are normally earth structures and are maintained by local authorities. The remaining "other roads" category includes urban roads, private and estate roads, the former also being the responsibility of local authorities. Finally, in addition to these designated roads, there are a substantial number of rural earth roads linking farms and farming communities to the official network. They are usually maintained privately or by the community on a self-help basis.

13.5 With the closure of Malawi's external rail links in the early 1980s, external road links assumed a new importance for the movement of over 800,000 tonnes a year of external trade. There are basically three road exit points: in the south-west, through Mwanza to the Tete province of Mozambique then south to Zimbabwe; westward through Mchinji to Zambia; and due north through Karonga and Songwe to Dar es Salaam in Tanzania. The first of these is in the process of being improved with an all-weather link to Blantyre due to be completed in 1987 and a northward link toward Lilongwe in 1988. The western route through Mchinji was developed some years ago and is heavily used. These two routes carry 97 per cent of the traffic. The balance passes through the northern route to Tanzania which presently has very limited carrying capacity and is susceptible to weather damage.

TABLE 13.2: DISTRIBUTION OF EXTERNAL TRADE BY TRANSPORT ROUTE, 1980-1986 ('000 tonnes)

	1980	1984	1985	1986
Beira/Nacala	742	139	6	2
Durban	*	634	827	635
Dar es Salaam	*	*	27	23
Total	742	773	860	660

*Not significant.

Source: Ministry of Transport and Communications.

13.6 The cost to the economy of the forced diversion of traffic from the short Beira and Nacala rail links to these road routes has been substantial. From an average rail journey to a Mozambique port of approximately 700 Km, traffic now has to be moved an average of 3,150 Km to reach a port, largely by road. The burden falls not just directly on exporters and the consumers of imports but is also reflected in significant pressure on the reserve position, increased road maintenance costs, a high

diversion of available public sector capital resources to developing export routes, and the size of the subsidies necessary to keep Malawi Railways operational pending the re-opening of the Beira and Nacala lines, the latter of which is currently being improved. Limiting all these costs is, and will continue, to be a major concern of Government.

13.7 Current design standards for new road construction can be summarized as follows—

	Surface	Width (Metres)	Design Speed (km/hr)	Av. Cost per km. (Kwacha) (1987)
Main:	Bitumen/Gravel	6.7	80/100	275,000
Secondary:	Earth/Gravel	5.5	50	160,000
District:	Earth	5.0	50	35,000

Source: Ministry of Works and Supplies.

Traffic flows are relatively low, even on the external and primary north-south routes, typically 300 to 600 vehicles per day on main, 50 to 100 secondary, and 20 on district roads. A high proportion of this is commercial truck and passenger bus traffic and overloading of many of these vehicles has caused significant road damage in recent years. To control this, a programme of axle load limitation enforcement is being introduced at a number of key points in the network. Increasing attention has had to be devoted to maintenance and to the rehabilitation of many of the roads built before 1975, many to very light specifications. This has involved not just increased allocation of financial resources but a greater management effort in planning and executing maintenance programmes, largely by the Ministry of Works and Supplies. For the district roads, there have been a number of specific improvement programmes covering defined geographical areas. But for these, the relative importance of a need to encourage increased flows of traffic on existing roads has been identified and is being acted upon.

13.8 There are currently just over 25,000 motor vehicles in Malawi, including approximately 11,000 passenger cars, 5,000 motorcycles, 9,000 goods vehicles and 750 public service vehicles. Most of the road haulage industry is made up of 7-10 tonne trucks concerned with domestic traffic. There are less than 100 Malawian vehicles suitable for international haulage. Largely because of the recent forced switch of the international traffic from rail to road haulage, Malawi is dependent on the capacity of neighbouring countries and efforts are underway to build up a significant Malawian owned international road haulage industry. Road passenger public transport is made up of three types of service: urban/peri-urban, inter-city and rural. Only

one company, the United Transport of Malawi U.T.(M) operates all three types of service although there are a number of other companies which offer services in particular fields.

13.9 Rural services, which account for some 30 per cent of U.T.(M) operations, are limited and some of them are unprofitable. While all public service licences are issued on the basis that a minimum of 40 per cent of a company's route network is in these relatively unprofitable rural areas, in practice, it is difficult to enforce this condition, particularly on smaller operations. Large areas remain without regular bus services and most people in these areas rely on bicycles, ox-carts, or the informal taxi.

13.10 Between 1971 and 1981, Malawi Railways both rehabilitated a substantial part of its network and built a new East-West line from Salima on the shore of Lake Malawi, through the new capital Lilongwe, to Mchinji on the Zambian border. Unfortunately, the completion of this heavy investment programme coincided with the closure of the vital external rail links to the Mozambican ports of Beira and Nacala. Malawi was left with a system and an institution geared to freight traffic of 1,300,000 tonnes a year. The remaining domestic market is only 400,000 tonnes of freight per annum, supplemented by 1,850,000 third class passenger movements. Although there is currently no firm indication as to when the routes through Mozambique will re-open, a rehabilitation of the Nacala line will be completed within two years and Malawi's network and operating capacity is being maintained. In this way, as and when the route does open, immediate advantage can be taken of the opportunity. Meanwhile, it has been a policy to minimize the cost of maintaining these assets, and maximize their profitable utilization, both for domestic movement and in support of external road links. This has involved a continuing programme of track and equipment maintenance and refurbishment, the construction of a fuel tank farm

TABLE 13.3: RAIL AND LAKE TRAFFIC, 1980-1986

	RAIL				Passengers ('000)	Passengers ('000)
	Local Freight ¹	External Freight ¹	Other Freight ¹	Total Freight ¹		
1980	320	742	241	1,303	1,267	105
1981	309	652	228	1,189	1,287	133
1982	282	471	130	883	1,531	170
1983	260	259	96	615	1,553	198
1984	355	139	92	586	1,622	188
1985	395	6	—	401	1,851	201
1986*	445	2	—	447	1,691	200

*Provisional figures.

¹Freight in thousand tonnes

Source: Department of Economic Planning and Development.

and trans-shipment facility at Mchinji which allows fuel to be conveyed by rail to Lilongwe, Salima and Blantyre directly from the Zambian border, and an improvement in the rail telecommunications network.

13.11 Malawi has the great advantage of having a lake extending down 70 per cent of the eastern side of the country. For many years, the lake was the dominant mode of communication between the South and much of the Central and Northern regions of the country. The development of the road network over the last 30 years has sharply reduced its relative importance but it remains a vital link for certain communities. The lake retains considerable potential for the possible movement of bulk items such as coal and timber, and will become a vital link in the proposed export route to the North. Malawi Railways, the sole commercial operator on the lake, runs a freight and passenger service between a number of ports on the west shore of the Lake and to a number of small islands. Freight movement is currently not large, 30,000 to 40,000 tonnes a year, but there is a significant demand for passenger movement of around 200,000 a year. Capacity is generally under utilized and most passenger services run at a loss. The vessels are of varying types and vintages and their maintenance is a heavy burden on Malawi Railways. A small marine training school has recently been opened to ensure the production of an adequate number of skilled personnel.

13.12 The 1970s also saw substantial investment in aviation infrastructure, in particular the building of a new international airport in Lilongwe. The domestic network includes four airports with bitumen runways in Blantyre, Kasungu, Mzuzu and Karonga, and a further 15 grass strips located at all the remaining major settlements. Some 90 per cent of domestic aviation traffic, most of it business, is between Lilongwe and Blantyre. Of the current level of 70,000 international passengers a year, 75 per cent go to or come from countries in the Eastern and Southern Africa sub-regions and Europe. The national airline, Air Malawi, operates two medium-range jets (BAC1-11) on regional services and two smaller turbo-propeller aircraft (HS-748) on domestic flights. Air Malawi has run at a heavy loss for some years although there have been recent efforts to cut these losses by trimming both services and staff numbers.

13.13 With a relatively wide range of transport modes, many of them in direct competition, inter- and intra-modal issues assume particular importance in Malawi. Infrastructure investment in recent years has reflected the growing importance of

the road network relative to rail travel in relation to cross border traffic, and relative to lake services in relation to domestic traffic. But with spare capacity existing on rail, lake and most roads, the more immediate issues relate as much to services as to infrastructure. Policy in recent years has been to encourage by subsidy (fuel tax refunds and capital grants) use of the rail system, particularly for bulk freight capacity, and stimulate private sector road services, particularly in those areas not directly in competition with rail on lake services. It has met with mixed success. Inter-modal linkage developments have been limited to some ports and road/rail fuel trans-shipment facilities.

POSTAL AND TELECOMMUNICATIONS SERVICES

13.14 Postal and telecommunications services are a responsibility of the Department of Posts and Telecommunications which falls under the wing of the Ministry of Transport and Communications. The telecommunications network expanded four-fold in the last 15 years—by 10 per cent a year in the 1970s and 8.5 per cent a year in the 1980s. However, at 0.62 per 100 population, telephone density is still low by regional standards. Subscribers, now (1987) 21,800, are almost entirely urban, and although 45 per cent of these are classified as residential, many of these connections are in fact used for business purposes. There is a waiting list of about 10 per cent, plus a degree of suppressed demand, because of capacity limitations on some of the exchanges.

13.15 During the 1970s, the Malawi Post Office concentrated on building up efficient urban and inter-urban networks, in particular a microwave systems connecting the major urban centres. During the 1980s, the Department focused more attention on improving rural coverage and improving the quality of service. Rural areas such as Likoma Island, Dwangwa and Neno have been connected to the network and many of the smaller exchanges such as Chileka, Mangochi and Kasungu have been automated. Some 92 per cent of subscribers are now connected to automatic exchanges and the rural population is serviced by 244 public call offices installed in post offices or postal agencies. On average, there is one public call office per 25,000 people, at an average distance of 16 kilometres. Telegrams are normally distributed over a telephone circuit and the major towns have phonograms, international telegraph and printergram services. Blantyre has a modern automatic telex exchange and over 5,000 subscribers are now connected to it.

13.16 The existing telephone network is comprised of different types of technology made by a

TABLE 13.4: TELECOMMUNICATIONS NETWORK IN MALAWI, 1971-1996

	ACTUAL					FORECAST		
	1971	1976	1981	1985	1986	1987	1991	1996
Total telephone exchange capacity	8,466	12,626	21,007	30,560	31,535	34,175	55,817	84,316
Manual telephone exchange capacity	1,285	1,630	2,077	2,413	2,588	2,033	2,000	2,000
Automatic telephone exchange capacity	7,181	10,996	18,630	28,147	28,947	32,142	53,817	82,316
Total connections	5,417	9,152	14,421	18,718	20,251	21,766	33,490	59,021
Residential capacity	—	—	—	—	9,042	9,539	—	—
Business capacity	—	—	—	—	10,991	12,003	—	—
PCO and ATT telephones	—	—	—	—	218	224	—	—
Total Stations	16,685	18,576	31,437	40,931	43,502	45,029	66,980	106,238
Total telex exchange capacity	160	500	500	800	800	800	900	1,500
Total telex connections	45	126	348	484	521	554	871	1,404
Fascimile	—	—	—	—	1	10	23	106
Telegrams sent internal (000s)	—	130	130	186	198	222	349	616
Telegrams sent external (000s)	—	93	34	44	47	50	63	84

Source: Department of Posts and Telecommunication.

variety of manufacturers. Step-by-step, crossbar and digital switching apparatus is coupled to analogue and digital micro-wave systems, radio systems, cable and open wire transmission routes. The ways and means of integrating, developing and maintaining such combinations is a problem faced by all telephone administrations and the Malawi Post Office has built up a clear policy on how this is to be managed. In relation to switching equipment, a decision was taken some years ago to move at a measured pace over to modern digital equipment, making efficient use of the other types of equipment as long as it is economical to do so. Equipment that is replaced is commonly moved and used elsewhere, or at least used as a source of spares. Clear guidelines exist for planning exchange modernization, expansion and rehabilitation, and work is now well underway in the Southern and Northern Regions. In relation to trunk transmission, this is also being progressively digitalized.

13.17 At Independence, Malawi depended on other countries in the region for external telecommunications links but since then two direct satellite earth stations have been built, one "B" station to India and the Far East, and an "A" station to Europe, North America, and parts of Africa. Micro-wave links with Zambia and Tanzania have also recently been introduced and one with Zimbabwe is under construction. In 1981, an international gateway exchange was commissioned which offers direct dialing from most parts of Malawi to 33 countries, and a semi-automatic service to the rest of the world.

13.18 Telecommunications traffic growth has been accelerating in recent years, from an estimated 8.2 per cent a year in 1982 to 9-10 per cent

a year in 1987. Call rates peak during business hours at an average of 5 calls per subscriber which is extremely high by international standards. Some 70 per cent of domestic traffic is on trunk routes and 30 per cent local. International traffic has grown particularly rapidly—by 10 per cent a year between 1975 and 1981 and 22 per cent a year between 1981 and 1987.

13.19 Stable tariffs certainly encouraged traffic growth. For example, local call unit charges remained unchanged between 1981 and April 1987, but this represented a serious loss of potential revenue to the Malawi Post Office. Despite this and the burden of a heavy investment programme, the rate of expansion and modernization of the network has been such that the Treasury Fund system, under which the Malawi Post Office operates, has always produced a surplus (representing capital expenditure less depreciation plus operating profit). This averaged over K3 million in recent years. Since 1981, income has grown at 14 per cent a year, expenditures at 15 per cent a year, and operating profits at 12.7 per cent a year. The latter was slightly below the average rate of inflation. The sharpest rise in expenditure has been in capital costs as the depreciating Kwacha has sharply raised the cost of equipment and foreign currency denominated loans.

13.20 The general economic developments of the 1980s have had a particularly direct impact on the telecommunications operations of the Department of Posts and Telecommunications. Lower economic growth rates, high rates of inflation, pressure on the Government budget and reduced supplies of foreign exchange have exacerbated a number of management problems both in planning

and executing investment programmes and in day-to-day operational management. The organisation's status as a Department of Government also restricts its flexibility in a number of areas, in particular tariffs, capital budgeting, and manpower development. Capital investment programmes can be difficult to execute, not just for financial reasons, but because the involvement of bilateral tied aid can conflict with equipment standardization objectives. Manpower development is constrained because the Department has little flexibility on terms of service for its employees and they are subject to transfer to other Government departments.

13.21 The postal service has been expanding rapidly in recent years, both by increasing the number of post offices and agencies, and by offering a range of services. By 1986, there were 141 post offices and 128 postal agencies, each on average servicing a population of 27,000 and an area of 350 square kilometres. Over the last decade, the volume of mail has been rising at an average of 11 per cent a year to reach a total of 75 million letters, or about 50 per household a year. The agencies are mainly run by local authorities and offer only restricted services. They are normally upgraded to post offices when traffic reaches a certain level. In real terms, revenues have been growing at 4 per cent a year, rather slower than traffic. In certain areas, staff numbers and facilities have also not kept pace with demand, creating pressure on service facilities. An example of this is the Post Office Savings Bank (POSB) which has over half a million depositors and is increasingly suffering delays on its payment and withdrawal services.

TABLE 13.5: MALAWI POSTAL NETWORK, 1964-1986

	1964	1974	1984	1985	1986
Post Office ..	59	60	126	138	141
Postal Agencies ..	35	140	131	125	128
Mail Posted (millions) ..	—	24	58	75	—
Mail delivered (millions) ..	—	32	95	109	—
POSB Depositors ('000) ..	—	176 ¹	515	—	—
POSB Depositors Accounts (Kwacha millions) ..	—	5 ¹	52	—	—

¹Figure for 1970.

Source: Department of Posts and Telecommunications.

13.22 The organizational structure and corporate status of the Department of Posts and Telecommunications has been the subject of a recent study. Currently, it is a Government department headed by a Postmaster General who is responsible to the Minister of Transport and Communications. It has five divisions responsible for postal services, telecommunications, personnel and training, finance and supply, and investigations. Following the recent study, some restructuring has been taking

place, including the introduction of a computer division which will undertake the administration of billing which is currently done by the separate Data Processing Department (part of the Ministry of Finance).

REGIONAL CO-OPERATION

13.23 As a member of the Southern African Transport and Communications Commission (SATCC), Malawi actively participates in the individual working groups which have been established to improve consultation, standardization and harmonization in each mode of transport and communications. In recent years, particular attention has been devoted to the harmonization of road traffic laws and regulations, air traffic scheduling and tariffs, the standardization of port documentation, and improved posts and telecommunications linkages.

The Decade ahead

13.24 The emphasis in the last twenty years has been heavily toward the creation of basic road, rail, and air transport infrastructure. The next decade will, with the major exception of the Northern Corridor development, see a switch in this emphasis towards policies and programmes concerned with improving the utilization of these assets, both within and between the various modes of transport. The existence of excess capacity in the rail, lake, and air facilities will be a major influence on policy in transport investment, incentives, and controls. Investment will still be necessary but particular attention will be directed to a need to exploit specific economic opportunities in, for example, agriculture, tourism or mineral development. Both investment and tariff policy will bear in mind the relative economic cost position and service characteristics of the mode concerned so as to promote rational choice among consumers. Transport operations in all modes will be encouraged to take advantage of market opportunities by a combination of minimizing regulation and providing a range of specific support measures for new Malawian ventures.

13.25 The major investment over the next five years will be the Northern Corridor project aimed at opening a major additional exit route for foreign trade due North into Tanzania, the Tazara railway, and Dar es Salaam. The route runs from Blantyre/Lilongwe by rail or road to the port of Chipoka at the Southern end of the Lake Malawi, by the lake vessel north to Chilumba, then by road through Karonga and Songwe to the Tazara railway at Mbeya in Tanzania. It will involve substantial road investment between Blantyre and Chipoka in the South and Karonga and Mbeya in the North, the

development of freight handling and cargo vessel capacity on Lake Malawi, investment in rail transshipment facilities at Mbeya, and special port and fuel storage facilities for Malawi cargo in Dar es Salaam. When the project is completed in 1990, it will be capable of handling 50-per cent of Malawi's external trade and should both lessen dependence on South African ports and reduce the average transport costs associated with foreign trade.

ROADS AND ROAD TRANSPORT

13.26 Except where a railway facility is available, the primary road network will continue to serve as both the inter-regional grid within Malawi and the focus of Malawi's international trade links. The first link runs west of Blantyre through Mwanza to the Tete province in Mozambique, due for completion in 1987. The second is the road component of the Northern Corridor project involving both new and reconstructed road between Lirangwe (north of Blantyre) and Salima (serving the port of Chipoka) in the South, and a new road between Karonga in Malawi and Ibanda in Tanzania in the North. In relation to domestic requirements, completion of the bituminization of the main North-South plateau road (M1) will be achieved by 1988 with the last segment between Champhoyo and Mbowe now underway. The other North-South route along the lakeshore has a remaining 134 kilometres unbituminized section between Dwangwa and Nkhata Bay but the traffic on this is relatively light and upgrading is unlikely to be justified before 1990.

13.27 There are a number of east-west links in the grid where improvement may be justified at some point in time over the next decade but the timing and the standard of each of these have yet to be the subject of detailed appraisal. These include the roads between Lilongwe and Salima; Masasa to Golomoti; Mchinji through Kasungu to Nkhotakota; and Blantyre to Mulanje through Thyolo. Finally, there remain certain relatively large areas, some with significant agricultural potential, which are not well serviced by the existing primary network. What investment can be justified in terms of secondary roads running through these areas will be investigated over the next three years. For a number of road projects, specific development opportunities will contribute to provide part of the justification. These include agricultural crop developments (see Chapter 4), mining developments (see Chapter 7), and tourism development particularly to and along the lakeshore (see Chapter 11). A broad priority list of all the outline road projects currently identified is set out in Table 13.6. This will be subject to regular review.

13.28 A Central Government agencies improvement programme on district roads, which has been underway since 1977, will continue at least until 1990. Here, there will also be a reassessment of road design standards in relation to the physical and economic circumstances of Malawi. Efforts will continue to develop road construction and maintenance management practice, and strengthening of the capability to gather and analyse road traffic data. The design standard reassessment will be vigorous and pay particular attention to choosing the most economically efficient balance between capital (construction) and recurrent (maintenance) costs. Inadequate or inappropriate design will have high direct and indirect costs to both the Government and the user. The development of construction design and management practices will consider such options as staged construction as a means of minimizing capital outlays and will review the balance between in-house staff and consultants in the design and supervision of projects (see Chapter 9).

13.29 With a rapidly growing road network, road maintenance will assume a more important role over the decade ahead. Attention will be directed to the technical, institutional and financial aspects of this responsibility. For Central Government, the system of road maintenance planning and operational control will be improved so as to have a clear set of procedures and responsibilities. This should assist in determining the total physical and financial requirement, prioritizing the programme, and improving the efficiency of individual tasks with benefits to both Government and consumer. Most of these district roads and other minor roads are constructed by a variety of public and private agencies.

13.30 Co-ordination of network expansion, including the determination of the location of new roads, will be the responsibility of the Ministry of Transport and Communications while co-ordination relating to maintenance requirement will be the responsibility of the Ministry of Works and Supplies. The collection of road traffic data is currently executed by a number of agencies and not centrally directed by the National Statistical Office (NSO). This is wasteful and liaison between the Transport Planning Unit (TPU) of the Department of Economic Planning and Development, the Ministry of Works and Supplies and the National Statistical Office will be improved so as to determine both the requirement and the executing agency. Such data as has been gathered in recent years has not been comprehensive enough to form a solid basis for road network planning. In future, a wider range of data will be gathered and the

TABLE 13.6: OUTLINE LISTS OF MAJOR ROAD PROJECTS AND ESTIMATED EXECUTION PERIOD 1987/88-1996/97

ON-GOING PROJECTS	Length (km)	ESTIMATED EXECUTION PERIOD (X)															
		1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97						
Lirangwe-Mwanza	79	X															
Bianyre-Balaka	94	X	X	X													
Champhoyo-Mbowe-Mzimba Spur	62	X	X	X													
Karonga-Ibanda	51	X	X	X													
NEW PROJECTS																	
Balaka-Salima (Rehabilitation)	147		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mchinji-Kasungu-Nkhotakota (Improvement)	203			X	X	X	X	X	X	X	X	X	X	X	X	X	X
Jenda-Edingeni-Katumbi (Improvements)	236																
Lilongwe-Salima (Improvement)*	110			X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dwangwa-Nkhata Bay	132																
Ngana-Chitipa (Improvement)**	61			X	X	X	X	X	X	X	X	X	X	X	X	X	X
Masasa-Golomoti (Improvement)*	24			X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bianyre-Mulanje (Improvement)***	76			X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chitipa-Nakonde-Mphalungu	310																

* Relates very much to the development of the Lakeshore Tourist industry.

** Timing of this will depend very much on the rate of development of coal resources.

*** Part of the export trade route for tea but has also potential for tourist development, possible mineral exploitation, and the future movement of foreign trade.

Source: Department of Economic Planning and Development.

resources devoted to its analysis enhanced. The Ministry of Transport and Communications and the Transport Planning Unit will also collaborate in executing a number of vehicle operating cost studies. The result of the road design review, the traffic flow data and the vehicle operating cost studies should provide a solid analytical basis for the appraisal of the individual projects listed in Table 13.6 above.

13.31 One important factor relating to both road design and road maintenance is the vehicle axle loads permitted on the roads. Upper limits currently exist for all roads and a programme to introduce axle load weight checking facilities at major border points and some other key locations will be speeded up. There will also be a programme of spot checks using portable weighbridges. However, there is a particular problem of large trucks, within the legal limit, using secondary and district roads which were never designed for large vehicles. These cause disproportionate damage and consideration will be given to the introduction of regulations limiting the larger commercial vehicles to a specified network of main roads.

13.32 Distributing the availability of affordable passenger transport services more widely into rural areas will be a particular policy concern of the next decade. The existing prime route policy of obliging all bus companies to operate a proportion of their services in less profitable rural areas has been of limited success, very largely because it is difficult to enforce. It will be phased out over the next few years. However, the Government will also specifically encourage investors to participate in potentially viable rural transport ventures, promoting diversification into the design and operation of vehicles appropriate to the pattern of demand. Exactly which instruments and institutions can promote this most effectively will require further investigation. This is likely to involve both financial support, such as a special credit facility, training, and technical support in the form of subsidized provision of new types of vehicles on a pilot basis. Certain fiscal incentives will be considered.

13.33 Regulation will be kept to a minimum, concerned primarily with basic public safety and the control of any serious monopoly exploitation. The current restrictions on private individuals taking fare paying passengers will be withdrawn outside the cities. However, prior to liberalization the questions of safety and other related measures will be reviewed. Competition on inter-city passenger services will be encouraged, hopefully to the benefit of consumers. Here, there is a limited degree of inter-modal competition, at the bottom of the

market with rail passenger services and at the top of the market with domestic air services. As the road network improves and bus company competition increases, some traffic is likely to be diverted into the bus network, in particular on the Lilongwe-Blantyre route. In urban areas, competition will be encouraged, both between operators themselves and between different types of vehicular passenger transport (buses, mini-buses, taxis). There will be no entry control restriction on mini-buses and taxi tariffs will be fixed at levels reflecting the costs of economic vehicles. In both urban and rural areas, opportunities for improved complementarity between different types of transport will also be pursued. As a general policy, where tariffs are specified, they will relate to the estimated cost of providing a reasonably efficient service, attempts at cross subsidization, such as the prime route policy, being very much the exception.

13.34 The priority in road freight will be the rapid development of a Malawian-owned and operated international trucking industry which can carry the vast bulk of Malawi's external trade. The objective is not merely to reduce the foreign exchange loss resulting from the use of foreign firms to carry most of Malawi's external trade, but also to eliminate Malawi's dependence on foreign interests in a highly unstable area, vital to the Malawian economy. This will involve substantial involvement by the public sector in the provision of credit for vehicle purchase, training in vehicle operation, and the creation of an institutional framework which will stimulate expansion of Malawian ownership and operation.

13.35 Initially, five foreign owned umbrella companies are being established which will co-opt individual Malawian transporters to operate under their guidance. Related to this, over the next five years, the Government is also acquiring approximately 60 heavy duty trucks suitable for international haulage which it will sell to Malawians, through a financial intermediary, on commercial credit terms. Finally, the Government will continue to attempt to facilitate the free transit of Malawian freight traffic across neighbouring countries by negotiating specific bilateral road transport agreements. These agreements cover such matters as vehicle technical standards, documentation procedures, any transit payments arrangements, and border post operation. One has recently been signed with Tanzania and others are planned over the next three years. The possibility of introducing road tolls at Malawi's borders for foreign vehicles, and at other points in Malawi will be considered. Generally, the costs associated with raising tolls

on domestic traffic seem likely to exceed the benefits. However, there may be cases where it would be an effective means of financing road maintenance and this will be the subject of study.

13.36 A proportion of domestic road freight movement is currently subject to some regulations by the Government through one of the major parastatals. Although some real potential exploitation has undoubtedly been contained by this system, it has to some degree discouraged the development of a flexible and efficient network, with high average vehicle utilizations and low average tariff rates. The current system of controls will be progressively dismantled and open competition in services and charges encouraged. The parastatal most directly involved, the Agricultural Development and Marketing Corporation (ADMARC), will take a lead in this liberalization.

13.37 Most consumers utilize the road network using their own private means—a bicycle, an ox-cart, a motorcycle, a car, or a pick-up. There are relative incentives to operate smaller fuel efficient vehicles in terms of lower licence fees. This discrimination will be continued. The use of bicycles and motor-cycles will be specifically encouraged in both the public and private sectors with specific incentives where appropriate. The local assembly of bicycles is being actively promoted. There is a general concern with standards of road safety, particularly the roadworthiness of vehicles. A specific campaign will be undertaken in 1988 to ensure that minimum standards are observed by all vehicles. Unlit vehicles travelling or parked on the road at night, including ox-carts, are a particular hazard and action on this front will be a priority.

RAIL TRANSPORT

13.38 Malawi Railways will continue to maintain its capacity to take advantage of external links through Mozambique to Nacala and Beira as and when their use becomes possible. A programme to rehabilitate the line to Nacala is due for completion before 1990 but its regular use will depend on an improvement in the security situation. Connected with these developments is the possibility of a westward rail connection into Zambia from Mchinji. This possibility will be kept under review. Also, with the domestic railway network due to become an important component of the Northern Corridor project, track and telecommunications rehabilitation programmes will continue. Over the next decade, some but not all of the oldest locomotives and freight rolling stock will have to be replaced, and, with a growing demand for passenger service, more passenger coaches will have to be brought into services. Rail transport

could offer a cheaper, faster and more comfortable means of travelling between Blantyre and Lilongwe. This would, however, need investment in suitable coaches and faster locomotives, and this will be explored in the next decade. Other relatively minor investments in facilities (e.g. offices) and equipment (e.g. data processing) will be related to increasing operational efficiency.

13.39 As movement through the Northern Corridor commences in 1990, the freight tonnages moved should increase from just over 400,000 tonnes a year to nearly 700,000 tonnes a year. The current loss of K3 million a year should decline. Realizing a profit, however, will also depend on limiting staff expansion, a reduction in maintenance costs, and tight operational control. The establishment of 4,500 employees relate essentially to the old pre-1980 operation and while the overall ability of the system to take rapid advantage of the reopening of the Nacala and Beira lines is to be retained, this will not rule out some realignment of the labour force to reflect current realities. In relation to normal domestic traffic, the management will, in 1987, review the service's cost structure and tariff and marketing arrangements to ensure that all the profitable passenger and freight traffic that can be attracted to the system has been so diverted and the revenue from this is maximized. However, Government approval for tariff increases will only be given where it is clear that services are rendered efficiently and excess profits will not be realized through the exploitation of a monopoly position. There may well be some further potential for reducing the deficit by creating or attracting new business where revenue exceeds or could exceed marginal costs. There may be particular opportunities in, for example, organizing cargo collection and delivery services.

LAKE TRANSPORT

13.40 The Northern Corridor project will considerably increase the importance of lake transport within the overall system. Moreover, as and when significant volumes of coal are mined in the Northern Region (see Chapter 7), the lake will almost certainly become involved in moving this to the markets in the Central and Southern Regions. The Northern Corridor project, as currently planned, will involve some investment in vessel maintenance and port facilities at Chipoka in the South and Chilumba in the North. By the time the Northern Corridor routes become operational, new institutional arrangements for port operation will have been devised and introduced. There will also be a need for investment in a specific shipping capacity for freight containers. This should be complete and

operational by 1990. Strictly, domestic freight traffic has always been modest and, coal and perhaps charcoal apart, is likely to remain so. Passenger traffic, however, has been growing, and, while unprofitable, provides an essential service for certain lakeside and island communities not adequately serviced by any other transport link. It is also not an insignificant component in Malawi's small tourist industry.

13.41 The essential services described above will be maintained, if necessary at a subsidized tariff or possibly under some prime-route arrangement, but other passenger and freight services will be increasingly open to the winds of competition. Underused non-essential services will be trimmed if not withdrawn. The Malawi Railways will be free to offer such tariff schedules as they judge commercially appropriate except where a service is deemed to justify a subsidy. The private sector will be encouraged to offer new services, and undertake support functions such as the collection and delivery of freight. It is hoped to achieve a greater diversity of services to passengers and freight, a more efficient division of the traffic between lake and road services, a more efficient use of shipping capacity, and a better service to the consumer. For the bulk movement of such commodities as charcoal and coal, the introduction of sailing vessels is actively being considered.

AIR TRANSPORT.

13.42 Given that past investment has provided Malawi with a very adequate network of domestic and international aviation infrastructure, the emphasis of the next decade will be toward the operation and maintenance of these facilities, and the creation of a viable national airline offering a reasonable range of domestic and regional services. The agency responsible for the airports, the Department of Civil Aviation, will review user charges to assess whether they relate to costs and to what extent the user can reasonably bear. Each airport will also develop separate accounts, a clear operating and maintenance cost structure, as well as forecasts of likely future utilization. A number of new investment proposals have been the subject of preliminary technical appraisals. Each requires further technical and economic appraisal before the nature and timing of the respective project can be clarified. On present prospects, however, a good number of these will have to be postponed for several years.

13.43 Air Malawi, recently the subject of a substantial restructuring, will not easily become independent from Government financial support over the next decade, but it is heading in that direction.

The bulk of its fleet is nearing the end of its operational life and will need to be replaced. Some of its routes, both domestic and international, have relatively low load factors and will not easily reach commercial viability. For example, as the domestic primary road network is improved, and in particular the Lilongwe-Blantyre route, competition between road services and domestic air services is likely to become more intense. Most immediately, the Government can help by ensuring that people travelling abroad at public expense travel on Air Malawi unless there is a serious cost in doing so. Careful forward route, tariff, and investment planning and tight operational control will be needed for Air Malawi itself if load factors are to be improved and the recent trend towards reduced losses is to be maintained.

13.44 A number of other African and European airlines also operate a range of external routes. It is important, particularly for the tourist industry but also for business that the range, quality and price of these services is as optimal as can be negotiated or stimulated through means of competition. Domestic tariffs will relate to what the market can bear, so long as that is greater than costs. The situation on landing and passenger pick-up rights will be regularly reviewed by the authorities concerned so as to ensure that the optimal position is being achieved.

POSTS AND TELECOMMUNICATIONS

13.45 Over the next decade, the Government will ensure the efficient provision of a network of national and international communications services with sufficient coverage and quality to meet the reasonable needs of those prepared to pay for such services. Specific targets include an increase in telephone penetration with particular emphasis on the rural areas, reducing the average pedestrian distance from nearest telephone (public call office) from 16 kilometres to 10 kilometres, and increasing the number of telephone exchange lines from 15,000 to 45,000. By 1998, all telephone services are expected to be automatic and international subscriber dialing available to 99 per cent of subscribers. Capacity will be expanded and quality improved on both trunk and international services and all telecommunications services will be increasingly available on demand. Finally, management and staff performance will be improved with resulting reduction in operating and maintenance costs which, when combined with regular tariff revenues, will result in a healthy financial return on investment.

13.46 This policy will involve a heavy programme of investment in equipment, a number of institu-

TABLE 13.7: ACHIEVED AND FORECAST TELECOMMUNICATIONS GROWTH RATES, 1971-1996

	Per cent per annum		
	1971-1981	1981-1987	1987-1996
Total telephone exchange capacity	9.5	8.5	10.5
Total connections	10.3	7.1	11.7
Total stations	6.5	6.2	10.0
Total telex exchange capacity	12.1	8.1	7.2
Total telex connections	22.7	8.1	10.9
Facsimile	---	---	30.0
Telegrams sent internal ¹	---	38.9	12.0
Telegrams sent external ¹	18.2	6.7	6.0

¹Based on 1976-81 and 1981-85 growth rates.

Source: Department of Posts and Telecommunications.

tional and operational changes, and the establishment of a new national training school. The estimated demand for telephone lines is expected to reach 70,000 by 1996, with 59,000 actual connections. Telex is forecast to reach 1,400 connections and the number of facsimile machines is expected to rise to 106. Internal telegram traffic is forecast to grow at 12 per cent a year and external by 6 per cent a year. To meet this demand, and improve the quality of the services, coverage will be widened, and new micro-wave links will be built between Blantyre, Zomba, Lilongwe and Mzuzu. The telephone exchanges in Blantyre, Lilongwe and Zomba will be substantially expanded and a new national and international telex exchange installed.

13.47 Rural coverage extension will involve a number of projects including a programme for the installation of more public call offices at postal agencies, market centres and rural health centres. It will include the extension of the telephone service to the districts and areas which presently lack these services. A programme of upgrading and extending the smaller rural telephone exchanges will continue throughout the period, progressively replacing the older analogue with digital equipment, rehabilitating and relocating recoverable older

equipment as it is replaced. Full digitalization of the network, which will considerably simplify the operation and maintenance of the network, is the goal and this will be substantially achieved by 1996. Every effort will be made to standardize equipment procurement. Broadly, the investment programme follows a long-term plan drawn up in 1982 to cover the period 1983-2003.

13.48 Telephone tariffs are currently based on eight individual charge zones. As exchange automation takes place, this will be increased to 22, each with a radius of 37 km. Tariffs levels have recently (April, 1987) been doubled and this is expected to increase revenues by 80 per cent. In future, real growth in revenue per subscriber is expected to be 3 per cent a year, and with a trebling of the number of connections and the introduction of a range of new services, total revenue is expected to increase by 13.5 per cent a year in real terms (see Table 13.9). Although tariff increases in the foreseeable future should not exceed the rate of inflation, there will be need for more regular revision of tariff levels than has been the practice in the past. It also assumes that investment targets are met. A shortfall in investment and hence automation and subscriber numbers will have a direct impact on revenue and profits. At all times, tariff increases will be effected only after all efforts aimed at minimizing costs have been made.

13.49 Manpower development will remain an important concern for the telecommunications service. Levels of training will take into account likely losses of skilled personnel to the private sector and to other departments of Government. Formal training for professional engineers will continue to be done abroad, and training at the technician level will continue at the Multi-Country Posts and Telecommunications Centre in Blantyre. There is a need, however, for an increased provision of training facilities to teach basic skills to junior technical

TABLE 13.8: TELEPHONE TRAFFIC, 1971-1996

	ACTUAL					FORECAST			Percentage Growth 1971-1987 (Ave. Annual Rate)
	1971	1976	1981	1985	1986	1987	1991	1996	
Total connections ..	5,417	9,152	14,421	18,718	20,251	21,766	33,613	51,907	9.08
Average traffic per connection	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	
Total original traffic connections	433.36	732.16	1,153.68	1,497.44	1,620.08	1,741.28	2,464.36	3,805.63	9.08
Local traffic	130.00	219.64	346.10	449.23	486.02	552.38	739.04	1,441.26	9.08
Trunk traffic	---	---	788.68	995.31	1,078.76	1,157.02	1,412.36	1,890.03	6.0
International traffic	303.36	512.52	18.90	52.90	55.30	62.40	137.89	372.62	22.0
TELEPHONE TARIFF (ERLANGS)									
Total original traffic	---	---	9.75	15.79	18.08	19.24	30.28	53.37	12
National traffic	---	---	---	5.80	8.11	11.37	19.18	42.22	40
International traffic	---	---	---	9.99	9.97	10.19	10.60	11.15	1

Source: Department of Posts and Telecommunications.

TABLE 13.9: FORECAST GROWTH IN TELECOMMUNICATIONS REVENUES, 1985/86-1996/97

	1985/86	1986/87	1987/88	1991/92	1996/97
Total connections	18,718	20,251	21,766	33,490	59,021
Annual Revenue connections (K)	1,305	1,481	2,745	3,089	3,582
Total annual Revenue (K million)	24.4	30.0	59.7	105.4	211.4

Revenue per connection rises by 80 per cent as a result of tariff increases and by an additional 3 per cent value added services and charging adjustments.

Source: Department of Posts and Telecommunications.

personnel. For this, a national training school will be established within the next five years.

13.50 The development of postal services will involve improvements in those existing services subject to delays, plus the introduction of a range of new services. This will be achieved by means of a combination of some re-organization, some investment in new buildings, technology, and systems, and programmes for staff development. House-to-house mail delivery will not be introduced within the next decade, but there will be improved internal and new external express mail services. A giro payment facility will be introduced for the payment of utility bills, and telex public call offices and facsimile terminals will be made available for rental in the larger towns. Modernization will affect the quality of a number of existing services. A new computer system with a network of terminals will speed POSB clearance of deposits and withdrawals and a new international sorting office at Kamuzu International Airport will speed the movement of airmail. A more decentralized management structure will be introduced with more regional Post Offices and regional Post Office Savings Banks, each with more resources and greater autonomy. Tariff increases will be required to adjust real unit revenue levels back towards those which pertained some years ago.

13.51 Management reforms of the Department of Posts and Telecommunications commenced fol-

lowing the recent review and this will continue. The individual divisions and sections will be more clearly and specifically accountable for their costs and revenues, and more comprehensive budgeting and control procedures applicable to all Treasury Funds (see Chapter 19) are being introduced. Improved cost accounting techniques will be introduced and a review undertaken of the costs and methods of charging for services provided to other Government Departments. This will have the objective of aligning payments with actual costs incurred. A decision has been made in principle to convert the Department into a parastatal body but this will only be effected when a number of these reforms have been completed and a detailed design for the new corporate entity has been made and is seen to be realistic. The machinery for considering capital projects and their finance, the Development budget cycle, is the subject of general reform (see Chapter 19). This will be particularly important for this Department.

CO-ORDINATION OF TRANSPORT AND COMMUNICATIONS DEVELOPMENT

13.52 Currently, the Department of Posts and Telecommunications takes responsibility for the planning and execution of postal and telecommunications projects, the Ministry of Works and Supplies for road projects, and the Ministry of Transport and Communications performs the functions in respect of all other transport activities. Since 1982, there has also been a Transport Planning Unit in the Department of Economic Planning and Development with a mandate to undertake a central data collection, project analysis, and policy co-ordination role. In future, postal and telecommunications planning matters will remain very much with the Department of Posts and Telecommunications. However, planning matters for all transport modes including roads will be centralized in the Ministry of Transport and Communications. This centralization will be executed together with improved liaison arrangements between this Ministry and other concerned agencies.

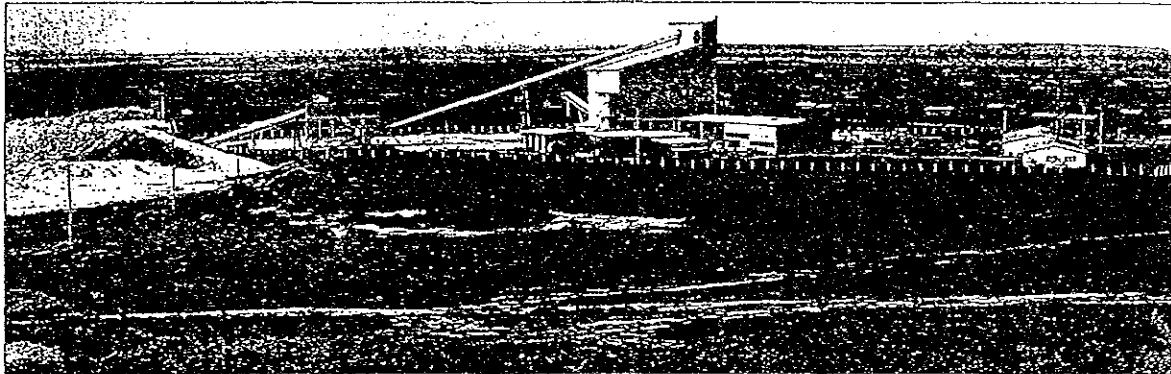
6. MINJINGU PHOSPHATE FOR DIRECT APPLICATION



MINJINGU PHOSPHATE FOR DIRECT APPLICATION

1.0 Historical background

Minjingu Phosphate deposit, located 106 km South-West of Arusha town along the Arusha/Dodoma road, was formed during the Pleistocene age. There are two main types of phosphate which differ in consistency and fabric, namely "hard ore" and "soft ore". The total geological reserves are 10 million tonnes with a P_2O_5 content of between 7 % and 32 %.



GENERAL VIEW

2.0 Mining and processing

The open-cast mine has a stripping ratio of about 1:1.6.

Processing of the phosphate ore applies a dry method, comprising comminution, sorting, drying and classification. The raw phosphate with an average P₂O₅ content of 22 % is enriched to 30 % P₂O₅ after treatment.



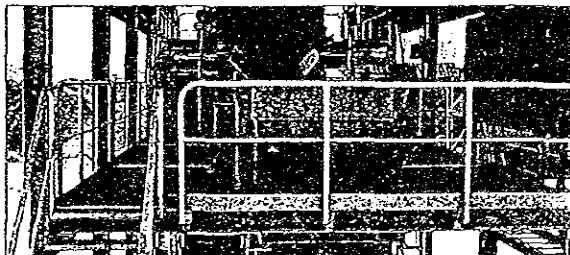
GENERAL VIEW OF OPEN PIT



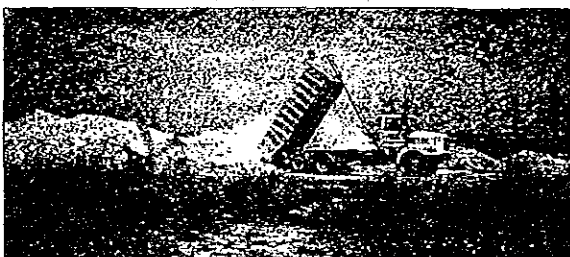
A VALMET FEEDING AT A FEED STATION



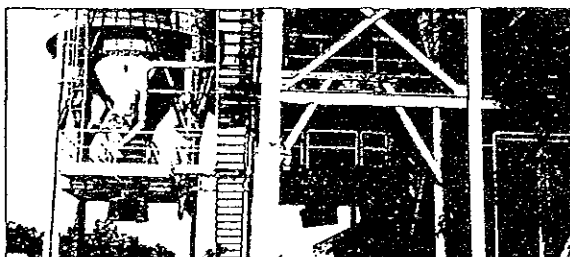
EXCAVATOR LOADING INTO TRUCK



VIEW OF THE PRE-SCREENING AREA



TRUCK UNLOADING AT THE BUFFER STATION



VIEW OF MACHINERY OF CONCENTRATION PLANT



OFFLOADING MPR AT THE FARM



SPREADING OF MPR ON THE FARM

The crops to which rock phosphate will confer its most benefit are:

1. Pastures and fodder crops which occupy the soil for a long period of time.
2. Green manure crops e.g. maize will benefit increased weight of green manure to be turned under and the high residual effect of the phosphate and lime.
3. Vines, fruits and other trees which have to feed in the same pocket of soil for many years.
4. Any soil that is low in phosphate and whose pH is less than 6.0.

As a general guide, on field crops such as pastures and green manure crops, Rock Phosphate should be applied at the rate of 300 to 600 kg. per hectare. Pastures may be simply top-dressed, which with green manure crops it is best to spread before ploughing.

3.0 Application of MPR on crops

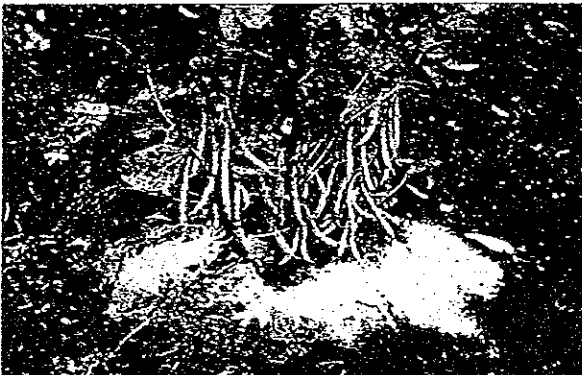
Miningu Phosphate concentrate is very fine with particles size of 60 % minus 100 microns, light and greyish powder. It is clear that the finer the particle size is, the greater the total surface exposed to the dissolving action of the soil solution. The gradual solubility of the product under sub-tropical soil conditions ensures a continuous supply of phosphate to the plants throughout the growing period, while leaving behind residues for the benefit of subsequent crops.

Rock Phosphate has a beneficial effect when added to farm manure and compost heaps. Farm manure and compost are an important source of plant food, especially Nitrogen and Potash. However, during the fermentation of storage period, bacterial action may liberate free ammonia which is lost to the atmosphere. As much as 56 % of ammonia is lost in 4 months in untreated manure heaps. The addition of Rock Phosphate to the compost heap causes a reaction between the acid forming products of the fermentation process and the slightly alkaline Rock Phosphate.

Miniingu Phosphate Company Limited (Subsidiary of State Mining Corp)



MIXING OF MPR WITH THE SOIL



RESULTS OF MPR ON BEANS

Ammonia gas is fixed and in addition further decomposition by bacteria is both increased and speeded up in the alkaline or neutral medium. Furthermore, the phospho-organic compounds which are formed are directly available to the plant. Thus the Rock Phosphate has been "pre-digested" through the action of the humic acids present in the farm manure.

The recommended rate of application for best results is 1 kg. of Rock Phosphate per 500 kg. of compost. The operation should consist of successive spreading of Rock Phosphate on the surface of the heap for each 40 cm. layer of organic matter added.

4.0 Direct application (D.A)

Both, ground Minjingu Phosphate Rock (MPR) and processed phosphate concentrate has high reactivity and NAC solubility. These two factors make MPR be the most natural source of phosphorus, balanced with calcium and micro-elements for the application into agricultural land.

Minjingu Phosphate Rock is an active fertilizer suitable for acidic soils. It contains 30 % P_2O_5 and 40 % CaO by weight.

The result of Direct Application of Minjingu Phosphate Rock on farms are very encouraging in terms of yield and pH-level corrections. The field experiments of MPR in areas with acidic soils indicate that:

- (i) Although MPR shows to be inferior to DSP or TSP during the 1st year of application, it has greater residual value. It gives better yields in the 2nd and 3rd years of harvesting than DSP or TSP.
- (ii) It has no harmful effects to the soils.



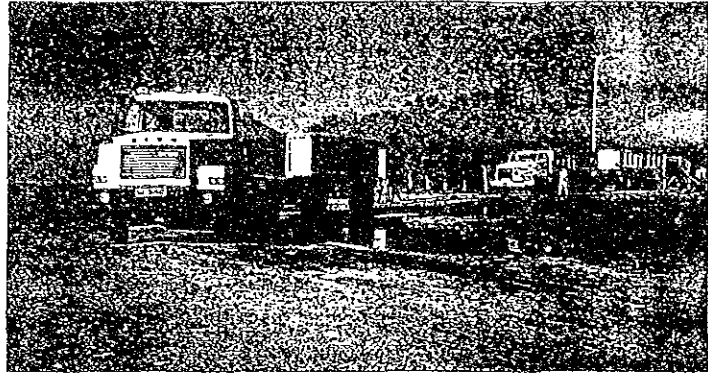
MPR DIRECT APPLICATION ON FARMS

on). P.O. Box 912. Arusha, Tanzania. Telex: 42047. Tel: Minjingu 01/Arusha

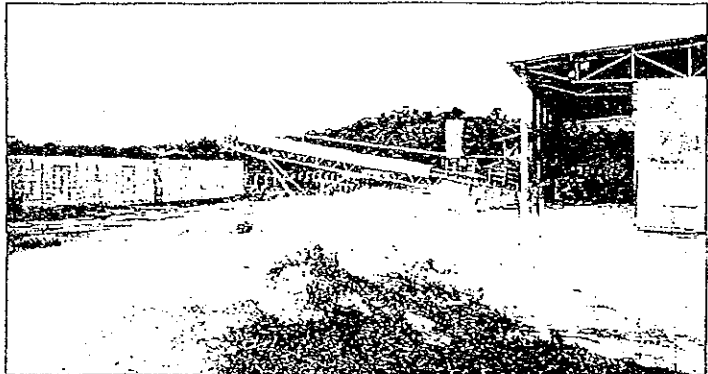
Chemical Analysis of Beneficiated Minjingu Phosphate Product

	CHEMICAL ANALYSIS
P ₂ O ₅	30.0
CaO	41.7
F	3.1
SiO ₂	9.4
Al ₂ O ₃	1.2
Fe ₂ O ₃	0.89
Na ₂ O	1.3
MgO	3.2
K ₂ O	0.78
CO ₂	3.1
SrO	1.4
BaO	0.2
TiO ₂	0.13
S	0.09
Cl ⁻	127 ppm
L.O.I	10.7 ^a
Free H ₂ O	4.1 ^a
C.S. P ₂ O ₅	5.6 ^{a, c}
TOTAL	95.49
-O = F ^a	1.31
	95.18

- a. Not included in total.
- b. Loss on ignition = weight loss, 1000°C, 1 h.
- c. Free H₂O = weight loss, 105°C, 1 h.
- d. Neutral ammonium citrate-soluble P₂O₅ (AOAC) method, second extraction.
- e. Fluorine correction: two F⁻ substitute for one O.



SISU TRUCKS LOADED WITH PHOSPHATE ON THE WAY

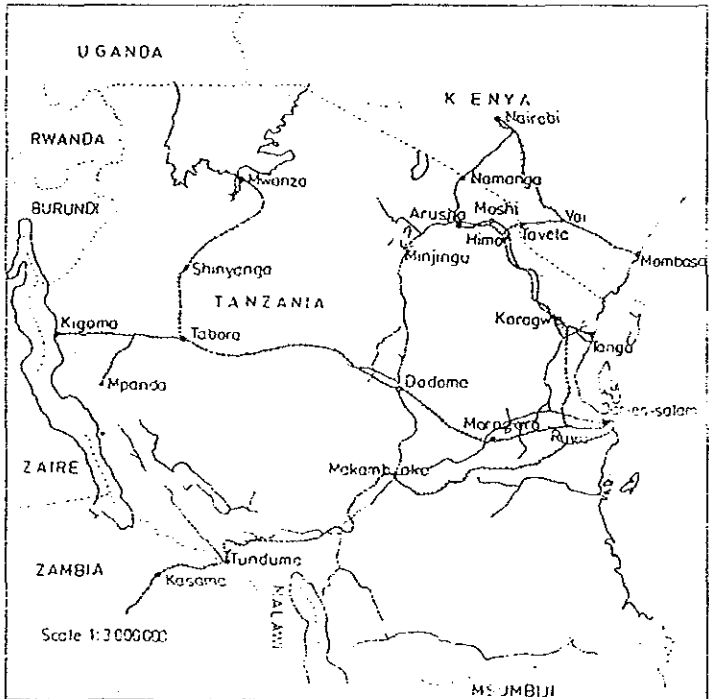


VIEW OF WAGONS LOADED WITH PHOSPHATE AT ARUSHA GODOWN

Sieve Analysis of Beneficiated Minjingu Phosphate Product

+1.00 mm	- 0.2 %
0.50 -1.00 mm	- 1.2 %
0.25 -0.50 mm	- 7.7 %
0.20 -0.25 mm	- 6.9 %
0.15 -0.20 mm	- 7.9 %
0.10 -0.15 mm	- 4.4 %
0.075-0.10 mm	- 23.4 %
0.060-0.075 mm	- 11.0 %
-0.060 mm	- 37.3 %

Marketable phosphate concentrate is stored in silos at the plant site, and thereafter transported to Arusha Godown with railway siding facilities. From the Arusha Godown the phosphate is railed to various customers.



MIPCO

MINJINGU PHOSPHATE COMPANY LIMITED
(Subsidiary of State Mining Corporation)

P.O. Box 912, Arusha, TANZANIA
Telex: 42047, Tel: Minjingu 01/ARUSHA