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Volume III: Annexes 12-19

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General Agriculture Division
Eastern Africa Regional Office

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CURRENCY EQUIVALENTS

US$1	=	Kwacha 0.64
Kwacha 1 (K1)	=	US$1.56
Ngwee (n) 100	=	Kwacha 1

WEIGHTS AND MEASURES

1 hectare (ha)	=	2.471 acres
1 square kilometer (km^2)	=	100 ha = 247 acres
	=	0.386 square miles
1 kilometer (km)	=	0.621 miles
1 kilogram (kg)	=	2.2 lbs
1 metric ton (t)	=	2,204.6 lbs
1 liter (1)	=	2.116 US pints
1 bag maize	=	90 kg
1 bag groundnuts	=	80 kg

ABBREVIATIONS

AFC	–	Agricultural Finance Corporation
CIMMYT	–	International Maize and Wheat Improvement Center (Centro Interracional de Mejoramiento de Maiz et Trigo)
CSB	–	Cold Storage Board
IDZ	–	Intensive Development Zone
LANDSAT	–	Satellite undertaking program of land resource photography (formerly ERTS)
MLNR	–	Ministry of Lands and Natural Resources
MRD	–	Ministry of Rural Development
NAMB	–	National Agricultural Marketing Board
SNDP	–	Second National Development Plan (1972-76)
RGA	–	Rural Growth Area
RGC	–	Rural Growth Center
RRP	–	Rural Reconstruction Program
TAZARA	–	Tanzania-Zambia Railway
UNIP	–	United National Independence Party
ZNS	–	Zambia National Service

ZAMBIA

AGRICULTURAL AND RURAL SECTOR SURVEY

VOLUME III

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AGRICULTURAL AND RURAL SECTOR SURVEY

TRANSPORT IN AGRICULTURAL DEVELOPMENT

ABBREVIATIONS

BCEOM	Bureau Central d'Etudes pour les Equipements d'Outre-Mer
CARS	Central African Road Services
CH	Contract Haulage
CFB	Chemins de Fer Benguela
CPO	Contingency Planning Office
EAHC	East Africa Harbours Corp.
EPTCA	Eastern Province Transport Cooperative Association
MC	Ministry of Commerce
MSD	Mechanical Services Department of MPTW
MLGH	Ministry of Local Government and Housing
MPF	Ministry of Planning and Finance
MPTW	Ministry of Power, Transport and Works
MRD	Ministry of Rural Development
NAMB	National Agricultural Marketing Board
NTC	National Transport Corporation
PWD	Public Works Department (of RC)
RC	Rural Council
RD	Roads Department (of MPTW)
RRTA	Roads and Road Traffic Act
RTC	Road Traffic Commissioner
SNCZ	Societe Nationale de Chemins de Fer Zairois
TAZARA	Tanzania-Zambia Railway Authority
T Sh	Tanzania Shilling
UBZ	United Bus Company of Zambia
vpd	Vehicles Per Day
ZR	Zambia Railways
ZTRS	Zambia-Tanzania Road Services

ZAMBIA

AGRICULTURE AND RURAL SECTOR SURVEY
TRANSPORT IN AGRICULTURAL DEVELOPMENT

INTRODUCTION

1.   Zambia, a large landlocked country with a scattered population, depends crucially upon its transport networks, not only because of the country's geographic and demographic characteristics, but also because imports and exports amount to about half the value of its GNP. The high cost of bridging distances of more than 2,000 km to the sea is made even higher by the fact that the volume of imports far exceeds exports. This imbalance results in many vehicles going empty during the first half of round trips to the coast. These empty-trip costs are not reflected in the consumer price of imports because the Government grants subsidies to cover them. Even so, about 50% of the CIF Zambia price reflects transport-related costs from port of origin. If subsidies were included, in extreme cases transport-related costs would account for as much as 80% of actual CIF prices.

2.   Agricultural products account for more than 10% of the value of imports, but if volume is considered, agricultural products' share of imports is still larger because of their price and weight-volume ratio, as compared to other imports. Zambia's trade imbalance, in the light of the country's ample potential to expand agricultural production, more than justifies an agricultural policy to produce and substitute local goods for imports and eventually to produce an exportable surplus, which would benefit from practically zero additional inland transport costs to the ports. While transport problems are not the main constraint on expanding agricultural production, certain policies and practices which unnecessarily hinder the development of adequate internal transport and, thus the growth of agricultural output, can be improved.

3.   This Annex examines those aspects of the Zambian transport sector which are related to agricultural development. The main features of the existing transport infrastructure, of Zambian transport policy, and of agriculture-related transport are summarized in Part I, and some conclusions and recommendations are given in Part II. Parts III and IV explore in greater detail the most important aspects of transportation, that is, roads and road transport within Zambia and international transport routes. All numbered Tables are in Appendix I.

PART I -- SUMMARY

Transport Infrastructure

Internal

4.   Zambia's transport infrastructure is relatively well developed by African standards. The network includes more than 34,000 km of road of vari-

ous standards; two 1.067 m gauge railways, Zambia Railways, with about 1,050
km of track, and Tanzania-Zambia Railways (TAZARA), which is still under
construction and totals in both countries about 1,860 km; approximately 120
airfields of various categories; and a few inland navigation facilities (Map
IBRD 11509).

5.   Road transport is the most important mode for the rural sector. The
network has been developed to serve population concentrations and import/ex-
port traffic needs. About 4,000 km of roads are paved and 7,400 are gravel,
all-weather roads. The rest are earth roads or tracks (Table 1.1). National
road density averages about 50 m/km^2 and 7 m/person (Table 2), high by African
standards. Vehicles in Zambia numbered more than 130,000 in 1973, or 3 per
100 inhabitants on average. About 80% were light vehicles, and 15% trucks and
trailers (Table 3.1). Additional details are given in Part III.

6.   Zambia Railways has a main line of about 800 km which crosses the
central and southern part of the country in a north-south direction. Along
this line are grouped most of the country's major economic activities, and
there is a complex network of about 250 km of subsidiary lines which serve
mines, refineries and other plants, mainly in the Copperbelt area. TAZARA,
expected to be completed this year, will connect with the Zambian Railway at
Kapiri-Mposhi and after approximately 900 km reach the Tanzanian border at
Mwenzo. It is to carry as much of the country's external traffic as the
capacity of the Dar es Salaam port allows or as cannot be routed through
Lobito. It could also be used for local freight, and should foster rural
development along the line-of-rail.

7.   As far as other transport modes are concerned, aviation is not pres-
ently relevant to rural and agricultural development. Internal water trans-
port is also of negligible importance for overall agricultural growth because
rivers are navigable only with difficulty and on short sections, and lakes are
only suited for minor local transportation.

International Links to Seaports

8.   Because Zambia is both landlocked and heavily dependent on foreign
trade, it is also very dependent on neighboring countries for transport facil-
ities. The surface connections which exist between Zambia's infrastructure
and seaports are: the Zaire and Angola railway system to Lobito (2,683 km
from Lusaka); Rhodesian and Mozambique railways to Loureco Marques and Beira
(about 2,040 km); road and Malawi and Mozambique railways to Beira and Nacala
(about 1,655 and 1,750 km respectively); paved road to Dar es Salaam (2,090
km); the TAZARA to be opened this year to the same port (2,040 km); and road
to the port of Mombasa (about 2,350 km) 1/ (See Map IBRD 11510 and Part IV
for further details.)

1/   The lengths for the various railways and route sections between ports
     and Lusaka differ in various sources.

9.   The route through Rhodesia has not been used since January 9, 1973, as Zambia continues the border closure initiated by Rhodesia. However, many other routes are available which have been or are being improved and which increasingly obviate the effects of the border closure.

Transport Policy

Basic Policy and Related Institutions

10.   The Zambian Government's basic transport policy objectives are apparently (a) to provide services which every citizen throughout the country can afford, and also (b) to ensure uninterrupted import-export traffic flow.

11.   Various ministries and agencies of the Government share responsibility for meeting these objectives. The Ministry of Power, Transport and Works (MPTW) is responsible for carrying out the first objective and part of the second. This is done through planning, developing, and maintaining infrastructure; regulating transport operations; and controlling parastatal transport organizations. Recently, in line with the decentralization policy, local authorities such as the Rural Councils (RC) may establish and implement investment proposals of local importance. Other ministries, such as the Ministry of Planning and Finance (MPF), are supposed to assist in coordinating plans of the various agencies. Specifically charged with carrying out the second objective, a Contingency Planning Office (CPO) was established under the Prime Minister's office after the Rhodesian border closure to ensure adequate import-export flows through careful routing plans. To help carry external trade, the CPO has acquired its own 400-vehicle trucking fleet.

Infrastructure Development

12.   The Second National Development Plan (SNDP) (1972-76) allocated to the transport sector K 335.3 million, or 28% of the total public investment, in order to consolidate the transport network and ensure the country's integrated economic development. At an estimated cost of K 134 million, the main priority was the construction of the Tanzania-Zambia Railway (TAZARA) to ensure the free flow of foreign trade and to reduce its transport costs. Total railway investment accounted for 53% of the transport sector allocation. Construction of roads followed in priority, comprising 33% of the program. Lesser importance was given to the development of other modes.

13.   Although later adjustments in the SNDP did not alter priorities, implementation has been uneven. From 1972 to 1974, 57% of the railway program was implemented, while only 24% of the roads program was undertaken. Details are shown in the following table:

ZAMBIA

Transport Plans, 1972-76
(millions K)

| Mode | SNDP | | | Actual Plans | | | Spent 1972-74 | |
	Cost Estim.	%	Foreign Loans	SNDP at Revised Costs	Add'l Projects	Total (1)	Total	% of (1)
Railway transport	178.5	53	158.9	205.1	2.9	208.0	118.9	57
Road transport[1] 93.1[2]		28	30.5	123.7	41.3	165.0	40.2	24
Tazama Pipeline	25.0	7	16.7	23.0	30.0	53.0	25.0	47
Air transport	20.9	6	4.4	29.2	5.5	34.7	10.5	30
Water transport	3.1	1	2.2	1.7	-	1.7	0.6	35
Provincial roads[3]	14.7	5	-	14.7	-	14.7	n.a.	n.a.
Total	335.3	100	212.7	397.4	79.7	447.1	195.2	42

/1 More details are included in Table 4.
/2 Including Samfya-Serenje road, not included in the SNDP.
/3 Additional details are shown in Table 5.

Note: Revised costs are possibly underestimated.

Source: SNDP and Mid-term review, MPF, 1974.

14.   Until recently road development was focused only upon building all-weather standard main links. Gradually, however, more emphasis is being given to rural low-class road building, even though paved connections among provincial capitals and from those capitals to district centers is still a goal. The SNDP indicates that "consideration will be given to studies aimed at examining financial resources for construction and maintenance of roads as well as the need for all-weather roads in Zambia;....and self-help road building..." 1/ Officials are now aware that roads should be upgraded only

1/ See page 13 of Zambia's Second National Development Plan.

when the corresponding investment is economically justified, and they will therefore conduct more detailed feasibility studies instead of making decisions only on the basis of traffic levels. They are also aware that self-help works can be meaningfully undertaken only after undertaking such studies and after developing a strategy for rural development as a whole.

15.   In line with Zambia's decentralization policy, roads of local importance are planned by local agencies and generally built by the RC with funds allocated to them by the Ministry of Local Government and Housing (MLGH); however, no appropriate local road inventory exists so that funds can be properly assigned. 1/

16.   Both the MPTW and the MPF state that road maintenance has high priority, as specified in the SNDP, but allocated funds have been far from adequate and are continuously decreasing. Now they are at about half the required level, even when the need is conservatively estimated. All the agencies are struggling with shortages of qualified staff, and training is not being undertaken to the extent necessary to overcome these shortages. Given the ongoing Zambianization policy, these shortages may even worsen at headquarters. (See Part III for additional details about roads and related institutions.)

Transport Services

Internal

17.   Some commodities, such as foodstuffs, copper and mine inputs, have been classified as essential and are thus favored with low transport fares. Other items are considered non-essential commodities because they have relatively little effect on the consumption needs of lower-income groups or on the earning of foreign exchange by the country's main export. These are transported at higher rates. Passenger services are supposed to be provided even on low-density routes at rates accessible to all citizens.

18.   The parastatal Zambia Railways, one third of whose costs are subsidized, is being used as much as possible to convey essential commodities, which are given priority. and pay tariffs below financial costs. When the TAZARA becomes operational in 1975, it will perform a similar role. The tariff level is still being studied.

19.   Since the railways have limited coverage, road transport is widely used, both to feed the rail lines and for long distance transport. The parastatal road transport organization, the National Transport Corporation

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1/ Agricultural Offices undertake road construction also. (See Part III—Roads.)

(NTC) was established by the Government because it considers it more appropriate to rely on parastatal organizations to perform unprofitable services (instead of doing without them or directly subsidizing a large number of private operators) and to handle emergency situations, which are more easily dealt with by a central entity. NTC is composed of four subsidiaries: Zambia Tanzania Road Services (ZTRS), Contract Haulage (CH), United Bus Company of Zambia (UBZ), and Bulk Carriers of Zambia. ZTRS is operating efficiently on the route to Dar es Salaam, but it is to stop operating six months after TAZARA starts functioning. CH moves internal freight. Since the border closure, it also carries international traffic both on the Great East Road and sometimes subcontracts services to ZTRS on the Tan-Zam Road. (Further details about NTC are given in Part III--Road Transport.) However, the NTC subsidiaries operate largely by subcontracting private transporters at officially established, profitable tariffs because the Government apparently prefers that private carriers undertake public road services. A large number of these private operators exist and are competitive.

20.   The National Agricultural Marketing Board (NAMB) has taken charge of moving agricultural products, as explained in Part I--Agricultural-Related Transport.

21.   Commercial vehicles can be imported subject to only a 10% duty, and some kinds of vehicles can be imported duty-free. This may change, though, once the heavy-vehicle assembling plant under construction at Kasama starts production. The Roads and Road Traffic Act and its subsequent ordinances establish the conditions under which road transport can be undertaken. It includes well-defined safety regulations and licensing requirements which are not, however, firmly enforced. Lack of axle load control enforcement is damaging the roads. Fees and fines are detailed in Table 6. All public road service license applications have to be processed in Lusaka. The Road Traffic Commissioner (RTC), assisted by a Road Transport Panel, decides to deny or grant licenses and establishes their conditions. The goods road service licenses specify the route/area on which the vehicle can operate, the type of goods it is allowed to carry, and may establish the fares to be charged for the service; the validity period varies from one to five years, although some short-term licenses (for three months) are granted, for instance, for moving agricultural products. Passenger service licenses establish route and timetable, and all bus operators are required to charge a uniform tariff per km, established by the RTC independently of the type of road on which the service is to be provided.

22.   Internal road transport is discussed in greater depth in Part III--Road Transport.

International

23.   International transport policy is centered on efficient routing of trade in order to balance flows on each route--taking into consideration the capacity of each port--and on subsidizing at least part of the increased costs which have resulted from the border closure. The overall objective is to keep

prices in the country from rising. The CPO implements this policy by limiting some non-essential imports; by specifying on each import license which route is to be used (generally bulk cargo is directed through Lobito, fertilizer through Ncala, and general cargo through the other ports); and by carrying part of the goods in its own fleet or through parastatal organizations (ZTRS, CH and railways). The Government is also considering linking the Zambia railway system to the Malawi system to ease traffic flow to eastern ports. It can, however, do little to improve foreign port conditions, which are generally the main bottleneck.

24.   Because of the border closure, Zambia has received considerable support from other nations, including neighboring countries: technical assistance, support in kind, and K 10 million grants and K 20 million in soft loans. 18 Diesel locomotives and about 400 wagons were bought with the loans, to enable ZR to fulfill its new role over the Lobito route, and about 400 trucks were acquired by the CPO, to be operated by CH to solve the transport capacity shortage. This emergency expenditure, together with normal capital investment in rolling stock, amounted to more than K 17 million in 1974.

25.   In 1974, about 1,016,000 tons were imported and 937,000 exported, a more balanced tonnage flow than in previous years. However, most of the exports were copper, with high specific weight, and most of the imports are general cargo or agricultural products, with only about two-thirds the specific weight of copper. Thus, in terms of volume, imports are as much as 150% of exports, 1/ and export transport capacity, even by air, remains underutilized. Traffic flows by surface and air routes since 1970 are shown in Table 7. Note that the congested Lobito port in 1974 was used for about 50% of Zambia's external traffic, compared to a little more than 10% in 1970. Dar es Salaam, also congested, handled about 30%, Mombasa about 10%, and Beira and Nacala the remaining 10%, except for the small proportion shipped by air. The original rerouting plans allocated less traffic than what actually has been carried on the route to Lobito and overestimated the use of aircraft.

Agriculture-Related Transport

Internal

26.   The long distances between agricultural production and consumption centers, the latter mainly along the line-of-rail, create a high transport demand, which is heavily seasonal because of the pattern of agricultural activities. As it is Zambian policy to ensure that all farmers, wherever located, can sell their crops at uniform proces and obtain inputs, farmers have no

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1/   For instance, 20 tons of general cargo or 29 tons of copper constitute a
     full load for similar trucks.

incentives to transport their own produce or to buy inputs beyond the nearest NAMB depot. Thus, NAMB itself has to secure transport from there onward for crops and to the depots for inputs. 1/

27.   In remote areas, NAMB is also requested both by small farmers and cooperatives to move products between farm and depot, and it accepts when a full load is ensured. Although about 90% of the commercial farmers carry produce from farm to nearest depot in vehicles they own--either in trucks or tractor-trailers--few small farmers do so (in some places, oxen-drawn rubber-wheeled carts are available). In addition, most of the few agricultural cooperatives that have been formed lack their own transportation. There are few transport cooperatives and almost no local trucking contractors out of the line-of-rail, and most of the latter are unwilling to undertake haulage on the lower-class roads in remote areas because their units are generally too large for these roads.

28.   The official policy is that NAMB should use the railway whenever possible because its rates are considerably lower than those for private road-haulage (about 1/10 for essential products) and the economic cost to the country is probably also lower. However, since the track serves only a limited area and services are not always available when needed, 2/ transport by road is more important, in terms of both volume and value, than by rail. (The TAZARA will probably attract freight now carried by road, but the extent is still uncertain.)

29.   Each year NAMB estimates its road transport requirement for the next season and then tries to ensure its availability. Transporters are invited to present proposals, including rates, to a tender in Lusaka. Bids are reviewed by a Tender Committee chaired by the Minister of Commerce. The Director of Marketing from the MRD and a representative from the MPTW are among its members; the General Manager of NAMB also attends but is not a member. Contracts are awarded mainly on the basis of past performance, for one season, for a specific route, and for a certain allocation of tons, at a fixed rate per ton-km. When contracts are issued, transporters and NAMB provincial managers are notified. The latter control the fulfillment of the contracts and may revoke them in case of contravention; about five persons from headquarters carry out spot checks.

1/ As explained elsewhere, NAMB is the agency responsible for implementing agricultural policy related to essential products and, for that purpose, operates Government uniform pricing system--in simlified terms: the same price for a specific product at any place--and an operational system with numerous depots.

2/ For example, when input stock replacement is required immediately, and delays of 14 days are probable by ZR, motor vehicles can be used even along the rail route.

30.   At NAMB's depots, only its staff can load or unload the trucks. A
waybill is issued upon loading and signed at the unloading place as a receipt.
Thereafter, it is submitted to Lusaka headquarters. (Transporters generally
present them personally but can mail or deliver them to the NAMB District Man-
ager.) The Transport Officer checks and confirms the bills which are then
paid by the Freight Officer within two weeks, on two paydays per month. Pay-
ment can be mailed upon request. The Freight Section notifies 1/ the Tax
Department for income tax control.

31.   For the 1973-74 season, contracts were awarded to private trans-
porters 2/ at the rates prevailing for the previous seven years. However, in
September 1974, NAMB increased the tariffs by 50%, apparently to attract more
transporters. The rate level theoretically compensates for an empty return
trip, so when the return trip is also a loaded one, only half the rate is paid
for it. NAMB rates are:

Distance (km)	ngwee/ton - km, 1974 /1	
	Maize, Fertilizer /2	Cotton
Up to 80	7.50	9
From 81 to 160	6.75	9
Over 160	6.00	9

/1 It is interesting to note that the ZTRS rate per ton-km is 2.35 and that
CH's rates range from 1.2 to 4.6 (Tables 9 and 10); subcontractors receive
90% of these rates, a level which is still profitable. However, these
organizations may have lower operating costs than NAMB's contractors
because they use better standard roads which are generally paved, and
they also use trucks more efficiently, as measured in loading averages
and waiting times.

/2 And other products, such as sunflower, beans, groundnuts, insecticides,
pesticides.

32.   During 1973, NAMB transported about 100 million ton-km, at a cost
to the institution of about K 4.6 million. 3/ Handling and storage costs were
about 15% of the transport cost. Details are shown in the following table:

1/ We don't know if only upon request, or as a general rule.

2/ In June 1974, NAMB had a total transport capacity of 12,150 tons provided
by 545 trucks, owned by 135 contractors. It is interesting to note that
to service the whole country, 69% of the contractors reside in Lusaka,
and the remaining in only 20 more localities (Table 8).

3/ This is not necessarily undesirable; it depends on the individual and
combined transport and agricultural policy objectives.

NAMB Transport: Handling and Storage Costs, 1973
('000 K)

| Province | Transport Cost | | | | | Storage & Handling (Head Offices) | Total |
	Maize	Sundry Crops & Produce	Fertilizer	Cotton	Sub-Total		
Central	830	27	2,661	33	3,551	527	4,078
Copperbelt	394	1	185	–	580	54	634
Eastern	6	–	79	–	85	9	94
Luapula	67	1	69	–	137	21	158
North Western	24	–	6	–	30	8	38
Southern	87	1	74	1	163	31	194
Western	28	–	18	–	46	9	55
Total	**1,436**	**30**	**3,092**	**34**	**4,592**	**659**	**5,251**

Source: NAMB, 1974.

33.   In 1974, with unit transport rates 50% higher, total transport costs must have increased considerably. For instance, for only 15 days during the peak season in mid-November, K 514,173 were paid to 94 transporters. Given the uniform crop and fertilizer pricing system, these steep transport costs have to be absorbed by NAMB. Products with the heaviest weight-volume ratio or the lowest price receive comparatively the largest cost reduction in transport, a reduction which is not proportionately reflected in crop prices. Consequently, farmers partly lose the incentive to use their land for the crops to which it is most suited and this may result in distorted production patterns. For example, the transport cost from various places and the percentage of this cost in various crop and fertilizer prices are shown below:

Province	Locality	Approx. kms to rail line	Transport Cost K/ton[1]	Transport cost, as % of Crop Price[2]				
				Maize	Wheat	Ground-nuts	Cotton Seed	Fertilizer price[3]
E	Lundazi	745	44.70	81	34	21	15	56
E	Chipata	570	34.20	62	26	16	11	43
E	Katete	490	29.40	53	22	14	10	37
E	Petauke	410	24.60	45	18	12	8	31
L	Kawambwa	415	24.90	45	19	12	8	31
	Samfya	260	15.60	28	12	7	5	20
N	Mbala	810	48.60	88	37	23	16	61
	Kasama	645	38.70	70	29	18	13	48
NW	Zambezi	690	41.40	75	31	19	14	52
	Kasempa	360	21.60	39	16	10	7	27
	Solwezi	175	10.50	19	8	5	3	13
W	Senanga	695	41.70	76	31	20	14	52
	Mongu	585	35.10	64	26	16	12	44

/1 At 6 n/ton-km.

/2 Not all crops are produced in all places; therefore, some relations may be irrelevant. The prices NAMB pays producers are in K/ton: maize, 55; wheat, 133; groundnuts, 213; cotton seed, 300 (1974).

/3 Average fertilizer price to farmers in K 80/ton.

Source: Author's elaboration of data from various sources, 1975.

Fertilizer is provided to farmers far below cost: about 30% of the import-transport cost to the line-of-rail is subsidized (para. 32), and then there is an additional internal distribution cost subsidy. As shown in the previous table, internal transport subsidies amount to as much as 60% of the NAMB fertilizer price. However, because of the distribution system, this percentage is somewhat misleading. If imports were not all taken to the line-of-rail first and subsequently distributed to the various provinces, but were instead sent there directly, then travel distances would be shorter, with correspond-ingly lower costs. For instance, if fertilizer is imported from Dar es Salaam, then the trip to Lusaka and back to Mbala on the Tan Zam corridor is completely unnecessary. As opposed to transport rates, NAMB retail prices are different in various locations, and the price differentials seem to reflect differentials in transport costs from origin.

International

34.   Agricultural food products account for more than 10% of the value of imports and many of the empty trips to the ports are attributable to these imports. Apart from the railway, which is used for priority transport, CH un-dertakes most of the international agricultural haulage with the CPO fleet,

and the resulting empty trips cost the Government, which subsidizes them,
K 750 each. The importance of transport cost in the total product cost can
be clearly seen by looking at some examples: 1/

	Wheat	Sunflower-oil	Fertilizer
Imported from:	Australia	Europe	Europe
Through the port of:/1	Lobito	Beira	Dar es Salaam
Total transport time to Zambia, days:	38 - 44	45 - 50	55
		K/ton	
FOB cost	52.90	386.00	62.90
Transport cost			
– excluding empty truck trip cost:	57.00	101.00	56.41
– including " " " "	87.51	151.00	91.82
CIF cost			
– subsidized (current):	109.90	467.00	119.31
– if non-subsidized:	140.41	537.00	154.72
		%	
Subsidized transport cost, as % of CIF current cost:	52	21	47
Total transport cost, as % of CIF current cost:	80	31	77
Transport subsidy, as % of CIF current cost:	28	10	30

/1 Apparently, orienting imports through the port which entails the shortest
   sea route does not reduce the sea-freight tariff. In the three cases,
   ports other than the nearest have been used.

1/ As given by CPO, 1974, and author's elaboration. Current 1973 values.

PART II--CONCLUSIONS AND RECOMMENDATIONS

Transport Policy

General

35.   Even though recommendations about general transport policy may seem
out of place in this survey, transport policy constitutes a framework for,
and strongly affects agriculture and rural development. For this reason,
findings related to policy are first presented, followed by transport recom-
mendations which are more specifically agricultural-related.

36.   Zambia's transport strategy seems consistent with its overall objec-
tives policy, but, as in the case of agriculture, some aspects of the strategy
should be reviewed and adapted to present and foreseeable conditions and its
implementation improved. It must be kept in mind that external factors are
given. Zambia has to adapt to some of them, as in the case of seaport avail-
ability (and probably one of the best ways of easing trade flows is by conti-
nuing its present routing procedure). On the other hand, in dealing with
factors such as the border closure, Zambia has an active, decision-making role.
The country will sooner or later reach an agreement with Rhodesia about reopen-
ing the border, and another rail outlet to the sea will become available. In
the meantime, Zambia should avoid building up excess long-term transport
capacity.

Infrastructure Development

37.   Roads. Past and planned network development seems to be in line
with the country's needs. Previously, interest was mainly concentrated on
developing primary links, but more recently, emphasis is also being given to
feeder roads. It is increasingly recognized that additional local rural-road
building can be meaningfully undertaken only after an overall agricultural
development policy is established (para. 17). When a specific agricultural
strategy is agreed upon, planning awareness at headquarters, combined with a
more vigorous implementation of the decentralization policy, under which local
authorities will participate more in the decision-making and implementation
processes in their own regions, should facilitate road work, the need for
which is identified in agricultural strategy. However, the following aspects
of infrastructure development should be reviewed:

    (a) Phasing of outstanding SNDP projects (para. 13): About 70% of the
        Plan remains to be completed. Completing the projects within the
        plan period would involve tripling the present road construction
        budget. Even if funds were available, it seems more appropriate to
        continue the present pace of road construction over a longer period
        of time. This would avoid wide fluctuations in demand for contrac-
        tor services, as has been the case in the past (Part III--Roads).
        These fluctuations make it difficult for the contractor to determine

how much he should invest in equipment. Smaller contractors cannot compete under such conditions, and the market has become increasingly oligopolistic.

(b) Capability of local agencies (paras. 15 and 16): Having been given greater responsibilities, local agencies require additional planning skills and coordination. A local road inventory should be undertaken so that funds for road maintenance can be properly assigned. Both the RC and the Agricultural Offices undertake local road works separately, but if these works were instead assigned to only one agency, implementation costs could probably be reduced by pooling resources, and specialized staff and equipment could be used more appropriately and spare parts stock reduced. Agricultural Offices should turn their road works over to the RC.

(c) Recurrent funds and staff (para. 16): Solving shortages of recurrent funds for road maintenance and of qualified staff has been recognized in Zambia as a first priority, but little has been done about it. Funds are not allocated to RC on the basis of estimated road maintenance requirements and are generally less than requested. Given a lack of information about maintenance requirements, even these requests do not necessarily reflect actual needs. Because of obviously insufficient road maintenance allocations, RC is eager to transfer roads to RD for maintenance. However, RD recurrent expenditure for the roads under its jurisdiction--which in 1973 actually decreased K 3.5 million from the 1971 expenditure level-- is so inadequate that road maintenance is endangered. Additional funds for RD maintenance activities are urgently required to prevent further negative consequences of inadequate services. To alleviate the shortage of qualified Zambians in the RD, the major problems that have to be dealt with are lack of technical training and overwhelming competition from the private sector for the services of those Zambians who are technically qualified. More technical training programs and a review of civil service salary level and structure are needed.

38. Railways. Some proposals have been made for building a new section which will link with the Malawi system (para. 23) at the Zambia border at Mchinji. Such a link from Mchiniji to Chipata may be economically justified, but a track further northward than this to link with TAZARA is probably not, since it would have to climb very steep gradients from the Luangwa Valley to the plateau, with high construction and operation costs. A feasibility study seems required.

Transport Services

39. Carrying capacity is apparently enough for the country's needs. However, certain policies, regulations, and procedures of some parastatals impede the rendering of adequate services. NAMB transport improvement proposals are made in Part II--Agricultural-Related Transport. More general recommendations are:

(a) <u>Parastatal tariff policy</u> (paras. 17 and 18): This is the aspect
of transport services which requires most careful attention. Both
road and railway tariff levels for various commodity classes should
be analyzed. The interrelationships among them, the relation to
operating costs and subsidies--if applicable--and immediate and
ultimate effect on the overall economy should also be analyzed.
This suggests the need for a traffic study, with an evaluation
of all parastatal transport organization operations.

(b) <u>ZTRS dissolution</u> (para. 19): The rationale for ceasing ZTRS opera-
tions should be identified in the study mentioned above. However,
a decision will certainly be required beforehand, in view of the
imminent opening of the Tan-Zam railway. In any case, ZTRS' vehicle
fleet will remain available to Zambia, a fact that should be remem-
bered when estimating additional trucking capacity requirements.

(c) <u>Road traffic regulations</u> (para. 21): All regulations and enforce-
ment should be reviewed. Implementation of some of the following
suggestions should improve road transport services by private
operators:

> <u>Decentralization</u>: licensing in other places besides
> Lusaka should ease the procedure.
>
> <u>Road Traffic Commissioner's authority</u>: he is allowed to
> make decisions "as he may think fit," and in license granting
> it is not clear how much influence the Road Transport Panel
> has. It should be determined whether this leads to arbitrari-
> ness, and, if so, the situation should be corrected.
>
> <u>Goods road-service licensing conditions</u>: the restrictiveness
> of these conditions hampers transport activiites.
> Gradually, freer operations should be permitted. <u>1/</u>

<u>1/</u> For instance, we would suggest deleting the following from licenses:

a) License specification of route(s)/area and type of goods: a strict
specification does not allow for the operational flexibility that
would ease, for instance, seasonal peaks. Neither does it help to
ensure services on non-profitable routes because there is no incentive
to apply for a license to operate on them. A broad specification would
have the same effect as no specification.

b) Rate specification: the broad influence of the ZTRS, CH and NAMB, which
establish their own fares, seems to outweigh the rates established by
the RTC for independent operators. However, if other rates were to be
the charged, they should be established by free competition. At most,
if the RTC thinks that the truckers would overcharge if a limit is not
imposed on them, a methodology for determining rates could be set up
and the RTC could sample control the rates charged for some services
to see that they do not exceed their estimates.

c) Short-term license: since subcontractors to parastatal organizations
are almost automatically given a license once they have secured a con-
tract, the issuance of these licenses represents nothing more than an
administrative burden on the RTC. The regular license and fitness
certificate, required anyway, should suffice.

Bus tariffs: the only established tariff per km does not take into consideration the type of road on which the service is provided. Allowing tariffs to reflect costs would motivate operators to provide services on low-standard roads. 1/

Axle-load control: most operators, including the parastatals, load more than 10 tons per axle in order to maximize benefits per trip. The Roads Department is in charge of operating existing weighbridges, but its staff does not have enforcing capacity and only operates the weighbridges a few hours daily. As a first measure to improve axle-load control, management of the ZTRS, CH and NAMB should ensure operators' compliance with the weight limits at loading points. In addition, the existing weighbridges should be operated by RTC officers 24-hours a day or on an ad hoc basis, and contravening operators should be penalized according to the law.

Fees and fines: in order to determine the economic adequacy of these fees and fines, they should be reviewed, taking into account other taxes that vehicle operators pay, including fuel tax, import duties, and income tax.

40.   Although to a certain extent Zambia has to accept international transport services as given, the country's approach to providing them seems satisfactory (paras. 23-25). Considering that more than 50% of Zambian traffic went through Rhodesia before 1973, the rerouting effort has been rather successful. In 1973, import tonnage decreased about 40%, partly due to deliberate restrictions on import licenses, while export tonnage continued as previously. Even so, transport costs increased considerably, from about K 67 million to K 87 million, 2/ and the increase has been financed almost entirely by the Government. However, the effects and desirability of the transport subsidy that the Government grants to imports should be reviewed. Its impact on agriculture is discussed in para. 42.

1/ Presumably, in charging the same rate per km the intention is that all passengers be treated equally. But private operators avoid providing services on low-standard roads (unless they operate simultaneously on good and poor routes, cross-subsidizing the latter), with the result that people in remote areas may lack transport services unless UBZ provides them at a loss. People might prefer paying a higher fare which would be attractive to private operators, instead of doing without services. These aspects should be reviewed.

2/ This resulted from higher inland transport costs, higher port charges, greater airways utilization, and a change in import origin. Many imports previously bought from the Republic of South Africa are now purchased in Europe, which was the origin of about 55% of Zambian imports in 1972, but of 80% since 1973.

Agriculture-Related Transport

Internal

41.   NAMB virtually determines the framework for internal transport,
Some deficiencies in its operations, result in a trucking capacity shortage.
Although some officials even suggest that NAMB should have its own fleet, the
following recommendations concentrate on improving NAMB effectiveness. If
implemented, it seems likely that truck availability will increase and transport
needs and costs will decrease.

(a) Agricultural pricing policy (para. 26): if uniform product prices
     were eliminated, production would increasingly reflect the comparative
     advantage of areas, uneconomic transport of low value crops would be
     avoided, and total transport requirements reduced. Moreover, with
     crop returns no longer insulated from transport costs a farmer would
     be encouraged to seek the lowest cost means of transport and may even
     feel encouraged to take care of his own transportation needs.
     Competitive, more efficient and overall lower-cost transportation
     services would develop. Also, the introduction of a seasonal
     pricing system would encourage on-farm storage, enhance
     farmers' incomes, and spread peak transport demand. Simulta-
     neously, NAMB's burdens would decrease and the agency could
     then operate as a clearing agent. Regional transport shortages
     (para. 27) would be alleviated.

(b) Planning and coordination (para 29): an improved estimate of local
     consumption needs would make it possible to avoid exporting more
     than surplus produce from any area, which requires subsequent
     imports of the same type. This would eliminate many costly and
     unnecessary trips. Better coordination in timing loads in both
     directions (fertilizer and other inputs and crop extraction) would
     also avoid empty trips. In order to carry out these improvements,
     depot availability (capacity, type and location) should be reviewed.

(c) Trucker contracts (para. 29): NAMB contracts specify the route and
     tons each truck will carry. Once the operator has obtained a con-
     tract, he has no incentive to provide services quickly. If, instead,
     contracts specified only the route, and mentioned the total tonnage
     to be moved on it by all trucks, the various truckers for that
     route would have to compete to carry as much as possible of that
     tonnage and therefore would probably proceed faster. Axle-load
     control would then become even more important. An arrangement
     should be worked out with the RTC to eliminate seasonal licensing
     requirements (but with registration remaining obligatory). (See
     para. 39, Goods road-service licensing conditions.) Only smaller
     trucks should be granted the routes on low-standard roads. At
     present the 30- or more-ton trucks travel on any type of road
     indiscriminately, which breaks up the lower-standard roads and
     increases vehicle operating costs and number of breakdowns.

(d) Decentralization (paras. 29 and 30): most contractors have to go
to Lusaka to get contracts and collect subsequent payments, and
this causes unnecessary trips for contractors who serve remote
areas locally. The possibility of contracting and paying in re-
gional NAMB headquarters should be investigated. Many international
agricultural exports have to be arranged through NAMB. Generally,
they are first sent to Lusaka and subsequently exported. This
involves excessive trips, since some products have to come and go
over the same route. The possibility of avoiding this should be
examined. Both these problems could be solved by effective
decentralization of administration and financial control.

(e) Loading/unloading (para. 30): these operations can be under taken
only by NAMB staff, are performed slowly, and result in truck queues
and corresponding delays and costs, which worsen seasonal peaks, and
raise trucking costs by as much as 100%. In addition, trucks are
loaded with more weight than the RTC has authorized them to carry.
NAMB staff should be properly trained and supervised, and perhaps
some operations should be mechanized in order to accelerate the
operation. The staff should be responsible for loading no more
than the bags equivalent to the truck's net load-weight limit.
(See para. 38, Axle-load control). Simultaneously, truckers could
perhaps be authorized to assist with loading and unloading.

(f) Transport tariffs (para. 31): Present NAMB tariff levels seem
unrelated to operational costs and are not differentiated by the
type of road on which services have to be provided. Adequate finan-
cial operating cost estimates should be obtained for various sizes
of trucks on different road surfaces and tariffs established for
trips on earth, gravel, and paved roads. Differentiation by type
of product does not reflect the weight-volume relation. Thus maize
transport is the most profitable to, and preferred by truckers,
who try to avoid hauling cotton, for instance. Therefore, the
weight-volume ratio should also be taken into account for fixing
tariff differentials.

International

42.   At present, import transport costs are partially subsidized by the
Government in order to keep internal prices as low as possible. This policy
to protect consumer prices means that, at the same time, an artifically low
import opportunity cost reduces incentives to produce local substitutes. For
instance, the wheat import subsidy of about 30% (para. 32) is probably enough
to offset interest in exploiting local potential. Even worse, NAMB producer
prices are even lower than border prices.

43.   If a policy of subsidizing consumer prices is to be continued,
Zambia may be better off subsidizing its own agricultural activities rather
than imports. Even if agricultural imports are replaced by local production,
a considerably underutilized export capacity remains available, including

air services, and the possibility of agricultural exports, at almost no additional transportation cost to the country, should be considered. In order to encourage production for export, agricultural exports could be granted a subsidy, perhaps by reducing transport costs. Even a reduced tariff would decrease Government's overall subsidy cost. However, real costs of inputs and outputs should be calculated in order to evaluate the net effect of the subsidies, at various levels, on the producers. An effort should also be made to optimize coordination of transport and agriculture policies.

PART III—ROADS AND ROAD TRANSPORT

Roads

Existing Network

44.   Zambia's road network is one of the most developed in Africa, both in density per km^2 or per inhabitant, and in quality. It comprises about 34,500 km of roads, of which about 4,000 km are paved, 7,400 km are gravel all-weather roads and 7,200 km are classified earth roads. These roads are maintained by the Roads Department (RD) of the MPTW. The remaining 15,900 km are unclassified earth roads and are maintained by the Rural Councils (RC). No updated and reliable inventory exists for these roads, and the 15,900 km figure is merely an RD estimate. Although there are also local tracks, no details are available about them.

45.   The Roads and Road Traffic Act (RRTA) 1/ classifies the roads as interterritorial, main territorial, district, branch, rural, and estate roads. The Minister of MPTW designates the roads and assigns each to a corresponding highway authority. A summary of the designated network length by type of road and by province is given in Table 1.1; the corresponding standards are shown in Table 1.2, and the generally accepted functional definitions of roads are given in Table 1.3.

46.   The network has been developed and upgraded according to traffic requirements. Thus, the three provinces along the line-of-rail, with the highest population density and, until recently, the only main line for inter-national traffic, have the highest density of roads per km^2 and the lowest length of road per capita. The provinces with more scattered populations have lower ratios of m/km^2. Their roads are also largely lower standard, but the relative length per inhabitant is longer. The national averages are about 50 m/km^2 2/ and 7 m/person. Densities by province are shown in Table 2.

1/ Chapter 766 of the Laws of Zambia.

2   Compared with 630 m/km^2 in USA, 70 in Kenya, 20 in Tanzania, 30 in Zaire, 190 in Rhodesia.

47.   The main paved network includes the north-south road, which runs
from the Rhodesia border at Livingstone to the Zaire border at Chingola
(885 km) and is parallel to the line-of-rail; the Great North Road which
branches off from the north-south at Kapiri Mposhi and reaches the Tanzania
border at Tunduma (810 km); the Great East Road which extends from Lusaka to
the Malawi border near Chipata (590 km); three western links, one from Lusaka
to Mongu (585 km), another from Chingola to Solwezi in the north (180 km),
a third from Livingstone to Shesheke in the south (180 km); and, finally, a
southern link to Rhodesia (80 km) and a paved section in the Luapula Province,
from Mansa to Chembe (80 km) (Map IBRD 11509).

48.   Traffic density on the highways increases near urban regional centers,
especially close to Lusaka. The main north-south road carries the highest traf-
fic volume, in some sections about 3,500 vpd, 80% of which is light vehicles,
and circulates in congested flow conditions. The other main roads generally
carry not more than 600 vpd, but on these roads heavy vehicles account for
50% to 80% of the total. On the all-weather gravel roads, traffic is usually
below 200 vpd. Unclassified roads serve few vehicles but reflect heavy sea-
sonal variation as they are mainly related to agricultural activities. Road
standards are generally adequate for traffic requirements, but the lack of
maintenance endangers continued adequacy.

Recent Developments

49.   Zambia's authorities previously focused their attention on develop-
ing the primary network first, and only now is emphasis shifting to improving
or opening local lower-class rural roads. During the 10 years since independ-
ence, the considerable amount of K 170 million has been spent on road construc-
tion and about 2,750 km of the existing 4,000 km of paved roads have been
built, 800 km of them in the first three years (1972-1974) of the SNDP. In
addition, 2,200 km of gravel roads have been constructed or reconstructed.

50.   The SNDP is very ambitious and includes main road projects (includ-
ing some begun previously) at an estimated cost of K 67 million, excluding
the cost of the externally-financed Samfya-Serenje Road. Actual cost esti-
mates for the road program vary from K 86 million (MPF) to K 118 million
(MPTW). However, the former fast pace of road improvement has steadily
slowed, and only about 25% of the SNDP was implemented by 1974 when 60% of
the plan period had elapsed, as shown in Table 4. The SNDP also includes
K 23 million in its Provincial Investment Program for district roads, bridges,
and buildings (Table 5), but no information on implementation status was
forthcoming. Short road sections, not under the SNDP, have also been
initiated and completed.

51.   Since 1962, traffic on this improved network has been increasing
at an average of 7%/annum. and at about 20%/annum on the main roads, even
before the border was closed. The size of heavy vehicles has also gradually
increased, and units up to 50 tons use the network.

Current Plans

52.   Although only two years of the plan period are left, about 75% of
the SNDP remains to be carried out. Furthermore, the MPF has added new main
road sections to be upgraded and expects about 30% of the program to be
carried out after 1976. Because this implies annual 1975 and 1976 budgets
at about 3-times previous levels, the implementation rate will probably be
slower than MPF expects.

53.   Mainly, the plans call for the upgrading to paved standards of
main-road extensions and branches in areas not in the line-of-rail. These
extensions and branch roads are required for agricultural development as
much as the local feeder roads which are provided for under the Provincial
Investment Program, in order to facilitate transport of required inputs and
access to markets over the long distances between production and consumption
centers. The most important roads to be upgraded are links to the Great
North Road, from Serenje to Samfya and from Mpika to Kasama and to Mbala;
the extension of the main road near the Zaire border from Solwezi to Ikelenge
in the North Western Province; the extension of the Great East Road from
Chipata to Chama following the Malawi border, and a connection from Mongu to
Senanga in the Western Province. The direct link between the Copperbelt and
Luapula, in Zaire, is also being paved. The MPTW has additionally indicated
the advantages of paving several road sections branching off from the main
north-south road, some short access roads that carry about 150 vpd, and the
sections from Mansa to Kawambwa and from Mansa to Samfya in the Luapula
Province (Table 4). In addition to the SNDP, the RC prepare plans on an
annual basis for roads of local importance.

Related Institutions

54.   Several institutions deal with road construction and maintenance:
the MPTW, through its Roads Department (RD), the Rural Councils through the
Public Works Department (PWD), and, to a lesser extent, the Ministry of Rural
Development (MRD). The Minister of the MPTW allocates roads to RD and RC.
The Mechanical Services Department (MSD) of the MPTW is in charge of purchas-
ing, maintaining and repairing all Government-owned equipment, but the agen-
cies can utilize private services instead of MSD, and the agencies, especially
the RC, do so, since in the past the MSD has not been very efficeint   The
Government has taken action to improve this department and better services
should be forthcoming.

55.   Roads Department of MPTW. This Department is responsible for main-
taining all the roads, bridges, airfields, and harbors supervised by the
Ministry, that is, maintenance of 18,600 km of designated roads and of
minor harbor installations such as Mongu, Mpulungu, and Samfya; it is also
responsible for the implementation of national public-works construction
plans. Maintenance and construction of airfields is carried out on behalf of
the Department of Civil Aviation, from whom funds are warranted. This sec-
tion will deal only with those aspects of RD that pertain to roads.

Staff and Training

56.   RD organization is shown in Chart 1. The Department has a total
of about 4,900 employees. The approximately 4,400 daily-paid posts, as well
as about 400 industrial and administrative posts are generally filled, but
at times as much as 50% of the 175 technical and engineering positions remain
vacant; there is, for example, no engineer in the design office. This situa-
tion seriously hampers the activities of the Department.

57.   There is a shortage of qualified Zambians. Only one of the 20 top
technical positions is filled by a Zambian executive engineer, but there are
6 national engineering assistants. The Department runs a fully-equipped
Roads Training School that can accommodate up to 50 students per course.
A variety of subjects at various levels are taught, and courses normally last
from one to three months. The school has been operating for more than 10
years and has gradually increased the number of graduates from 61 in 1965
to about 170 a year since 1972. Further training is encouraged and already
a number of the engineering assistants have attended diploma courses at the
Zambia Institute of Technology at Kitwe, and some Zambian technical staff are
studying for an engineering degree at the University of Zambia.

58.   The Government intends to progressively Zambianize the Department,
but the present situation is likely to continue for several years, even if
training programs are accelerated, because the private sector attracts most
graduates (after they have served a few years in Civil Service) and resident
expatriates, due to the Zambian Civil Service salary structure and level. In
addition, inadequate overseas advertisement makes expatriate recruitment
difficult. Another complicating factor is that expatriate recruitment has
to proceed continuously due to, among other factors, the short contracts
offered. A housing shortage also imposes restrictions.

Financing

59.   Funds for capital works (new construction or improvements) are gen-
erally allocated directly to the Department, although certain projects are
carried out on behalf of, and financed by, other Ministries or on behalf of
provincial administrations using Development of Feeder-Road Funds. The
latter funds, however, generally remain directly under the control of the
respective Provincial Permanent Secretaries. Authorized funds for this
purpose amounted to approximately K 2 million in 1974.

60.   For recent years, funds spent by RD have been as follows:

| | Roads (K million) | | |
	Capital	Recurrent	Total
1971	15.3	8.3	23.6
1972	12.3	5.3	17.6
1973	4.3	4.8	9.1
1974 (authorized)	8.3	5.6	13.9

61.   Detailed expenditures for 1973 are shown in Table 11. Of the, low capital budget of K 6.2 million, only K 4.3 million was spent, surprisingly low compared to previous years' levels. Planned expenditures comprised 42% of the MPTW capital budget, or 6% of the national budget. In 1974, the RD had 37% of the MPTW authorized capital expenditure, or 5% of the total. The recurrent expenditure is so far below requirements that road maintenance is endangered.

Planning and Design

62.   The planning unit undertakes feasibility studies, which have been primarily technical up to now, with economic considerations limited largely to traffic counts. When a road reaches the upper-limit traffic design level (Table 1.2), it becomes a priority for upgrading, and the work is undertaken as funds are available. Traffic counts are conducted periodically on the roads that the RD maintains, and new counting stations are installed on those low-class roads where traffic apparently justifies road upgrading. In 1969, a transport survey covering all modes was carried out by BCEOM, which made recommendations for an investment plan, but no similar survey has been carried out since the border closure. Little planning coordination exists among the several ministries involved or affected by road construction.

63.   The design office prepares the designs for smaller works, such as widening or upgrading. Most feeder road projects, aerodrome improvements, and minor bridges are prepared by the RD when possible. There has been a growing trend for other ministries to request designs, but the RD lacks the staff necessary to execute them. Important projects are designed and supervised by consultants. Road standards are specified in Table 1.2.

Construction

64.   Expenditures for construction by force account are almost as high as those for work done by contractors. Capital funds allocated in 1974 amounted to K 8.3 million, 2 million more than in 1973 but still low compared to the K 15.4 million allocated in 1971. This is reflected in a widely varying volume of ongoing works. As a result, the number of contractors has actually decreased in past years and the market has become increasingly dominated by those few who can risk investing in equipment beyond average requirements. To finish the SNDP on schedule, the rate of work would have to be tripled.

65.   According to the RD annual reports, the construction rate has been
as follows:

		Construction (km)		
		Class		
		I	II	III
By Contract	1971	301	–	103
	1972	459	–	200
	1973	150	15	97
By Force Account	1971	33	23	86
	1972	–	11	109
	1973		155	66

Maintenance

66.   The RD is supposed to maintain about 18,600 km of rural roads and,
in addition, roads within major urban areas, such as Lusaka, Ndola, and Kitwe.
The RC can request that the RD take over feeder roads on which traffic has
increased or which have been upgraded, but this is only done to the extent
that funds are available and is generally avoided. Maintenance is implemented
on a decentralized basis, with headquarters in each province.

67.   For routine maintenance, the areas are split up into 125 zones,
each including approximately 180 km of road. Road camps are located about
80 km apart on main roads and are provided with a minimum of a grader and a
lorry and about 20 persons under a Road Foreman. (A Road Superintendent is
responsible for the supervision of four road camps and he reports to a Road
Inspector under the Provincial Road Engineer.) Present yearly maintenance
cost estimates 1/ per km are K 230 for paved roads, K 190 for gravel roads
and K 60 for earth roads.

68.   Periodic regravelling, on an average of every four years, is some-
times carried out departmentally, using provincial regravelling units if
sufficient equipment is available, or is alternatively handled by contract.
An individual contract rarely costs more than K 150,000. All paved roads are
designed to be resealed in three- to six-year intervals, depending on road
standards and traffic wear, or to be covered with at least 5 cm of premix
within ten years of construction. In practice, however, only when resealing
becomes urgent are funds made available for this purpose. The work is
generally carried out under contract, with RD design, documentation and super-
vision. Periodic maintenance has taken place as follows:

1/ November 1974.

Betterment (km)

		Resealing	Regravelling	Other
By Contract	1971	-	947	-
	1972	30	201	173
	1973	57	175	56
By Force Account	1971	165	144	-
	1972	80	356	4
	1973	-	207	36

69.   Despite awareness of the importance of maintenance both in the
MPTW and in the MPF and the increasing traffic volume and length of roads
to be maintained, authorized expenditure has decreased continuously and is
now only about half the required level, or K 5.6 million in 1974 compared
with a requirement of K 11 million (based on apparently low unit costs).
Continuing maintenance activities at this inadequate level threatens the
capital invested in the road network.

70.   A serious shortage of plant and vehicles, intensified by a lack of
spare parts, hampers RD activities, especially maintenance. According to the
decentralization policy, the provinces are to become self-sufficient in the
supply of vehicles, spare parts, and adequate maintenance. Although each
maintenance zone should ideally be equipped with 1 Land Rover, 1 flat truck
or tipper, 1 grader, 1 front/end loader, and 1 water tanker, only 167 vehicles
are serviceable. The RD evaluated its additional needs at 270 vehicles and
more funds will have to be made available to achieve this. The RD generally
has to hire vehicles from private firms and from the MSD, which further reduces
funds available for maintenance. Normally, only the MSD should repair and
maintain RD vehicles.

71.   Besides poor maintenance, the roads suffer from the effects of
overloaded trucks. To control weights, RD has installed 6 weighbridges since
1971, at Kafulafuta, Kapiri Mposhi, Mpika, Tunduma, Mwami, and Solwezi, and
another is planned for Mumbwa. However, these weighbridges operate only
during working hours and when offending drivers are detected, the RD agents
can do little about it since they are not law-enforcing agents and thus cannot
order drivers to offload.

Public Works Department of Rural Councils

72.   The Public Works Departments (PWD) of the RC are responsible for
all types of works of local importance in their districts, including construc-
tion and maintenance of the roads for which they are designated authority by
the MPTW.

Staff

73.   The PWD generally has a Works Officer, an Assistant Senior Works
Officer, an Assistant Works Officer and a variable number of Works Foremen,

on a permanent basis, and equipment operators. People with the broad experience required to carry out all kinds of works are usually unavailable or difficult to attract due to low salary levels. So, to carry out the road works, a contract is generally made with an experienced man in the district who, on a temporary basis, subhires and supervises required unskilled labor.

Financing

74.   The RC budget is about K 5 million per year. About 75% of this revenue is collected from the beer surtax. In theory, the MLGH is to allocate half the resources according to population in each district. The other half is to be distributed according to deficits remaining after the population allocation, that is, the most active in presenting projects would obtain more funds. But in fact, funds are actually allocated on the basis of the 1969 budget, increased by about 5% each year. About 20% of the total is assigned to roads. This means that there is little relationship between needs and resources, and funds are generally less than RC requests. So the RC is then eager to transfer roads to the RD for maintenance. The MLGH has prepared an estimate for feeder roads maintenance per district for 1974, but the lack of information about km of roads maintained makes this exercise of dubious validity. Obtaining approved funds from headquarters has apparently presented no difficulties. The RC even have some flexibility; for instance, if a budget surplus results, it can be reserved for the following year, which prevents interruption of works at the beginning of the year when the new budget may still be awaiting approval.

Planning and Design

75.   As much as possible, the planning process follows the theoretical procedure, which starts at the local level, in accordance with decentralization policy. Local Village Productivity Committees, meeting twice a month, review proposals and then make recommendations to the Ward Committee, which meets monthly. Projects approved by the Ward Committee are reviewed by the District Development Committee (2.5 meetings/month) and then by the Provincial Development Committee (1 meeting/quarter), which recommends to Parliament which projects should be included in next year's budget. There is almost no coordination with other local agencies which may be undertaking road works in the districts. No designs are made. In most cases, new roads follow old paths or connect population centers. Sometimes, RD branch assistance is requested, but this has proven ineffective since the recommendations they give tend to be of such a high standard that they are beyond RC implementation possibilities.

Works

76.   Due to the low standard of the roads under the RC, no clear differentiation exists between construction and maintenance, and both are really a sort of upgrading. Costs differ from district to district, but they are usually low: about K 120/km for clearing, K 150/km for stumping, or K 230 for

opening a km of road. Generally, the work is done with minimum equipment. Maintenance costs vary from K 20 to K 50 per km for unskilled labor. Even so, the resulting roads seem quite satisfactory in some regions and are used even by heavy vehicles, which the RC has no authority to stop or to deny circulation rights.

Provincial Agricultural Offices of MRD

77.   Extension workers travel in their areas, noting where farmers are beginning to produce enough to justify a new access road. When a new road is opened, it is generally done on a self-help basis or with a grader from the Land Use Services Division under the Provincial Agricultural Office. New roads should be maintained by the Rural Councils, but in practice, because the RCs are short of funds, they are frequently assisted with MRD equipment. No information of how many km these offices are maintaining is available.

Mechanical Services Department of MPTW

78.   This Department buys and repairs all the Government equipment and vehicles, and is highly centralized even when its depots are located in the provinces. It has not been functioning well, mostly because of staffing and funding constraints. MSD has the same kind of staffing problems as RD, and, in addition, its apprentice system has been discontinued, so MSD now depends on graduates from other institutes. In 1973, MSD requested K 6.2 million for maintenance and repairs, but only K 5 million was authorized. The inadequate funding of MSD has produced a shortage of spare parts, made it impossible to subcontract major overhauls to dealers, and virtually precluded the buying of equipment since 1971. For example, only K 3 million was authorized for purchasing new vehicles in 1973, as compared to the K 15 million requested. As a result, vehicles operating uneconomically have been kept in service.

Road Transport

Regulations

79.   The Roads and Road Traffic Act, plus subsidiary regulations, are very comprehensive. 1/ A Road Traffic Commissioner, assisted by a Deputy and an Assistant, all appointed by the Minister of the MPTW, is in charge of enforcing the regulations 2/ and appointing other officers (driving examiners, vehicle examiners and road traffic inspectors) as required. Licensing officers for specific areas are designated by the Minister.

1/ These are stated in Chapter 766 of the laws of Zambia.

2/ Axle-load limit compliance is not verified by the RTC staff, but by the RD.

80.   Only those aspects of traffic regulations which are directly related to the transport of goods and passengers, excluding safety requirements, will be considered below.

Vehicle Licensing

81.   All vehicles must be registered and licensed. Initial applications for registration are made to the RTC by the owner of the vehicle and include a certificate by the manufacturer or customstating that the vehicle conforms to the specifications of the Act. After a fee is paid, a registration number and a registration book are issued. The officer may request an examination of the vehicle, and afterwards a test certificate is issued. Change of ownership also has to be registered within 14 days. The Director of Roads may exempt certain vehicles from licensing requirements. Vehicle licenses last 12, 6 or 3 months, and the owner pays respectively 100%, 50% or 30% of the established fees. The RTC may remit short-term license fees, such as those granted for carrying maize or farm produce from rural areas to collection centers. This can be done without a public sitting but the specified roads/areas must be published in the Gazette. Exclusive passenger-service concessions may be granted by the Minister. Revenues from fees and fines, which are assigned to General Revenues, are listed in Table 6.

82.   Public service vehicles require a road service license. An interested party presents an application to the Road Transport Panel.1/ The application is published in the Gazette at least 40 days before a decision is taken to allow any objections to be presented. Then the RTC and two members of the RTP decide on it during a public sitting in the Lusaka City Council chambers. (This group can issue licenses for Zambian citizens, but the Minister's approval is required for non-Zambians.) Several factors are considered in deciding whether or not to issue the license: the suitability of the proposed route(s);

1/ The application form for a road service license has to state:

1) Type of service to be provided, that is, "letting vehicles on hire" or "service of conveying for reward";
2) Particulars of the road(s) or area it proposed to serve;
3) Various financial statements;
4) Reasons for alleging that existing transport on the road(s) or in the area proposed to be served, is inadequate;
5) Detail for each vehicle to be used: registration number; year of make; type and maximum tonnage/passengers it is desired to carry. Indication also of which vehicles should be used exclusively as replacement for a break-down of any other listed;
6) If a bus service, time-table or frequency of the service and the time to be taken by it should be given;
7) Rates to be charged for the proposed service (may be withheld from public inspection.

the adequacy of existing transport services on the route in question and the extent to which they may be adversely affected; whether the proposed service is in the public interest; the applicant's qualifications; any objections raised by those already providing services, by the authorities of the affected zone, or by the probable public; and, receipt of a certificate of vehicle fitness which is valid on the day the license goes into effect. 1/ Finally, the RTC decides the conditions of the license "as he may think fit". 2/ A license usually takes three months to be processed. When granted, a notice is published in the Gazette. Licenses are valid from one to five years, are not transferable, except by the Minister's authorization and may be revoked or changed if the RTC verifies that the specifications have not been complied with. The RTC keeps a register of all valid road service licenses, which is open to the public. If a license is not granted, appeals can be submitted within 30 days of the decision to the Road Service Appeal Tribunal and afterwards to the High Court. Any person operating a public service vehicle is supposed to keep related accounts as prescribed by the RTC and produce these for inspection when requested. No goods vehicle or trailer licensed as private may be rented or used for commercial hauling.

Vehicle Weights

83.   The MPTW is responsible for fixing the maximum weight that may travel on the roads. 3/ The Minister issues regulations prescribing the maximum laden weight and the maximum axle weight, although the Director of Roads may grant exemptions. 4/ Part III, Section 12 of the Construction, Equipment and Use Regulations prescribe that:

1/ Fitness certificates are valid for 4 or 12 months when passenger or goods, vehicle, respectively. (It seems that the procedure for obtaining them is slow.)

2/ The license contains:
  1) Type of service;
  2) Period of validity of the license;
  3) Route(s) or areas where the service may be provided;
  4) Base from which the service is to be operated;
  5) Goods that may be carried;
  6) Other uses for which the vehicle(s) may be let on hire;
  7) Identification of each vehicle: registration mark, licensed carrying capacity of the tractor or trailer if any, authorization date, number and date of expiring identify certificate, and if it is a "replacement" unit;
  8) Conditions: that any rates that may be fixed for the letting of vehicles on hire be adhered to, as well as RRTA and its regulations;
  9) For passenger services: frequency and/or time-table(s).

3/ The Act also prescribes that local authorities be consulted; this should probably be deleted because only a uniform weight limit throughout the country should be allowed.

4/ For instance, the CPO has allowed overloads in order to solve rerouting problems with the existing trucking fleet.

a)   "the maximum laden weight of a vehicle shall not exceed
the manufacturer's permitted gross weight of the vehicle,
or 14,000 lbs. whichever is less," and

b)   "the maximum weight carried on any axle of a vehicle shall
not exceed the manufacturer's permitted axle weight, or 10,000
lbs. 1/ whichever is less."

84.   The gross weight--the maximum weight of goods or maximum number
of passengers--authorized by the vehicle examiner during the fitness tests
has to be conspicuously shown on the vehicle. If the limits are exceeded,
"the operator is guilty of an offense." Actually, the ten-ton axle weights
are often exceeded, but the Regulations do not give the vehicle examiner the
authority to force the operator to unload or to pay the established fines.

Vehicle Fleet

85.   In 1973, there were 132,000 licensed vehicles in Zambia, or 3 per
100 inhabitants on average. This is a high ratio for an African country 2/
and reflects the relatively high income per capita. About 80% of this fleet
consisted of light vehicles and less than 1% of buses. Trucks and trailers
accounted for 15% of the total, or about 19,450 vehicles. From 1968-72, the
fleet increased almost 9%/annum, with only slight variations by types (Table
3.1). Most vehicles are licensed in Lusaka, and no fleet statistics were
available by area. Trucks added to the fleet are increasingly larger, but
very few small units suitable for feeder roads are available. Yearly new
registrations are considerable, about 12% of the fleet (Table 3.2). Although
85% of the new registrations are recorded in offices located along the line-
of-rail (Table 3.3), this may not reflect regional vehicle availability.
Vehicles outside the line-of-rail are probably not registered.

86.   An important problem encountered by both private and public sectors
is the difficulty of obtaining spare parts.

Road Haulage

87.   Trucks and trailers may be licensed for private use or for commercial
purposes. Trucks with private licenses are theoretically not allowed to per-
form any public road service.

88.   As mentioned earlier, the Government prefers that public road
services be performed by private operators but considers it to be its duty
to deal with emergency situations to assure continuity of import-export flows

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1/   This allowance seems very low. It may have been increased by subsequent
amendments, since the RD considers the axle-load limit to be ten tons.
This has to be verified.

2/   The vehicle-per-100-persons ratio is about 1 in Kenya, .5 Tanzania, 3 in
Rhodesia, 1.4 in Zaire, and 53 in the USA.

at transportation costs similar to those in effect before the border closure
and to ensure passenger services which private operators would probably not
undertake. This continuity is maintained through the parastatal National
Transport Corporation (NTC) composed of 4 subsidiaries: CH, ZTRS, UBZ and
Bulk Carriers of Zambia. About 70% of the heavy vehicles in Zambia have
private licenses. There is a large number 1/ of private trucking companies
which perform public services, many of which operate as subcontractors to
ZTRS and CH (which secure a license for the operator if he does not have
one). Apparently there are only two transport cooperatives and no trucking
union.

89.   The extent to which truckers set their own tariffs is not clear,
but ZTRS, CH and especially NAMB determine the overall level by contracting
transport at their established rates.

Contract Haulage (CH)

90.   In 1970, the Transport Holdings of Zambia Company, initially called
Central African Road Services (CARS), became a subsidiary of, and wholly-
owned by NTC. Re-named Contract Haulage (CH), its functions are internal
freight distribution and haulage in connection with the Republic of South
Africa and Rhodesia. When the border was closed, the CPO purchased 400
30-ton trucks and gave them to CH for operation to assist in the emergency.

91.   CH has its headquarters and a central workshop at Lusaka. It has
its own fleet but hires subcontractors if necessary, paying them 90% of
the fares received. Workshop services and fuel are made available to the
subcontractors and these costs are deducted from payments due them. CH has
three divisions, Freight South, Malawi Division and Northern Division. All
carry internal freight at rates proposed by the company and approved by the
MPTW 2/ and agricultural products for NAMB at its rates. The Northern
Division also provides services to ZTRS and is supposed to make the empty
trips from Zambia to Dar es Salaam, the cost of which is borne by CPO. The
Malawi Division operates on the Great East Road particularly. Under an
agreement with United Transport of Malawi, each company carries 50% of the
international traffic in both directions, at tariffs agreed to by both Gov-
ernments. CH has 4 mobile workshops operating on this route.

92.   Since 1973, CH has operated at a profit. Operating costs and
tariffs are shown in Table 9, which indicates the high level of profits,
especially at NAMB's rates.

Zambia-Tanzania Road Services (ZTRS)

93.   This company was started in 1966, and is 35% owned by the Zambia
Government, 35% by the Tanzania Government and 30% by an Italian private
company. It was set up to move Zambian cargo, especially copper, on the

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1/ In 1968, 165.
2/ The rates are based on those established by Transport Holdings, and have
    not been revised to reflect subsequent road upgradings on various routes.

Tan Zam Road until the TAZARA becomes operational. The border closure has increased demand for its services, so it has continued to increase its vehicle fleet even though the railway is expected to start operations in 1975.

94.   The company operates efficiently, with headquarters at Lusaka and its own workshops and depots along the route. The staff includes about 2,300 persons, some of whom work in Tanzania. The fleet is composed of about 520 32- or 35-ton trucks 1/ and a similar number of trailers, with which more than 300,000 tons a year were carried even before the border closure. In addition, ZTRS generally has more than 400 trucks under sub-contract, more than 200 of them from CH and the remaining from only seven contractors who may in turn have subcontracted them. ZTRS trucks, both its own and subcontracted, average only four-days travel time between Lusaka and Dar es Salaam. Terminal operations have been greatly improved since 1973. They previously took 5.5 days in Dar es Salaam and 7.9 days in Zambia (13.4 days total), which was reduced to 1.6 and 6 (7.6 days total), respectively, in 1974. As a result, each vehicle can manage four single trips per month.

95.   A shortage of qualified drivers seems one of the company's major difficulties. In an attempt to overcome it, ZTRS has established a training school and a payment incentive system, which can add up to K 34 per single trip, by efficiency, express and/or no-breakdown bonuses.

96.   ZTRS' immediate subcontractors receive 90% of the tariffs. In 1974, for the first time since its establishment, ZTRS increased its tariffs to K 49/ton of general cargo from Dar es Salaam to Zambia (K 45 to contractors, who in turn are paid within 60 days upon receipt of documentation). ZTRS average revenue (not including commission on contractors) and cost per trip and per km are shown in Table 10.

Cooperatives

97.   The mission was informed of the existence of only one transport cooperative and one agricultural cooperative with transport facilities. Other agricultural cooperatives rely mainly on NAMB for transport. The Eastern Province Transport Cooperative Association (EPTCA), which consists mostly of people with one or two 40-ton or smaller trucks, operates in the Eastern Province. The second, the Luapula Cooperative Union, assisted by FAO/SIDA, has about 1,300 members (small farmers with one or two ha each), grouped in 9 affiliated societies. The cooperative has its own workshop and one 7-ton lorry for traffic between its headquarters at Mansa and the nine societies, for which K 1/bag is charged. With 12 Land Rovers, about 40 tractors and 15 trailers, it also provides transportation between the nine societies and the farmers. Transport is satisfactory, according to management.

Passenger Transportation

98.   Any Zambian can apply for a license to provide passenger transport services. According to RRTA regulations, these services can be provided

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1/ They carry about 30 tons of copper or 25 tons of general cargo.

only after a license has been granted. But in practice there are many con-
traventions. The RTC establishes the fare applicable to each service, which
is determined according to distance but without differentiation by type of
road on which the service is provided (Table 2). Fares have remained
unchanged since 1971.

99.   In 1974, besides the parastatal UBZ which accounted for about 51%
of total passenger transport capacity, there were many private operators:
52 bus operators for long- and 16 for short-distance runs, and 87 taxi opera-
tors for long and 200 for short distances. The Rural Councils are entitled
to establish and maintain passenger transport services, but no information
on such activities was to be found. Some industrial companies provide trans-
port for their employees.

100.   Road passenger transportation has increased enormously. For in-
stance, there were 20% more passengers and 38% more km travelled in 1973
than in 1974, an effect of favorable economic development, rapid population
growth, and increasing urban concentration. However, services provided have
also improved as a result of a considerable expansion of carrying capacity.
Zambia Railways is also a competitor for passenger transport, but its traffic
decreased by 20% from 1971 to 1973.

United Bus Co. of Zambia (UBZ)

101.   In 1970, UBZ started taking over from CARS the providing of services
throughout Zambia. Since June 1974, the company has been divided into two
divisions, the Northern Region and the Southern, with headquarters at Kitwe
and Lusaka, respectively. Its staff numbers about 4,700 employees and the
fleet about 600 large buses of various makes. Both are double the 1972
figures. In 1974, approximately 81 million passengers were carried and 46
million km travelled. For vehicle maintenance, UBZ has a main workshop in
each headquarters and 12 minor ones. In important cities, branches have been
established and managers propose routes to regional headquarters. At present,
the company is operating on about 86 local service routes in 10 major cities
and on 60 long-distance routes.

102.   UBZ is currently operating at a deficit. On the average, its cost
per km is 30.8, but its revenue is only 30.4. In 1973, taxi services, which
also operate at a loss, were introduced. Up to now these deficits have been
made up by Zambian commercial bank loans, but the Government may have to pro-
vide subsidies for UBZ to repay the loans. 1/

103.   A complete development study of the company was done in 1974 by
a MPTW specialist, 2/ which made recommendations for its improvement, such
as review operations on unprofitable routes, improve staff (including
drivers, maintenance specialists, and management), study the possibility of
further expansion, and improve terminal facilities.

1/   Due to persistent losses the service was suspended in September 1975.

2/   M. Hromic, "UBZ Development Study," (Lusaka, 1974).

PART IV—INTERNATIONAL TRANSPORT ROUTES

Lobito Route

Port

104.   Up to 1970 the port of Lobito, operated by the Angolan Government, handled about 1.8 million tons of cargo yearly. 1/ Of this total, Zambian traffic accounted for 17%, or 305,000 tons comprising 7% of Zambian imports and 22% of its exports. In 1973, a UN team estimated that Lobito's share could easily be increased, since the port did not have capacity constraints at this level. In fact, in 1974 the port surpassed UN estimates and handled for Zambia approximately 453,000 tons of imports and 517,000 tons of exports, corresponding to 44% and 55% of Zambia's total import and export traffic respectively. Although in July 1974, the port ship waiting time was ten days, and a congestion charge of 70% was added to the shipping rates, the delay seemed to originate in labor problems rather than in physical port-capacity constraints.

105.   The distance by sea from Europe or America to Lobito is about 4,000 km shorter (or about 10 days less travel time) than to East African ports. Therefore, use of Lobito port represents a considerable overall time and cost saving, even though fares to it are not significantly different from those to other ports.

Inland Transport

106.   The only operating surface transport from Lobito to Zambia is the all-rail route with a 1.067 m gauge. Thus transshipments are not necessary and the route is therefore preferred for bulk commodities and other heavy items. It is composed of: The Chemins de Fer Benguela (CFB), with 1,350 km of track to the Zaire border at Dilolo; the Societe Nationale de Chemins de Fer Zairois (SNCZ) (previously the KDL network), which runs 757 km by electric power to Lubumbashi and 255 km by diesel power to Sakania; and the Zambia Railways which is used for internal distribution and collection. In all, there are 2,362 km of transport to the Zambian border. All three companies have working arrangements that allow free international movement.

107.   Previously, there was a major bottleneck on this route, the Benguela escarpment section. Within about 386 km from Lobito, the line climbed to its highest point (1,854 m) in very steep gradients that were badly aligned. For instance, there was a 900 m sudden rise between Catumbela and Cubal, and the 60-lb. track could only handle a few cars at a time. However, the Cubal variant, a 128-km track-relocation designed to avoid the problem, was built with heavy duty 90-lb. rail on a gentle alignment. It was finished

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1/   No later data are available.

in 1974 and will enable the CFB to handle considerably more traffic. In 1974, 12 additional diesels were ordered and this will help even more to facilitate transport. Furthermore, the rest of the track is to be gradually replaced and the whole line dieselized by 1985. Further to the east, the SNCZ apparently has no transport constraints.

108. Zambia has no influence on the tariff rates but enjoys progressive rate reductions with increased freight. Zairian and Zambia traffic account for more than half the cargo handled. The total capacity in one direction was estimated as 2 million tons a year. With the Cubal variant, its capacity is even larger than this. This route, like the others, carries more import than export volume, which results in empty outward trips.

109. Transport takes 10-14 days from Lobito to the Copperbelt or to Lusaka. Prior to the complete disruption of the route in mid '75, the CPO routed most bulk imports, including all wheat, and most copper exports this way, because it resulted in the lowest possible transport costs. When political stability is restored in Angola, given the advantage of the newly built Cubal variant and provided that the port labor problems are overcome (para. 104), more tonnage should be carried this way.

Dar es Salaam Route

Port

110. The port of Dar es Salaam, operated by the East African Harbours Corporation (EAHC), has been handling continuously-increasing tonnage. About 1 million tons were forwarded in 1965 and 2.8 million tons in 1970, of which approximately 400,000 tons or 14% was Zambian cargo. In 1974, about 300,000 tons of imports and 320,000 tons of exports were handled for Zambia through this port. This represented 29% and 34% of Zambia's total import and export traffic respectively, a remarkably-balanced flow causing low empty-running. (These figures can be compared to 37% and 28% respectively, which were predicted by earlier rerouting studies.)

111. An ongoing project of the EAHC investment plan for 1973-76 (whose foreign cost of about $52 million is financed by IBRD and CIDA) provides for construction of three deep-water berths, the modernization of existing facilities, and for new equipment. The purpose is to enable the port to meet estimated requirements through 1980, as estimated in the IBRD appraisal. The projection includes a provision for exporting 440,000 tons of Zambian copper in 1975 and up to 640,000 tons in 1980. These amounts could easily be increased, since port import tonnage continues to be about double that of exports:

	1975	1980
	----- '000 tons ---	
Exports	1,203	1,507
Imports	2,385	3,060
Total	3,588	4,567

112.   The port has been handling even more than it was designed to, so
the Tanzanian Government has rerouted some of its own imports through Tanga
to facilitate Zambian traffic. Even so, it was pointed out to the mission
that there are several problems: that clearance from the port area is slow,
that storage space is restricted, and that Zambia road transport capacity
is insufficient. However, it is not clear which of these is the real con-
straint. Whatever the major problem, in 1974, about 13 days ship waiting-
time was typical at Dar es Salaam, and a congestion surcharge of 40% was
levied.

113.   EAHC increased its tariffs in May 1974, and even though Zambia
enjoys preferential tariffs, they are higher than Lobito rates. The most
important concession to Zambian cargo is the import storage rate at 1/ton/day,
compared to the T.Sh. 8.50/ton/day generally charged other importers. Since
Zambia's imports have piled up, this subsidy is damaging to EAHC. (The
tariffs for import-export storage will be reviewed once TAZARA becomes ope-
rational.) The EAHC clears cargo between the port area and the Ubungo trans-
shipment depot across the city, allocated to Zambian traffic. EAHC also
supplies mobile cranes for offloading. These services are free. It is cal-
culated that the subsidies amounted to about T.Sh. 8.5 million in 1974. (It
is rather astonishing that EAHC subsidizes a more wealthy country, by per
capita-income standards.)

114.   The EA Railways system runs through the port of Dar es Salaam with
a 1 m gauge. This contributes to quay congestion, and if another track, with
1.067 m gauge, for TAZARA operations were added, congestion would be even
worse. Therefore, the suitability of short-distance road transport to
depots out of the port area should be studied.

Inland Transport

115.   A 2,090 km paved road joins Dar es Salaam and Lusaka. It is called
the Great North Road in Zambia or, more generally, the Tan-Zam Road. The
TAZARA Railway, under construction with completion expected at the end of 1975,
runs 2,042 km from Dar es Salaam to Kapiri Mposhi, where it joins the Zambia
Railways system. This will constitute another 1.067 m gauge all-rail sea con-
nection. ZTRS was created to carry international flow on this route and its
functions expanded notably with the border closure. At that time, CH began
assisting with haulage on this route (Part III--Road Transport). By July 1974,
about 1,200 new vehicles were providing services on it, at a rather high cost
due to the expensive empty trips to Dar es Salaam, which cost the government
more than K 1 million in subsidies in 1973. Although in 1974 import tonnage
was lower than export, imports still required more trucking capacity because
of the higher weight-volume ratio for exports. Current tariffs for these
trips, which take about 8 days, are K 54 a ton for copper exports and
K 49 for general cargo. The three groups which own ZTRS have agreed that the
company cease operations six months after the opening of the railway.

116.   Since 1974, TAZARA has been sporadically carrying cargo from
Dar es Salaam to Mwenzo, and is expected to carry all the long-distance
Tan-Zam corridor traffic, at rates that will probably be in line with other
ongoing railway systems favoring agricultural transport. If the real
constraint is lack of transport, then overall costs, as well as port
congestion should be reduced after TAZARA is fully operational. However,
total transportation costs on this route may not be significantly less than
present road costs, if—as seems likely—EAHC increases its rates and
railway capacity is underutilized.

Beira Route

Port

117.   This port handled more than 3 million tons a year, mostly for
the inland Rhodesia, Zaire, and Zambia. It has been relatively efficient,
with a maximum 2-day ship waiting time in 1974 (compared to 13 in Dar es
Salaam). It seems that the port can handle as much Zambian cargo as may be
sent, constrained only by Malawi railway capacity. Further, Rhodesian use
of the Beira port may decrease with the new railway section through Beit-
Bridge, which facilitates access to the South Africa Railways (RSA) and its
ports and to Lourenco Marques. Zaire traffic may also be routed through
Angola to avoid passing through Rhodesia. In 1974, Beira handled about 10%
of Zambia's imports, or about 130,000 tons, which was a small share of the
port's total tonnage.

Inland Transport

118.   There are several routes between Zambia and Beira. Although the
ones through Rhodesia are not now used due to the border closure, they
should be taken into account in longer planning horizons in anticipation of
a change in the political situation.

Routes Presently Used

119.   The Mozambique Railway (CFM) from Beira to the Malawi border
(331 km) presents no constraints. But the Malawi Railway (MR) has a 17 km
section from Nkaya to Balaka on which not more than 11 tons per axle can be
carried. This is, however, being upgraded. From the border at Sena, it is
310 km to Balaka and an additional 157 km to Salima. From either of these
points, transshipment to road transport is necessary. Salima has very good
transshipment facilities, but only a one-lane 220 km paved road to Lilongwe.
A railway line in this section is being constructed. Balaka, on the other
hand, has limited facilities, but does have a high standard two-lane paved
road of 350 km to Lilongwe. From Lilongwe on there is a common route to the
Zambian border at Mchinji, a 114 km all-weather gravel road, to be paved with
USAID assistance, with vpd ranging from 75 to 150. Recently, the RSA has
loaned the Malawi Government funds to build a railway line joining Lilongwe

to the Zambian border at Mchinji. This will leave only the Zambian section
dependent on road transport, that is on the paved two-lane Great East Road,
which is in good condition and carries slightly more than 200 vpd.

120.   If, upon completion of the ongoing railway construction and general
modernization, and especially upon completion of the proposed new section,
Zambia decides to use the railway more intensively, Malawi will have to in-
crease its rolling stock. This may be advantageous for her since the railways
are operating efficiently and at a profit.

121.   The route through Salima adds up to 1,655 km (798 km of rail).
It may be less costly than Dar es Salaam and Lobito because port waiting
time is less and congestion charges lower. After railway improvement, more
traffic could be channeled this way.

Routes Not Presently Used

122.   The all-rail line from Lusaka to Beira, combining ZR, Rhodesia Rail-
ways (RR) and CFM tracks totaling 2,046 km, was the route most used for inter-
national trade before the border closure. Transport costs were about one-third
less than present levels. In fact, the overall cost by this route may remain
lower than that of routing through Dar es Salaam, even when the TAZARA is
operational over a similar distance (2,042 km), because port services are
better and cheaper in Beira.

123.   The shortest route of all is the paved road from Lusaka to Sinoia
in Rhodesia (about 350 km) and on RR to Beira (about 650 km), which totals
only 1,000 km but has the disadvantage of a transshipment and steep road
gradients.

Nacala Route

Port

124.   At present, the port has three berths. It has been handling more
than 500,000 tons a year with no delays, and could easily increase the
amount of Zambian cargo handled and could even be easily developed further
since it is a natural harbor.

Inland Transport

125.   The CFM joins Nacala to the Malawi system at Nayuci (about 656 km),
from which point the MR takes over to Balaka or Salima and further, as pre-
viously explained in para. 119. The total distance to Lusaka is about 1,749
km, or 100 km more than to Beira.

Mombasa Route

Port

126.   This port, operated by the EAHC, has the capacity to handle more
than 6 million tons a year. It is currently being modernized to permit
the handling of 7.4 million tons (of which 4.4 million are imports) in 1975
and 8.9 million tons (5.6 in imports) in 1980, according to the EAHC invest-
ment plan and loans obtained for implementation. In 1974, this port moved
only about 10% of Zambia's foreign trade, about 92,000 tons each of imports
and exports, a negligible amount of overall clearing capacity.

Inland Transport

127.   There is an all-road connection of about 2,350 km to Lusaka,
100 km of it is in Kenya, 270 km in Tanzania, from Kenya to the Tan-Zam
Road, and 1,980 km from there on the Tan-Zam Road.

Other Routes Not Presently Used

Lourenco Marques Route

128.   Unfortunately, the mission was not able to obtain any information
about Lourenco Marques port, except that it used to share with Beira more
than 50% of Zambia's external trade. It handles about 10 million tons a
year, and overall 90% of its traffic is for the neighboring countries. In
1975, it was beset with delays exacerbated by strikes. If the Rhodesian
border is reopened, the utilization of this port should again be considered.
At present, the distance from Lourenco Marques to Lusaka by rail is about
2,040 km, a distance which will decrease after completion of the Beit-Bridge
link.

Matadi Route

129.   This route, by "La Voie Nationale" in Zaire, has been unsatisfactory
to Zambia for two reasons. First, the Matadi port has been congested, which
resulted in related surcharges. Second, inland transportation requires two
transshipment between rail and river transport both in Kinshasa and in Ilebo.
When ongoing transport projects in Zaire are finished, this route can be
reconsidered.

Mtwara Route

130.   This Tanzanian port is underutilized, but there are no good inland
connections to Zambia. However, the Tanzanian Government, with help from IBRD
and ADB is paving the road from Mtwara to Masasi (200 km) and is considering
improving the link with the Tan-Zam Road.

Table 1.1: ROAD INVENTORY, 1974
(km)

	Maintained by Roads Department					Maintained By Rural Councils (Unclassified) 1/
	Class I	Class II	Class III	Unclassified	Total	
By Province:						
Copperbelt	680.1	515.5	145.8	32.7	1,374.1	459.1
Central	1,204.9	172.1	1,357.4	1,163.1	3,897.5	2,139.6
Northern	568.4	592.3	493.5	1,303.2	2,957.4	3,423.4
Eastern	397.8	48.0	843.9	723.5	2,013.2	3,021.3
Southern	631.1	393.7	224.6	1,648.0	2,897.4	1,587.0
Western	348.2	3.0	704.7	711.2	1,767.1	2,890.3
Northwestern	89.8	852.6	108.4	1,156.7	2,207.5	1,598.3
Luapula	98.9	116.5	818.9	468.2	1,502.5	781.1
Total	4,019.2	2,693.7	4,697.2	7,206.6	18,616.7	15,900.1
By Classification:						
Inter-territorial, main	2,705.7	150.2	-	241.9	3,097.8	
Territorial, main	1,043.4	1,709.1	826.8	65.2	3,644.5	
District roads	350.0	834.4	3,870.4	6,765.8	12,020.7	10,185.8
Rural roads	-	-	-	-	-	5,714.3

1/ Estimated lengths.

Source: Roads Department, 1974.

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Table 1.2: MPTW ROAD CLASSIFICATION AND STANDARDS

Characteristics	Class I A	Class I B	Class I C [1]	Class II	Class III	Unclassified
Surface	Bitumen	Bitumen	Bitumen	Gravel (engineered)	Earth and gravel where necessary for all weather service	Earth, with 3.50 m gravel where essential
Width: (m)						
Carriageway	7.30	6.70	6.10	min.6.10	min.5.50	
Shoulder	3.00	2-3 [2]	2.00	2.00	1.00	
Total	13.30	10.70-12.70	10.10	10.10	7.50	5.50
vpd expected for nth year after construction	1500-5000	500-1500	150-500	50-150	20-50	-
Design Speed (km/h)						
Flat	100	100	100	80-100	60-80	-
Rolling	100	80-100	80	60- 80	50-60	-
Mountainous	80	60- 80	60	50- 60	30-50	-
Limiting Grade (%)						
Flat	4	5	6	6	8	-
Rolling	6	6	7	8	10	-
Mountainous	7	8	8	10	12	-
Maximum Length of Limiting Grade (m)						
Rolling	220	220	180	150	-	-
Mountainous	180	150	150	150	-	-

1/ When exceptionally a road with geometric and/or structural standard lower than Class IC requires bituminization, it shall be called Class ID.

2/ According to traffic levels.

Source: Roads Department, 1974

Table 1.3: FUNCTIONAL HIGHWAY CLASSIFICATION

The highway system of Zambia comprises Interterritorial Main (T), Main, District (D) (RD), Branch (B), Rural (R) and Estate (E) roads.

Although no specific definitions are given for these various categories of road, it is generally understood that they serve the following purposes:

1. T roads are the international main roads which, together with the M roads form the primary road network, connecting the Zambian highway system with that of neighbouring countries, linking Provincial seats of Government and the main centres of population.

2. D and RD roads form the secondary road network linking local centres of population, districts and special development areas with the primary network. At present, some are of local and others of national importance.

3. B roads are entirely of local importance and are usually so designated to preserve a public right of way. The Minister has the power to appoint a highway authority for such roads, which are not generally constructed or maintained at public expense.

4. R roads are generally low standard tracks of local importance connecting local areas with the secondary road network. The local Rural Council is the highway authority for such roads, the construction and maintenance of which is grant-aided by Central Government.

5. E roads serve the purpose of internal access in areas being developed by Government or otherwise for residential or industrial plots or farms. To date no such roads have been designated.

Source: Roads Department, 1974.

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Table 2: ROAD DENSITIES, 1974

Province	RD roads		RC roads		Total	
	m/km^2	m/inhabitant	m/km^2	m/inhabitant	m/km^2	m/inhabitant
Copperbelt	44	1	15	1	59	2
Central	34	4	18	2	52	6
Northern	20	5	23	6	43	11
Eastern	29	4	44	5	73	9
Southern	34	5	19	3	53	8
Western	14	4	23	6	37	10
Northwestern	18	9	13	6	31	15
Luapula	30	4	15	2	45	6
ZAMBIA	25	4	21	3	46	7

Source: Roads Department, Central Statistical Office, own elaboration, 1974.

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Table 3.1: VEHICLE FLEET, 1960-1973

Year	Cars, Station Wagons [1]	Vans, Vanettes	Trucks	Buses	Construction Vehicles	Tractors	Trailers	Sub-Total	Motor-cycles	Total
					Private					
1960	32,724	6,544	3,969	262	211	1,049	1,444	46,203	1,879	48,082
1961	34,300	6,474	3,687	279	144	1,097	2,130	48,116	1,942	50,058
1962	36,930	6,943	3,766	292	135	1,115	2,267	51,448	2,064	53,512
1963	39,491	6,807	3,566	306	33	862	2,531	53,596	2,145	55,741
1964	41,467	7,147	3,744	321	28	905	2,657	56,269	2,252	58,521
1965	43,729	7,454	3,941	337	30	950	2,789	59,220	2,364	61,584
1966 [2]	42,146	9,558	4,993	320	243	1,778	3,625	62,663	3,027	65,690
1967	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1968	48,325	14,385	8,308	593	171	2,490	4,246	78,518	5,550	84,068
1969	53,849	15,467	10,179	658	190	2,564	4,246	87,153	5,960	93,113
1970	58,508	16,253	10,740	668	220	2,759	4,330	93,478	6,331	99,809
1971	61,579	18,118	11,666	690	258	3,393	4,969	100,673	6,939	107,612
1972	65,794	20,705	12,725	769	382	3,910	5,310	109,595	8,233	117,828
1973	72,140	23,502	13,375	780	472	4,469	5,519	120,257	8,446	128,703
					Government-Owned [3]					
1968	n/a				367	1,130	n/a	n/a	n/a	n/a
1969	6,046				396	1,217	375	8,034	430	8,464
1970	7,031				425	1,294	477	9,227	505	9,732
1971	8,178				455	1,411	529	10,573	650	11,223
1972	8,932				637	1,471	556	11,596	656	12,252
1973	9,012				657	1,517	556	11,742	668	12,410

1/ Including CD registrations
2/ At June 30, 1966
3/ Excluding defense forces equipment

Source: Central Statistical Office, 1974
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Table 3.2: NEW REGISTRATIONS OF MOTOR VEHICLES, 1955-1972

| | | N E W | | | | | | | | |
| | | Commercial Vehicles | | | | | Motor-Cycles and | | Total | Grand |
Year	Passenger Cars	Buses	Vans & Vanettes	Trucks & Mech. Horses	Tractors & Const. Veh.	Total 1/	Scooters	Total	Used	Total
1955	4,011					2,187	268	6,456	1,710	8,166
1956	5,235					2,602	334	8,171	2,260	10,431
1957	3,867					1,934	332	6,133	2,600	8,733
1958	3,187					1,177	253	4,617	1,885	6,502
1959	3,979					1,628	253	5,860	2,750	8,610
1960	4,277					2,068	341	6,686	2,981	9,667
1961	4,421					1,804	360	6,585	2,408	8,993
1962	4,475					1,851	367	6,693	2,368	9,061
1963	5,114					1,785	590	7,489	2,391	9,880
1964	5,640	15	1,487	445	362	2,309	524	8,473	2,752	11,225
1965	6,366	28	2,686	1,092	479	4,285	728	11,379	2,401	13,780
1966	4,507	37	2,374	1,773	660	4,844	1,123	10,474	1,818	12,292
1967	6,558	71	3,430	1,874	649	6,024	1,762	14,344	1,483	15,827
1968	7,240	36	3,364	1,707	394	5,501	2,197	14,938	1,543	16,481
1969	6,246	86	3,441	1,356	541	5,424	1,682	13,352	1,908	15,260
1970	5,984	54	3,743	1,470	622	5,889	1,657	13,530	1,851	15,381
1971	6,165	152	5,042	2,349	854	8,397	1,616	16,180	1,389	17,569
1972	5,539	274	4,321	1,747	836	7,178	1,824	14,541	1,354	15,895

1/ Excluding trailers and caravans.

Source: Central Statistical Office, 1974

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1972 (January-December)

Area	Cars New	Used	Station-Wagons New	Used	Buses New	Used	Vans & Vanettes New	Used	Trucks New	Used	Tractors New	Used	Other Comm. (construction) New	Used	Motorcycles New	Used	Trailers/ Caravans New	Used	Total New	Used
Chingola	209	21	36	5	6	-	230	9	111	-	6	1	15	-	35	-	29	1	677	37
Kabwe, Mkushi Serenje	193	17	19	10	5	-	163	29	27	7	61	4	5	-	163	2	18	-	654	69
Kitwe	776	59	135	20	20	1	643	42	224	13	37	-	69	-	251	2	102	1	2,257	138
Livingstone	184	7	31	4	3	-	200	9	31	-	11	-	1	-	83	3	13	-	557	23
Luanshya	136	14	38	6	6	-	159	8	42	3	-	-	2	-	12	-	15	2	410	33
Lusaka	2,424	219	314	54	173	2	1,418	205	832	189	416	5	28	1	905	20	272	66	6,782	761
Mufulira	91	40	10	7	17	-	101	12	39	4	8	-	19	-	41	1	16	2	342	66
Ndola	586	53	97	10	24	-	557	56	214	18	6	2	6	-	152	4	63	4	1,705	147
Government	76	-	17	-	12	-	645	-	172	-	40	-	22	-	27	-	6	-	1,017	-
Other Areas	154	18	13	6	8	1	205	96	55	31	81	1	3	-	155	3	76	-	750	156
Total	4,829	448	710	122	274	4	4,321	466	1,747	265	666	13	170	1	1,824	35	610	76	15,151	1,430

Source: Central Statistical Office, 1974

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Table 4: ROADS PROGRAM (1972-76)

	km [1]	Estimated in SNDP	1974 Cost Estimates[2]	Status End 1974
			('000 K)	
I. SNDP				
Carry-over from FNDP				
Paving				
Chingola-Solwezi	179	3,542	3,500	completed
Chembe-Mansa	98	3,000	3,000	"
Livingstone-SheSheke [3]	180	3,789	3,720	"
Great East Road	590	2,064	2,636	"
Great North Road	810	28	32	"
Feira Road		776	678	near completion
Kariba North Access		823	820	"
Isoka-Lundazi		700	570	"
New Projects				
Paving [4]				
Lusaka-Mongu	585	17,000	15,000	near completion
Magoye-Munali	51 (widen)	1,000	1,000	half completed
Luangwa Project		3,833	4,500	completed
Samfya-Serenje	264	-	16,760	to be started
Kapiri-Mposhi-Ndola		150	2,800	?
Ndola-Kitwe	56 (dualling)	3,750	8,900	to start
Solwezi-Ikelenge	349	5,500	19,900	"
Mpika-Kasama	214	6,400	10,770	"
Kalongola-Kalabo	181 (to III)	3,200	3,620	"
Nampundwe Mine Road	23	600	760	"
Bridges				
Samfya-Serenje		18	18	completed
Lalafuta		180	150	"
Chembe		1,122	2,000	to start
Sioma		1,500	2,500	"
Other				
Strengthening		5,250	9,000	ongoing
Weigh bridges		200	360	installed
Surveys and investigations		2,500	4,700	ongoing
Subtotal		66,925	117,694	
II. Subsequent additions by MPF				
Kalulushi-Kalengwa			206	completed
Norfolk Lodge Access	11		350	"
Mongu-Senanga	110		7,000	to start
Chipata-Lundazi	174		8,000	"
Lundazi-Chama	145		10,200	"
Kasama-Mbala	164		8,000	"
Subtotal			33,756	
				planned:
				20% - 30,290 1975
Total		66,925	151,450	30% - 45,435 1976
				30% - 45,435 carryover

III. Additional paving proposals by MPTW [5]				vpd
M11 - Namwala-Choma	169		9,300	120
M3- Kawambwa-Mansa Airport	160		9,600	105
D104/D791- Chipata-Luangwa				
South Airport	92		5,060	182
M18- Kalulushi-Jct. M8	256		12,825	175
D773-M8 - Kalengwa Mine	41		2,440	150
D94 -Mansa-Samfya	79		3,735	150
D776 -Choma-Batoka road link	35		1,915	110
D391-Mazabuka	47		2,330	240
D468-T3-Mpongwe	52		2,575	200
Access roads	323			

1/ Some differences appear between SNDP and later MPTW figures; these latter were used

2/ When Planning and Roads Dep. differ, used the latter.

3/ Including K200,000 for Kazungula pontoon.

4/ The Chinese loans will be financing: K9M for the Lusaka-Mongu road, 100% of the Samfya-Serenje road, and 60% of the Solwezi-Ikelenge, Mpika-Kasama and Kalongola-Kalabo roads.

5/ Extracted only those with vpd > 100.

Source: SNDP; MPF, "Mid-Term Review;" Roads Department, various documents; own elaboration, 1974.

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SNDP Transport Related

Table 5: PROVINCIAL INVESTMENT PROGRAM[1]/
('000 K)

Province/ Sector	Prov. and Local Governments 2/	(1974)	Transport					Total
			Roads	Build.Workshops & Maint. Camps	Other	Total	(1974)	
Luapula	600	(52)	1,815	260	20	2,095	(285)	2,695
Northern	232	(87)	1,666	223	191	2,080	(365)	2,312
Eastern	750	(54)	1,625	255	20	1,900	(355)	2,650
Southern	630	(60)	2,444	506	20	2,970	(331)	3,600
Center	860	(80)	737	201	12	950	(301)	1,810
Copperbelt	200	(20)	781	588	21	1,390	(225)	1,590
Northwestern	593	(75)	2,109	513	25	2,647	(83)	3,240
Northern	670	(77)	3,115	860	25	4,000	(579)	4,670
Total	4,535	(505)	14,292	3,406	334	18,032	(3,024)	22,567

1/ The funds are given to the provinces through the Office of the Cabinet Minister. Small amounts are also allocated for transport and included under other headings, but no details are available.

2/ Capital grants to Rural Local Authorities, for road upgrading.

Source: SNDP, Estimates of Revenue and Expenditure, 1974.

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Table 6: ROAD TRANSPORT FEES AND FINES

1. **Motor vehicles and trailers annual licence fees**

		K
- Motorcycles		6

	Vehicle	Trailer

- Public service vehicles and trailers (except hire cars and taxicabs)

	Vehicle	Trailer
a) net weight ≤ 5,000 lb	30	20
b) net weight exceeding 5,000 lb but not exceeding 7,000 lb	60	30
c) net weight exceeding 7,000 lb but not exceeding 8,000 lb	100	50
d) net weight exceeding 8,000 lb but not exceeding 10,000 lb	130	70
e) net weight exceeding 10,000 lb but not exceeding 12,000 lb	160	90
f) net weight exceeding 12,000 lb but not exceeding 14,000 lb	200	110
g) net weight exceeding 14,000 lb but not exceeding 16,000 lb	240	130
h) net weight more than 16,000 lb	280	150

- Light trailers and caravans		4

- Contract or hire cars and taxicabs

a) net weight ≤ 1,800 lb	20	
b) net weight exceeding 1,800 lb but not exceeding 3,400 lb	25	
c) net weight more than 3,400 lb	30	

- Private motor cars

a) net weight ≤ 1,500 lb	15	
b) net weight exceeding 1,500 lb but not exceeding 1,800 lb	20	
c) net weight exceeding 1,800 lb but not exceeding 3,400 lb	25	
d) net weight more than 3,400 lb	30	

- Other motor vehicles except farm tractors, and other trailers

	Vehicle	Trailer
a) net weight ≤ 1,500 lb	15	10
b) net weight exceeding 1,500 lb but not exceeding 1,800 lb	20	13.33
c) net weight exceeding 1,800 lb but not exceeding 3,400 lb	25	16.67
d) net weight exceeding 3,400 lb but not exceeding 7,000 lb	30	20
e) net weight exceeding 7,000 lb but not exceeding 8,000 lb	60	40
f) net weight exceeding 8,000 lb but not exceeding 10,000 lb	90	60
g) net weight exceeding 10,000 lb but not exceeding 12,000 lb	120	80
h) net weight exceeding 12,000 lb but not exceeding 14,000 lb	160	100
i) net weight exceeding 14,000 lb but not exceeding 16,000 lb	200	120
j) net weight more than 16,000 lb	240	140

2. **Public service vehicles licence fees**

Road service licence	4.00/year
Duplicate	.25
Endorsement	2.00
Short-term road service licence	2.00/week
Identity certificate	4.00
Duplicate	.25
Endorsement	.50
Appeal to Road Service Tribunal	20.00
Forms of monthly returns (24 forms)	.10

3. **Certificate of Fitness fees** | K

Examination of motor vehicle	4.00
Examination of trailer	2.00
Reexamination of motor vehicle	2.00
Reexamination of trailer	1.00
Duplicate of documents	.25
Appeal to Commissioner	6.00

4. **Test Certificate fees**

Vehicle examination	1.00
Duplicate certificate	.25
Appeal to Commissioner	6.00

5. **Registration fees**

Duplication registration book	.50
Duplicate licence or token	.25
Temporary registration cards	.50
Registration of new owner	.50
Assignment of registration card not currently in use	10.00
Assignment of registration card currently in use	20.00

6. **Driving licences fees**

Driving licence	4.00
Duplicate	1.00
Provisional	1.00
Extension	.25
Driving test	2.00
Renewal of public service vehicle driving licence	.25
Appeal to Commissioner	6.00

7. **Fines**

	1st time up to	subsequent
Lack of test certificate when required	50	100
Lack or contravention of road service licence	200	up to 500
Lack of required accounting by public carriers	50, plus 10 for each day the offence continues	
Exceeding authorized axle load	500	
Carrying more passengers than authorized	50	100
Others, generally	20	100

Source: Roads and Road Traffic Act, Chapt. 766, Laws of Zambia, 1974:

1. First Schedule
2. Second Schedule of Subsidiary Legislation, Public Service Vehicles Licencing and Use Regulations
3. Second Schedule of Subsidiary Legislation, Certificate of Fitness Regulations
4. Second Schedule of Subsidiary Legislation, Test Certificate Regulations
5. Second Schedule of Subsidiary Legislation, Registration and Licencing Regulations (The fee for initial registration is not stated)
6. Third Schedule of Subsidiary Legislation, Driving Licence Regulations

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Table 7: IMPORTS AND EXPORTS BY ROUTE (EXCLUDING PETROLEUM PIPELINE), 1970-1974
(thousand tons, %)

Year	Lobito TT	%	Dar es Salaam TT	%	Mombasa TT	%	Malawi TT	%	Rhodesia TT	%	Air TT	%	Botswana TT	%	Total TT	%
							Imports									
1970	118	7			248	15	18	1	1293	77	4	-	-	-	1681	100
1971	269	16			295	18	29	2	1048	64	7	-	-	-	1648	100
1972	144	11	126	10	84	7	39	3	857	68	8	1	-	-	1258	100
1973	418	49	200	23	68	8	109	13	35	4	25	3	4	-	859	100
1974*	453	45	295	29	92	9	136	13	-	-	27	3	13	1	1016	100
UN 1/	276	20	516	37	264	19	204	14	-	-	144	10	-	-	1404	100
							Exports									
1970	187	22			253	30	6	1	399	47	4	-	-	-	849	100
1971	176	22			222	28	9	1	390	49	2	-	-	-	799	100
1972	170	20			210	25	7	1	467	54	2*	-	-	-	856	100
1973	438	54	284	35	45	6	41	5	5	-	3*	-	-	-	816	100
1974*	517	55	322	34	91	10	7	1	-	-	n/a		-	-	937	100
UN 1/	420	48	240	28	120	14	84	10	-	-	-	-	-	-	864	100

* Estimate
1/ As estimated in 1973

Source: UN, CPO, 1974

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Table 8: NAMB'S TRANSPORT CAPACITY, JUNE 1974

District/ Province	Contractors Main Office at	No.	Vehicles No.	Total Ton Capacity
Mumbwa	Lusaka	13	40	874
	Mumbwa	3	13	197
	Kabwe	1	1	10
		17	54	1081
Lusaka Rural	Lusaka	29	81	1465
	Kabwe	2	14	242
		31	95	1707
Kabwe	Lusaka	6	14	136
	Kitwe	1	1	12
	Kapiri-Mposhi	1	7	40
		8	22	188
Mkushi-Serenje	Mkushi	1	4	100
	Kitwe	1	4	51
	Lusaka	2	5	57
	Mufulira	1	17	530
		5	30	738
Luapula Prov.	Lusaka	1	3	56
	Mansa	3	5	65
	Luanshya	1	4	34
		5	12	155
Copperbelt Prov.	Luanshya	2	9	66
	Kitwe	2	7	122
	Chingola	1	1	9
	Ndola	1	2	31
		6	19	228
Mongu	Limulunga	1	2	19
	Lusaka	1	3	73
		2	5	92
Senanga	Lusaka	1	1	10
	Senanga	1	1	8
		2	2	18
Kaoma	Lusaka	3	5	93
	Kafue	1	2	50
		4	7	143
Southern Prov.	Pemba	2	6	96
	Chisekesi	1	8	304
	Choma	1	5	185
		4	19	585
Mazabuka	Livingstone	1	3	125
	Kafue	1	3	32
	Lusaka	1	1	11
	Mazabuka	1	2	50
		4	9	218
N.W. Prov.	Ndola	1	4	40
	Solwezi	2	2	12
	Lusaka	1	1	10
		4	7	62
Eastern Prov.	Chipata	2	26	396
	Lusaka	35	220	6092
	Ndola	4	11	321
	Kabwe	1	4	105
	Kitwe	1	3	21
		43	264	6935
Total, of which in Lusaka -		135 93 (69%)	545 374 (69%)	12150 8877 (73%)

Source: NAMB, and own elaboration, 1974.

March 1975

Table 9: CONTRACT HAULAGE: OPERATING COSTS AND TARIFFS, 1974

| | Maize Movement | Malawi Route | | Refriger. Meat to Mombasa |
		Blantyre - Kabwe	Lusaka- Balaka	
1. Operations, average per truck:				
Driver's wage, K/month[0]	260	180	138	172
Single trip: approx. length, km	64	1228	966	2253
load, tons	25	28	25	25
	empty 1 way	both ways	both ways	empty 1 way
Round trip, frequency	2/day	3/month	3/month	2/month
Annual kilometers	61,400	88,400	69,550	108,144
Truck, capital cost, K	12,075[1]	26,000		
2. Fixed costs/truck/year		**K**		
License	300	240	2/	324
Insurance	187	480	2/	216
Overhead and accident provision	3,600	2,400	7,860	-
Depreciation	2,415	4,320	15,708[2]	13,800
Allowances	2,110	-	-	-
	8,612[3]	8,760	23,568	14,340
3. Costs per km:		**ngwee/km**		
Fixed	14.0	9.9	33.9	13.3
Running cost:				
Fuel & Oil	4.8	4.4	7.6	3.6
Maintenance	12.5	7.5	1.7	-
Tires	3.5	3.1	6.9	2.6
Driver's wage	6.4[3]	2.4	2.4	1.9
	27.2	17.4	18.6	8.1
Total	41.2	27.3	52.5	21.4
		ngwee/ton-km		
Total cost per ton-km, if fully loaded	1.65[4]	1.0	2.1	.85
" " " " ", if 50% loaded (or empty trip)	3.30	2.0	4.2	1.7
Actual rates per ton-km	6.00	imp. 4.0 ex. 1.2	imp. 4.6 or 3.7[5]	2.7
		K		
(Rates per ton-trip)		(imp. 49) (exp. 45)	(44) (or 36[5])	(120)

0/ The range is surprising.
1/ Seems rather low for a 25 ton truck.
2/ License and insurance are included under depreciation. In this case, operation is done with CPO trucks, and CH is supposed to pay back as depreciation 3.5% of the revenues; however, the amount shown seems rather high.
3/ CH indicates "all charges based on 1.25 unit per unit."
4/ CH indicates 18 ngwee/ton-km, with the same basic data and an error in calculation.
5/ Fertilizer.

Source: Contract Haulage, own elaboration, 1974.

March 1975

Table 10:   ZTRS OPERATING COSTS AND TARIFFS, 1973
(K)

	Total/trip	Average cost/km 1/
DIRECT COSTS	871.3	.417
Traffic expenses	369.2	.177
Fuel & oil	122.6	.059
Tires	79.2	.038
Other	56.1	.027
Drivers wages	111.3	.053
Administrative expenses	138.3	.066
Freight expenses	42.8	.020
Maintenance (workshops)	321.0	.154
Wages	117.9	.056
Spare parts	169.2	.081
Materials	13.7	.007
Subcontractors works	13.6	.007
Other	6.6	.003
INDIRECT COSTS	256.2	.122
Vehicle depreciation	161.7	.077
Financial	75.1	.036
Other depreciations	19.4	.009
TOTAL COST	1127.5	0.5389
Average revenue	1145	0.547

Average ngwee/ton-km 2/ = cost 2.22
                              revenue 2.25

1/ Average length/trip: 2,092 kms
    Average trips/unit/year: 22.3

2/ Average load: 20 tons (general cargo) or 29 tons (copper)

Source: ZTRS, own elaboration, 1974

Table 11: ROADS DEPARTMENT: EXPENDITURE BY PROVINCES - 1973

Recurrent	Copperbelt	Central	Southern	Northern	Western	Eastern	North Western	Luapula	General	Total
	K	K	K	K	K	K	K	K	K	K
Maintenance of Roads and Airfields	108,871	771,317	565,806	376,971	285,339	244,968	197,823	352,127	162,630	3,065,852
Cycle Maintenance and Roads Betterment	360,000	366,500	218,000	155,000	170,000	110,000	130,000	125,000	-	1,634,500
Lusaka International Airport	-	113,000	-	-	-	-	-	-	-	113,000
TOTAL	468,871	1,250,817	783,806	531,971	455,339	354,968	327,823	477,127	162,630	4,813,352
CAPITAL FUND										
Road Construction	182,493	328,699	1,009,785	59,585	805,813	404,171	95,710	1,344,123	11,724	4,242,103
Bridge Construction	-	21,133	-	-	-	28,718	35,602	-	-	85,453
Harbours and Slipways	-	-	-	-	-	-	-	-	-	-
TOTAL	182,493	349,832	1,009,785	59,585	805,813	432,889	131,312	1,344,123	11,724	4,327,556
MISCELLANEOUS WORKS AND SERVICES FOR OTHER BODIES										
(a) Department of Civil Aviation	270,410	42,390	-	-	12,311	876,721	51,335	-	-	1,253,167
GRAND TOTAL	921,774	1,643,039	1,793,591	561,556	1,273,463	1,664,578	510,470	1,821,250	174,354	10,394,075

Source: Roads Department, 1973 Annual Report, 1974.

March 1975

Table 12: ZAMBIA: MOTOR OMNIBUS FARES

FIRST SCHEDULE
(Paragraph 4)

LONG DISTANCE SERVICES

Column 1 Distance	Column 2 Fare	Column 1 Distance	Column 2 Fare	Column 1 Distance	Column 2 Fare	Column 1 Distance	Column 2 Fare
km	K	km	K	km	K	km	K
8	0.10	280	3.00	570	5.50	860	7.30
15	0.20	290	3.10	580	5.50	870	7.40
25	0.30	300	3.20	590	5.60	880	7.40
30	0.40	310	3.30	600	5.70	890	7.50
40	0.50	320	3.40	610	5.80	900	7.50
50	0.60	330	3.50	620	5.90	910	7.60
60	0.70	340	3.50	630	5.90	920	7.60
70	0.80	350	3.60	640	6.00	930	7.70
80	0.90	360	3.70	650	6.10	940	7.70
90	1.00	370	3.80	660	6.10	950	7.80
100	1.10	380	3.90	670	6.20	960	7.80
105	1.20	390	4.00	680	6.20	970	7.90
115	1.30	400	4.10	690	6.30	980	7.90
120	1.40	410	4.20	700	6.40	990	8.00
130	1.50	420	4.30	710	6.40	1,000	8.00
140	1.60	430	4.40	720	6.50	1,010	8.00
150	1.70	440	4.50	730	6.60	1,020	8.10
160	1.80	450	4.50	740	6.60	1,030	8.10
170	1.90	460	4.60	750	6.70	1,040	8.10
180	2.00	470	4.70	760	6.70	1,050	8.20
190	2.10	480	4.80	770	6.80	1,060	8.20
200	2.20	490	4.90	780	6.90	1,070	8.30
210	2.30	500	4.90	790	6.90	1,080	8.30
220	2.40	510	5.00	800	7.00	1,090	8.30
230	2.50	520	5.10	810	7.10	1,100	8.40
240	2.60	530	5.20	820	7.10	1,110	8.40
250	2.70	540	5.30	830	7.20	1,120	8.40
260	2.80	550	5.30	840	7.20	1,130	8.40
270	2.90	560	5.40	850	7.30	—	—

LOCAL SERVICES

Column 1 Distance	Column 2 Fare	Column 1 Distance	Column 2 Fare
km	K	km	K
2.5	0.03	8.5	0.08
3.5	0.04	9.5	0.09
4.5	0.05	10.5	0.10
5.5	0.06	12.5	0.12
7.0	0.07	16.0	0.15

NOTE—In any case where the distance to be travelled falls between two consecutive distances shown in the Schedule, the fare to be charged shall be the one for the greater distance.

SECOND SCHEDULE
(Paragraph 5)

LUXURY COACH SERVICES

Column 1	Column 2
	K
Lusaka—Kabwe	2.50
—Ndola	5.00
—Kitwe	6.00
Kabwe—Ndola	3.00
—Kitwe	4.00
Ndola—Kitwe	1.00

March 1975

ZAMBIA

AGRICULTURE AND RURAL SECTOR SURVEY

Roads Department Organization

```
                    ┌─────────────────┐
                    │ Director of Roads│
                    │      1/1        │
                    └─────────────────┘
                            │
                ┌───────────────────────────┐
                │ Assistant Director of Roads│
                │           1/1              │
                └───────────────────────────┘
                            │
```

| Planning & Design 1/1 | | Administration 17/14 | Training School 3/2 | Works 1/1 |

Planning & Design branch:

| Traffic Statist. & Road Ordinance 3/2 | Planning Unit 2/1 | Survey & Drawing Office 16/12 | Design Office 6/- |

Works branch:

| Contracts 3/3 | Materials Laboratory 22/16 | Maintenance 2/2 |

P R O V I N C E S

| Copperbelt 15/10 | Luapula 12/8 | Eastern 10/5 | Western 10/4 | N.Western 7/4 | Central 38/24 | Southern 26/17 | Northern 26/17 |

Central:

| Lusaka Airport 2/2 |

In each province:

Provincial Road Engineer
Assistant Road Inspector
Road Superintendent (Works)
Road Superintendent (Maintenance)
Road Foremen (4)

Note: Establishment/Filled positions.

Source: Roads Department, November 1974.

ZAMBIA

AGRICULTURAL AND RURAL SECTOR SURVEY

PERFORMANCE AND PROSPECTS IN CROP AGRICULTURE

Tables:

ZAMBIA

AGRICULTURAL AND RURAL SECTOR SURVEY

PERFORMANCE AND PROSPECTS IN CROP AGRICULTURE

Maize

Background

1.   Maize is the staple food of Zambia's urban population and also for
about 70% of the rural population. Local open pollinated varieties are grown
for subsistence, and an improved Composite A variety has been produced by the
Research Branch. The main hybrid variety, SR52 was evolved in Rhodesia, but
sufficient seed is now produced locally to satisfy Zambia's needs and leave
some for export. A Zambian hybrid variety, ZH1, is also being produced for
sale to farmers, but most farmers who market maize grow the proven SR52
variety. In a normal year, with an application of 350 kgs 'X' mixture (20N-
10P-5K-10S) basal dressing and 200 kgs urea top dressing and recommended
cultural practices, SR52 will yield about 5-1/2 m tons/ha.

Performance

2.   The vagaries of the weather and producer price changes have led to
wide fluctuations in maize marketed through official channels, as can be seen
in Table 13.1. Supply is from both the large-scale commercial sector, includ-
ing special production schemes, which up to 1972 accounted for 60%-70% of the
crop marketed through official channels, and from the traditional sector.
Fluctuations in marketed production from traditional farmers are large, because
subsistence needs are satisfied first. In addition to weather and price
uncertainties, the availability of inputs at the correct time and in the
quantities required, and the rate at which Zambian farmers move into commer-
cial production make the future supply position problematic.

3.   Present Government policy is to have 50% annual demand as a reserve
stock prior to the start of a new buying season; some reserve has been built
up since large imports in 1970-71 stimulated the policy, but the needs of
neighbors (Zaire and Tanzania) have led to subsequent export of part of this
reserve. Government has correctly proposed stimulating production in all
deficit provinces (Northern, Luapula, Copperbelt, North Western and Western)
and encouraging more production by small-scale farmers near the main markets.

Harvest Year	Central	Copperbelt	Eastern	Luapula	Northern	North Western	Southern	Western	Total
1964	1,323.9	3.0	95.0	2.0	15.7	-	811.1	1.0	2,251.7
1965	1,889.2	3.9	80.3	4.1	19.6	1.2	899.8	1.0	2,899.1
1966	2,330.3	10.6	150.8	11.6	28.3	1.5	1,705.6	2.1	4,240.8
1967	2,326.3	20.1	89.5	14.9	69.0	17.3	1,680.5	5.4	4,222.7
1968	1,590.0	15.7	117.3	23.3	93.2	13.2	1,031.7	23.0	2,908.2
1969	1,322.2	27.6	26.1	36.7	113.8	28.3	1,443.6	21.9	3,020.2
1970	903.2	6.7	15.6	19.6	56.8	15.2	461.4	11.8	1,490.3
1971	2,604.4	33.1	152.0	25.4	63.8	33.1	1,504.2	27.8	4,443.8
1972	4,196.7	28.7	334.8	28.8	72.2	28.6	2,115.0	35.8	6,850.6
1973	2,510.1	132.5	505.9	15.0	59.0	25.7	1,170.6	14.7	4,434.0
1974 May- Sept.1/	1,924.9	71.1	358.8	6.3	39.5	21.3	1,225.0	3.8	3,651.3

1/ MRD, Marketing Department
Source: Ministry of Planning and Finance, Economic Report, (1973)

Objectives and Proposals

4.   In view of the high cost of imports if required in a deficit year,
and the continued opportunity for profitable exports to Zaire in the foresee-
able future (see Agricultural Markets and Prices Annex), Zambia will be
well-advised to maintain a policy of keeping a reserve until mid-February
each year, by which time first estimates of the ensuing season's crop will be
known. Whether a reserve a 50% of domestic demand is correct needs further
study. Surpluses can be released for export, but countries which offer long-
term markets--Zaire, and initially Tanzania also--cannot afford to be totally
dependent on chance surpluses and at least basic quantities for such exports
would be included in production plans.

5.   The strategy to meet this target will be to maintain production
from the large-scale commercial sector through price policy and greater farm
management assistance to emergent large-scale Zambian farmers, and to encourage
much greater production from small-scale farmers near the line-of-rail and
markets, currently drawing supplies from the line-of-rail, in the Southern,
Central, Copperbelt and parts of the North Western, Luapula and Northern Pro-
vinces. Self-sufficiency, which can be achieved through integrated projects
in Rural Growth Areas (RGAs) based on maize, should be reached in all outlying
provinces. In parts of Northern, Luapula and North Western Provinces, which
are either close to the Copperbelt market or to export markets in Zaire and
Tanzania, an export surplus can be envisaged. Correct pricing policy will be
the key to success.

6.   In the Eastern Province, only self-sufficiency plus a local reserve
should be envisaged, and diversification to other profitable crops should be
encouraged. To immediately alleviate the need for Eastern Province maize
and speed this diversification policy, the price incentive should be reinforced
by a package maize project with smallholders in reserve areas close to the
line-of-rail in the Central and Southern Provinces. It is there that, due
to smallholders long exposure to commercial agriculture, the most rapid re-
sponse to incentives can be anticipated. Once a stage is approached when
small farmers on the line-of-rail or in export-potential provinces are pro-
ducing the majority of maize required for self-sufficiency, incentives should
be given to large-scale farmers to diversify away from maize.

Rice

Background

7.   Rice has always been a minor crop in Zambia, grown largely for
subsistence or local sale in a few restricted localities, always below 1,300
meters, in the valleys of the Zambezi, Luapula, Chambeshi and Luangwa Rivers
as dambo (swamp) rice. Since 1970, a French SATEC aid team has developed

small-scale rice production through an extension project in the lower Luapula
Valley, and Northern Province provincial extension staff have aided rice
development on the Chambeshi River. Both these schemes have been based on
increased extension, improved seed supply, improved implements, credit, fer-
tilizers and improved marketing. A small area of irrigated rice is being
developed on the shores of Lake Kariba in Southern Province, and floating
rice trials are being carried out by Research Branch on the Zambezi Flood
Plain at Mongu.

Performance

8.   The present recommended Indica varieties have yielded over six
tons/ha on experimental plots and in some small-farmer pilot trials, but
average yields for most farmers in the SATEC project have fallen in the one
to two ton range. At the present price of 15 n/kg of paddy, rice is an
attractive proposition for the small farmer; and further increases in produc-
tion from the Luapula and Northern Provinces can be anticipated. If double
cropping proves feasible, irrigation development near Lake Kariba should
also be an economic proposition, and will use land not at present under cul-
tivation. Rice marketed through official channels in the past five years is
given in Table 13.2. With imports running at a level equivalent to 6,000
tons of paddy, the 1975 target will still only displace 17% of imports, so
there is ample scope for an increase in rice production.

Table 13:2:   MARKETED PADDY RICE PRODUCTION BY PROVINCE
(Metric Tons)

	1970	1971	1972	1973	1974*	1975 Target
Luapula	89	93	96	217	472	580
Northern	86	114	110	128	192	240
Eastern	1	43	64	91	120	180
Western	92	29	12	50	56	70
N. Western	7	8	4	1	16	20
	275	287	286	487	856	1,080

* 1974 figures are estimates.

Source: MRD, August 1974.

Objectives and Proposals

9.   The best scope for immediate development is to build on the encourag-
ing results of rain-fed rice, utilizing flood control in river valleys that
has been developed in Northern and Luapula Provinces. The present 400 ha
under rice in Luapula Province, and 150 ha in Northern Province would need a

six-fold expansion to satisfy existing demand. An attainable five-year target would be two-thirds of the anticipated demand of 7,600 tons in 1980 from expansion in these two provinces, by the inclusion of a major rice component in integrated agricultural projects in RGA's in each province. Some 2000 ha in the Luapula, and 1,500 ha in the Chambeshi Valley would be developed, building on the experience of existing pilot schemes that are based on improved extension, seed, fertilizer, credit, marketing and milling facilities. With a yield of only 1.5 tons, the 5,250 tons produced would represent 70% of demand in 1980, and give improved incomes to some 4,500 farmers, each on average cultivating 0.8 ha of paddy.

10.   With the increased attention recommended by the mission for irrigation, rice is likely to feature in projects proposed for the Barotse Flood Plain and Lake Kariba, and possibly also in the cropping program recommended for the Kafue Flats. Other areas requiring feasibility studies for large-scale irrigation, in which rice would certainly feature as a crop, are on the Chambeshi Flats, and on the fringes of Lake Bangweulu. The sites are detailed in the Annex on Water Resources. Self-sufficiency in rice by 1980 might require a further 1,200 ha developed under irrigation, with a yield of 2 tons/ ha. Beyond 1980, further expansion could not only meet increased demand, but also enable profitable exports to Zaire.

Wheat and Barley

Background

11.   Wheat has been successfully grown in Zambia only under irrigation in the dry season; and production dwindled from 2,500 tons, accounting for 15% of local requirements, in 1964 to nil in 1968, when imports totalled 60,000 tons. In 1974, 112,000 tons were imported. Production fell because it was no longer economic to grow wheat, with yields then averaging only 2-1/2 tons/ha and a price fixed at 1967 import parity of only K 8.00 per 90-kg bag. However, subsequent trials by Projects Division and Research Branch in the period 1969-74, using new varieties (Umniati, Zambezi I and II and Z.CA/13 are now recommended) are giving yields in the four- to six- tons/ha range and commercial farmers should be able to achieve 4 tons/ha. The import parity price has now risen to over K 20 per ton; and Government has set a producer's price of K 16.00 per bag for the 1975-76 growing season which is expected to be sufficient to encourage production by commercial farmers with existing irrigation facilities and also to encourage some new capital investment in irrigation. Over 50 commercial farmers apparently intend to grow irrigated wheat during the 1975 dry season.

Objectives and Proposals

12.   Zambia's objective should be to move towards self-sufficiency as soon as possible, but at the same time to stem rapidly rising demand for wheat-bread by reducing consumer subsidies (the present subsidy is over 100%).

In a country with such low rural incomes, it is inequitable that an imported
cereal is subsidized to wealthier urban wage earners, who have now come
to regard wheat as their staple food. Consumers should pay the economic
price on imported luxury items: a social argument can be made for subsidizing
maize as a basic food, but not wheat.

13. To meet the current demand with yields of 4 tons/ha, over 25,000 ha
would be required. Even if the 50 commercial growers average 20 ha each this
season, only 1,000 ha would be grown, and production would meet 5% of total
demand. If this season's results are encouraging, it is possible to visualize
over a 5-year period a maximum of 100 commercial farmers growing 40 ha each,
providing 15% of total demand. Sufficient seed is produced locally for such
a program. In addition, detailed feasibility studies should be carried out
for combined state/private commercial/external aid ventures in large-scale
irrigated wheat, at sites proposed in the Water Resources Annex, fringing
the Kafue Flats and northeast of the Big Concession in Central Province, as
well as the Munkumpu area of the Copperbelt, where a study financed by the
Federal Republic of Germany has already been initiated. Over a ten-year period,
possibly 10,000 ha could be sown to wheat, the major constraint being avail-
able water in the Kafue. This would account for a further 40% of existing
demand.

14. As a third source of wheat, the Government has given approval for
a rain-fed wheat scheme financed by Canadian Aid in the Kalomo-Livingstone
area. As no trials have yet been done, the success of this venture is problem-
atic, but if initial results are encouraging, the Canadians visualize rapid
expansion based on medium-size commercial farms with 100-200 ha of wheat, each
initially managed by Canadians but handed over to Zambians trained on the
farms. However, whereas full research and field experience are available for
dry season irrigated wheat, the rain-fed program will have to start from
scratch, using imported wheat varieties, and thus, at this stage, it is not
possible to postulate the growth of production. If, however, the scheme
is successful, its expansion could be much more rapid than the irrigated crop
with which it would compete strongly with lower yields but much lower costs.

15. Suitable varieties of malting barley are also available for irri-
gated production in the dry season, and it is anticipated that self-sufficiency
in this sphere can be rapidly reached by commercial farmers under contract to
brewers.

Cotton

Background

16. Cotton growing is confined to the Central, Southern and Eastern
Provinces, where it grows well on the plateau areas and in the Luangwa Valley.
Further north, heavier rainfall (in excess of 40"), late showers in April and

May, and fewer sunshine hours retard growth and necessitate more costly pest
control. After being first introduced in the 1930's, pest problems led to
near-cessation of production in the 1950's. The advent of new insecticides
led to a resurgence of interest in the crop in the 1960's, when it became
firmly established as a smallholder crop. Albar 637 is the major variety
grown, fertilizer requirements are low, but labor input is high for weeding,
spraying and picking.

Performance

17.   More attractive maize prices caused commercial farmers to cease
cotton production in 1970, and subsequently caused a decline in smallholder
production, especially in 1973 and 1974. A 90%-100% producer price increase
(from 15-17 n/kg in 1972-73 to 30-32 n/kg for Grade A cotton in 1974-75) has
revived interest in the crop, and five commercial farmers will also be growing
cotton in the Mazabuka District in the coming season. The importance of
cotton seed for oil expression is discussed in para. 38 below. Recent produc-
tion figures by province are given in Table 13.3.

Table 13.3: SEED COTTON PRODUCTION BY PROVINCE, 1967-74
(Metric Tons)

Province	1969	1970	1971	1972	1973	1974*	1975 Target
Central	4,254	4,051	10,418	7,561	4,592	2,000	11,720
Southern	1,309	306	610	521	139	120	1,030
Eastern	1,343	779	711	237	401	380	750
Total	6,906	5,136	11,739	8,319	5,132	2,500	13,500

* 1974 figures are estimates.

Source: MRD, August 1974.

18.   The 1975 target figures, which were based on an earlier 1974
estimate of production of 6,300 tons, are unlikely to be reached, but could
be produced in 1976, providing the right balance between the cotton and maize
prices are set, particularly to encourage production in the Eastern Province.
With demand for lint by Kafue Textiles anticipated to rise to 6,000 tons of
lint (requiring 18,000 tons of seed cotton) by 1980, further production
increases will be required. Apart from the key relationship with the maize
price, new varieties at present being selected by Research Branch, and intro-
duction of ULV spraying (which reduces labor and water requirements) should
both contribute to increased cotton production. Zambia already has sufficient
ginning capacity at Lusaka and Chipata to handle an 18,000 ton crop.

Objectives and Proposals

19.   Zambia should aim to be self-sufficient in cotton in the early to mid 1980's, producing 18,000 tons of seed cotton. Major cotton elements should be included in smallholder projects for Southern, Central and Eastern Provinces. In view of the price interrelationships, and the need to develop improved farming systems, an integrated approach should be used. In Southern and Central Provinces cotton would be a subsidiary cash crop to maize, but in Eastern Province it would be the major cash crop, with alternatives of ground-nuts and Burley Tobacco. A necessary prerequisite for the cotton element in these projects would be improvements in price policy, and it should be recognized that an inggrated project will take perhaps a decade to become fully effective. The program should therefore be long-term and consistent. Government should also review the planned expansion of Kafue Textiles, and study the economic feasibility of alternatively locating another textile plant in Chipata.

Virginia Tobacco

Background

20.   Virginia Tobacco is the most important of the several types of tobacco that have been grown in Zambia. After its introduction in the 1950's, production reached a peak of 10,970 tons in 1964 from an area of 10,500 ha. Since then, a combination of the departure of expatriate growers and a move from tobacco to less labor-intensive crops brought about by labor problems and wage increases led to a fall in production from the large-scale commercial sector. Production is now increasing again with the development of assisted tenant and, more especially, smallholder development through the Tobacco Board of Zambia (TBZ), as can be seen from the planted area figures from 1972-75 in Table 13.4 below.

Table 13.4: VIRGINIA FLUE-CURED TOBACCO PRODUCTION, 1967-74

Year	Production	Average Producer Price (K/ton)	Area Planted (Ha)	Yield (Kg/ha)
1964	10,970	513	10,440	1,050
1965	6,610	602	6,639	996
1966	6,570	675	6,867	957
1967	4,950	668	4,605	1,075
1968	6,290	674	5,924	1,062
1969	5,020	777	5,829	861
1970	4,790	802*	5,467	876
1971	5,910	808*	5,634	1,049
1972	5,530	890*	4,920	1,124
1973	6,230	859*	5,423	1,147
1974	6,200	987	6,738	918

* Includes subsidy.

Note: 1975 planted area is 8,224 ha.

Source: MRD and TBZ.

Performance

21.   TBZ was set up in 1967 to control tobacco processing and marketing, and in 1968 it entered the production field. In 1974, TBZ had 71 tenant farmers growing 1,847 ha of tobacco, 108 assisted tenants growing 1,036 ha, 1,596 family farmers growing 851 ha, and 818 ha under direct production at some of the schemes and at its two staff- and farmer-training colleges, Mukonchi and Popota. From being responsible for 40% of the total crop in 1970, TBZ farmers and schemes produced 64% of the crop in 1974, or nearly 4,000 tons, of which 640 tons (11%) of the total crop came from the small family farms. Future expansion will largely rest on these smallholders, who are expected to number 2,384 in 1975 and to grow 1,297 ha, a 50% increase over 1974. This steady expansion should enable the currently underutilized capacities of the auction floor and packing shed to break even within three years, instead of incurring losses. In addition, greater production should attract more buyers, and the greater competition result in better prices. The subsidy introduced in 1970 as an incentive to keep farmers in production by guaranteeing a minimum price, was not paid in 1975, as the average price of 98.7 n/kg exceeded the guaranteed minimum of 94 n/kg. This minimum may need review in the light of cost inflation, and a close watch is needed on relative prices, particularly of maize, which can be a competing as well as a complementary crop.

Objectives and Proposals

22.   Zambia's immediate objective should be to increase production, both to increase the volume of exports and to fully utilize the capacities of her auction floors and packing sheds. In view of labor cost increases, it seems likely that future expansion will largely rest on family farms. The existing IBRD-assisted Family Farming tobacco project made a good start in this direction and appears to offer the best approach to future development, for which expansion areas have already been identified. However, in mid-1975, farmer recruitment was only two-thirds of projection, and although production of maize, a complementary crop within the scheme, was ahead, tobacco production was only 55% of projected levels. The reasons for this situation should be reviewed urgently, and in particular the role of a high relative price of maize in the Eastern Region in limiting both farmer recruitment to the scheme and tobacco production within it should be investigated.

<div align="center">

Burley Tobacco

</div>

Background

23.   Burley Tobacco is an ideal smallholder crop, as it is air-cured in simple barns and fits well in a rotation before maize or groundnut, which benefit from residual fertilizer. It grows best in heavier loam soils and needs a medium, 35"-45", rainfall regime, and thus does best on the red sandy

clay loams of the Eastern, Central and Southern plateaus: it should also grow
well on similar soils to be found at Kaoma (Western), Kasempa (North Western)
and Mpika (Northern Province).

Performance

24.   Burley Tobacco was introduced into the Eastern Province of Zambia
in the late 1930's, and by 1950 there were 2,530 growers, producing 150 tons
of tobacco. Due to falling prices, production declined, but experienced
another revival in the early sixties, peaking at a production of 800 tons in
1964. Prices again declined, and only a few small-scale growers kept exper-
ience with the crop alive, until prices improved again in the late 1960's.
In 1971, TBZ took over responsibility for production and marketing of the
crop from the extension branch of the Department of Agriculture, and with
improved prices the crop has steadily expanded. In 1974, a buyer contracted
to purchase the whole crop at 88 n/kg, guaranteeing a price of 94 n/kg for
1975, and 99 n/kg for 1976. This substantial price increase, which will more
than keep pace with rising input costs, will cause a more rapid expansion
of the crop. At present, 96% of production is in the Eastern Province, but
TBZ has plans for other areas of the country, including parts of the Southern
Province, Kaoma in the Western Province, the Kasempa area of the North
Western Province and Serenje and Mpika Districts in the Central and Northern
Provinces. Production figures and targets for the period 1969-75 are given
in Table 13.5 below.

Table 13.5: BURLEY TOBACCO PRODUCTION, 1967-75

Harvest Year	Hectares Planted	Crop Marketed	Average Yield kg/ha	Total Value K'000	Average Price (n/kg)
1969	408	240	588	122	50.7
1970	436	255	584	143	56.2
1971	611	388	635	218	56.2
1972	569	385	676	221	57.3
1973	678	471	693	224	61.1
1974	642	430	670	379	88.2
1975	1,242	900 /1	725 /1	850 /1	94.4

/1   Estimates.

Source: Ministry of Rural Development.

Objectives and Proposals

25.   By 1980, the aim should be to increase the existing 600 ha ,of
Burley to 1,300 ha in the Eastern Province, and, at the same time, initiate
production, integrated with other crops, in RGAs in other provinces. Burley
is a suitable crop for specific areas mentioned above, and 200 ha could be

established at each of the sites mentioned in the Central, Northern, North Western Provinces, and 500 ha in the Southern Province. The speed of this depends on the phasing of the various projects, but by the mid-1980's it is possible to visualize some 2,300 ha under production, a four-fold increase. With good price prospects, Burley Tobacco will be a competitive cash crop in suitable areas, and the major constraint is likely to be shortage of trained extension staff. It will thus be necessary to expand training programs for burley extension staff at the Popota Institute in Choma.

Other Tobaccos

26.   Oriental Turkish Tobacco was an important smallholder crop in the high rainfall areas in the late 1950's and 1960's; but with falling prices, production became uneconomic. With the future still uncertain, it would appear unwise to reintroduce Turkish Tobacco or to experiment again with cigar leaf, as is being suggested; instead TBZ should concentrate on Virginia flue-cured and Burley production.

Groundnuts

Background

27.   Apart from the Chalimbana confectionery nut, which is grown in the Eastern Province as a cash export crop, the majority of groundnuts are grown for subsistence, or for trading through informal channels. The Eastern Cooperative Union (ECU) buys groundnuts in Eastern Province, grades and normally exports about 60% of its purchases for the confectionery trade, and, after supplying local confectionery requirements, sells the remainder to Refined Oil Products for oil expression. In other provinces, groundnuts marketed through official channels are generally sold for oil expression.

28.   In all areas, farmers grow local varieties for subsistence, but the major improved variety multiplied and made available to farmers for cash cropping is Makulu Red, which does well in most areas of the country, except in the lower rainfall areas of Southern and Western Provinces, where a more suitable variety, Natal Common, is grown. Groundnuts are entirely a smallholder crop, and are demanding in labor, particularly for shelling. Suitable shellers have been devised for the uniform nuts used for oil expression, where some percentage of breakage is immaterial; but the Chalimbana nut is not only irregular in shape, but hand-shelling is needed to get the premium grade prices for unbroken nuts. Owing to the danger of cross-pollination, Chalimbana production is concentrated in Eastern Province, and Makulu Red confined to other areas of the country. Rosette and cercosphora leaf spot

are the main disease hazards, and in the high-rainfall areas with acid soils 'pops' (empty shells) can be a serious problem, especially with the Makulu Red variety. Liming is needed to combat this problem.

Performance

29.   The 1970-71 Census gives an indication of the location and scale of groundnut production for the 1969-70 crop season (Table 13.6).

Table 13.6: GROUNDNUT PRODUCTION AND MARKETING (SHELLED WEIGHTS)

Province	Area '000 ha	Production (tons)	Yield 80 kg bags/ha	Quantity Sold (tons)	% of Total	Quantity Sold to Official Markets	% of Total Qty. Sold
Eastern	45	15,460	4.3	6,140	40	2,583	42
Northern	23	11,180	6.1	2,880	26)		
Luapula	20	8,750	5.4	2,580	29)		
Copperbelt	27	14,500	6.6	5,740	40)	687	5
Central	7	3,610	6.2	1,130	31)		
Southern	27	11,350	5.4	1,810	16)		
Western	7	3,400	6.2	410	12)		
N. Western	5	1,930	5.4	610	32)		
Totals	161	70,180	5.5	21,300	30	3,270	15

Source: 1970/71 Census of Agriculture.

30.   This table illustrates the geographic spread of production, though the Copperbelt figure seems rather high and Central Province correspondingly low. The figures from Eastern Province, confirm that the Chalimbana variety is lower yielding; and the overall average level of only 5 bags/ha bears witness to low plant populations, and generally less attention given to groundnuts compared to other crops. Using efficient cultural practices a smallholder can average 12-15 bags/ha. Labor input for the crop is high, and with existing margins per man hour lower than for other crops, no marked increase in production is likely without improved prices and greater extension effort. Only 30% of the crop is sold. In the Eastern Province, 42% of this (18% of total production) passes through official marketing channels, whereas in other areas only 5% of the marketed crop does (1-1/2% of total production).

31.   Table 13.7 shows recorded groundnut marketing figures for the past ten years, with the percentage marketed from the Eastern Province.

Table 13.7: MARKETED GROUNDNUT PRODUCTION,[1] 1964-74

Harvest Year	Total Marketed Production (tons)	Eastern Province Share Amount (tons)	% of Total	Price (K/ton) Grade A	Exports[2] (tons)
1964	3,630	2,260	62	114	620
1965	6,740	5,826	86	121	2,710
1966	11,530	10,886	94	121	3,480
1967	14,810	13,667	92	125	4,450
1968	5,390	4,717	86	125	6,170
1969	7,820	6,894	88	125	4,876
1970	3,270	2,583	79	125	3,920
1971	6,160	5,498	89	128	3,400
1972	6,480	6,078	93	128	2,450
1973	2,960	2,560	86	157	3,630
1974	5,060	4,608	91	212	N/A

[1] Marketed production only includes that through marketing agencies, and does not even include that sold direct to oil expressors. (In 1968, for example, one oil expressor bought 1,600 tons from farmers in Central Province).

[2] Much of exports are from purchases of the previous year.

Source: MRD and Marketing Boards.

Objectives and Proposals

32.   For Chalimbana groundnuts in Eastern Province the initial aim should be to restore production to the 1966-67 level of 12,000 tons by 1983. Over the past five years, production has averaged only 4,300 tons. A prerequisite to this achievement is a change in price policy in favor of cotton and groundnuts at the expense of maize. Current groundnut prices are 40% below estimated border-price equivalents.

33.   In other areas of the country, groundnut production for oil should be encouraged within the context of integrated crop projects in RGAs in each province. In most areas, the project would be based on the Makulu Red variety, but in the acidic-soil, high-rainfall areas, where 'pops' is a problem, breeding selection for an improved variety is needed.

Sunflower and Soya Beans

Background

34.   In view of high imports of vegetable oil, and problems associated
with the expansion of groundnut production, the Government instituted a
National Oilseeds Development Program to implement the SNDP policy of achiev-
ing self-sufficiency in vegetable oils by 1981. To augment oil sources from
groundnuts and cotton seed, both sunflower and soya bean production have been
encouraged, utilizing results from research on varietal selection and agronomy
that was instituted in 1968.

35.   The encouragement of sunflower has been based on two major varieties--
Zambian Vniimk A and Mount Makulu Composite. With an extension drive, sun-
flower production has expanded rapidly with both large-scale and small-scale
farmers. Cultural practices are straightforward and similar to maize, but
the crop is demanding on the soil, gives widely fluctuating yields (varying
from 1/4 to 1 ton/ha) and is difficult to harvest. Further varietal selection
is needed to obtain reliable and stable yield levels; combine harvesting is
needed for large-scale farmers, and more applied research into harvesting
methods for small farms is needed.

36.   Soya Beans need a higher level of management than sunflower for
successful yields, but available varieties--Geduld, Hernon 147, Davis, Hale
and Bossier--are capable of giving yields of 1-1/2 to 2 tons/ha. With
inoculum to ensure nodulation, the crop fits well in a rotation and is
becoming increasingly popular with large-scale farmers for oil or for
protein for livestock. Harvesting, however, is again a problem.

37.   Generally, soya production is now being favored by large-scale
farmers, and sunflower by small-scale. Areas planted by province in recent
seasons, and targets for 1975 are given in Table 13.8:

Table 13.8: PLANTING AND PRODUCTION OF SUNFLOWER AND SOYA BEANS, 1973-75

	Sunflower Area in hectares			Soya Area in hectares		
Province	1973	1974	1975[1]	1973	1974	1975[1]
Southern	1,616	2,690	5,380	NA	540	1,150
Central	1,707	3,920	6,610	NA	55	500
Eastern	100	200	400	–	–	25
Copperbelt	64	135	270	NA	74	200
Northern	–	30	45	–	–	25
Luapula	–	27	40	–	36	50
N. Western	–	13	20	–	3	25
Western	–	55	80	–	2	25
Total (ha)	3,487	7,070	12,845	260	710	2,000
Production[2] (tons)	1,050	3,500	7,670	173	580	2,590
Yield (Kg/ha)	301	495	597	654	817	1,295

[1]   1975 figures are targets, but are unlikely to be achieved in 1975.

[2]   Sunflower Production in 1971: 16 tons; in 1972: 163 tons.

Source: Oilseeds Officer, MRD, 1974.

Prospects and Proposals

38.   In 1974, 20% of national demand for vegetable oil was satisfied
by the local crop, as 2,800 tons of crude oil were produced against a total
demand of 14,000 tons. Of the domestic supply, 41% was from sunflower,
30% by cotton seed, 26% by groundnuts and 3% by soya beans. Future increases
in production will require competitive pricing, a renewed extension drive,
further breeding, especially for sunflower, and applied research on sunflower
and soya harvesting, groundnut shelling, and cotton spraying. Rather than
being fostered through a special oilseed project, the crops should be in-
cluded as specific components of regional projects in growth areas, and, in
some areas, may justify special incentives through regional price policies.
Present producer prices are about 20% below import parity and should be
increased to give the necessary incentives to farmers. Whereas soya expan-
sion will come initially largely from large-scale commercial farmers, and
could be included in a rotation with irrigated wheat grown during the rainy
season, sunflower has advantages as a smallholder crop.

Coffee

Background

39.   There are a number of locations in the northern areas of Zambia where soil, climate and topography are excellent for the growth of Arabica Coffee, and yields of 1 ton/ha of clean coffee can be obtained. From the 1920's to the 1940's, some coffee was grown by commercial farmers in the Mbala area of Northern Province. Production declined due to low prices and disease problems, but there was a resurgence in interest in the crop in 1954, with the development of smallholder rain-fed coffee production at Nakonde in Isoka District. In 1959, a detailed agronomic research program, based at Misamfu Research Station at Kasama and with trials at Mbala and Mpika, was instituted; this has continued for 15 years. Problems of extension, input supply and marketing have, however, led to a widely fluctuating production from the 50-100 farmers involved; and an irrigated direct production scheme run by Projects Division at Ngoli has had a checkered career, due to management and development problems.

Performance and Prospects

40.   Coffee production has limited potential and should remain concen-trated in Northern Province at the sites already being developed. The Ngoli Scheme is scheduled to expand from the present 36 ha to 80 ha. Around Nakonde, the area of coffee, currently rainfed, is to be expanded to include areas of irrigated development and utilizing a package approach to include improved extension, input supply, credit, processing and marketing. A further develop-ment at Chilwa, near Mbala, has also been initiated based on smallholders. Pulping factories now exist at Nakonde and Ngoli, and Rucom has a processing plant at Misamfu which mills, roasts, grinds and packages coffee ready for distribution and sale.

41.   Production from Nakonde has fluctuated between one and five tons of cherry over the past ten years, and Research Branch has also been marketing their coffee together with the Nakonde crop. From 1965-67, this coffee was exported for sale at Moshi, then sold to a local firm in Zambia prior to Rucom's involvement in 1973. Production since 1971 from the four existing sources is shown in Table 13.9 below.

Table 13.9:   CLEAN COFFEE PRODUCTION AND YIELDS, 1971-74

Site	Production (Tons) 1971	1972	1973	1974	Area (Ha) 1974	Yield (Kg/ha) 1974
Nakonde	1.90	1.46	2.05	1.70	34.0	50
Ngoli	-	0.30	1.40	2.50	16.0	155
Research Branch	4.00	- /1	- /1	14.00	5.5	2,500
Chilwa	-	-	-	0.30	0.8	375
	5.90	1.76	3.45	18.50	56.3	328

/1   Coffee was not harvested and sold by Research in 1972 and 1973.

Source: Tree Crops Officer, MRD, and MRD Statistical Section.

Objectives and Proposals

42.   Improved extension and management are obviously vital to increase
production at Nakonde and Ngoli from existing coffee, quite apart from new
planting. Sites for outgrowers at Ngoli should also be investigated and
developed. It should be possible to obtain average clean coffee yields of
1,200 kg/ha under irrigation, and 500 kg/ha with rain-fed production. Some
50 tons should satisfy local demand for Arabica; thereafter it would not be
difficult to export small quantities of this high quality coffee. Coffee
production at the suggested sites should be fostered on a modest scale,
envisaging production up to 250 tons by 1985 as a component in Rural Growth
Areas, but a thorough review is needed and improved organization, management
and extension will be essential requirements. A program of this size in
addition to the 80 ha at Ngoli could involve 1,000 farmers, each producing
1/2 ha of coffee.

Tea

Background

43.   In 1960, the first trial plots of tea were established in Zambia
at Mpika, Mbala and Kawambwa; in 1965, a plot was established at Solwezi.
A 1965 Commonwealth Development Corporation (CDC) Mission reported favorably
on the prospects for tea (and coffee) growing in Zambia, and further trials
were instituted at Kasama. In 1968, a pilot tea project was established on a

site near Kawambwa, but this has developed slowly with management and irrigation development problems. It has now been taken over by the Rural Development Corporation (RDC), which has budgeted for constructing a processing factory in 1975 and is seeking technical management assistance from Sri Lanka. The history of planting at Kawambwa, which has been very slow, is given in Table 13.10 below.

Table 13.10: TEA PLANTING AT KAWAMBWA PROJECT

	Hectares	Comments
1969	3.03	Ready for plucking trials
1970	22.26	In reasonable condition
1971	55.66	In reasonable condition
1972	16.19	In very poor condition, 50% will need replanting
1973	22.29	In good condition
1974	20.00	
	141.43	

Source: MRD Tree Crops Officer.

Prospects and Proposals

44.   Neither plucking trials to establish yield levels, nor miniature manufacturing have been attempted. In view of the potential for tea development, it is apparent that considerably more effort is needed to expand and develop the tea estate and factory at Kawambwa, and to start planning neighboring areas for outgrower schemes. A minimum of 300-400 ha of mature tea within 4-8 hours of a factory are needed to establish a minimum viable unit. The best way to effective development would be for Government to go into partnership with established tea developers, who would conduct plucking trials and production and market tests on existing tea and, given satisfactory results, would then develop and manage the estate: later area expansion should incorporate outgrowers. It is suggested that Government explore such a possibility immediately. Investment in factory and estate might total K 650,000 (US$1 million).

Sugar

Background

45.   Investigations into the possibility of sugar growing in Zambia commenced in 1964, when Tate and Lyle Ltd. established 120 ha of experimental cane on the Kafue Pilot Polder near Mazabuka. From this developed the

Nakambala Sugar Estate, where by 1971 3,500 ha were under production: a further 2,570 ha have been developed in 1972 and 1973, and the system is being extended by a further 2,500 ha in 1974 and 1975, giving over 8,500 ha under the crop. Production from the estate and a few large-scale outgrowers has grown rapidly, as can be seen from Table 13.11.

Table 13.11: SUGAR PRODUCTION, 1969-1975
(Tons)

	1969	1970	1971	1972	1973	1974	1975 Estimate
Production (tons)	30,400	40,131	41,546	51,118	58,125	65,000	95,000
Yield (ton/ha)	12.4	14.0	11.6	13.9	13.0	11.8	

Source: MRD Statistical Bulletin, and Zambia Sugar Company.

Objectives and Proposals

46.   Although self-sufficiency will be reached in 1975, in view of the rapid expansion of demand, further sugar development will be required for the local market. A project for an additional 4,000 ha of land at Nakambala, envisages expansion of production by 1980 to 150,000 tons/annum raw sugar. Elsewhere, a site north of Mumbwa has been considered for further sugar expansion but, as this is on the Kafue where water availability is a constraint due to downstream power requirements, other potential sites in less-developed provinces need investigation. Ample water is available on the Chambeshi, and the point at which this river crosses the Kasama-Mpika section of the Tazara rail link would be a good location for market access: soils in this area, however, may be limiting and need careful investigation. In view of the need for a further 90,000 to 100,000 ton expansion by 1995, a feasibility study in the area is recommended.

Sorghum, Millet, Cassava and Beans

Background

47.   The major subsistence crops, other than maize and groundnuts, are sorghum, finger millet, cassava and beans. Tables 13:12 and 13:13 give the provincial statistics for these four crops.

48.   Finger Millet (eleusine coracana) is most important in Northern, Luapula and Western Provinces, and is much used for local brewing. Sorghum, on the other hand, is more important along the length of the Zambezi and in

Table 13.12:   MILLET AND SORGHUM PRODUCTION BY PROVINCE, 1969-70

Province	Millet				Sorghum			
	Ha '000	Production (tons)	Yield t/ha	% of Total sold	Ha '000	Production (tons)	Yield t/ha	% of Total sold
Central	7.4	4,100	0.55	30%	13.1	6,500	0.50	24%
Copperbel	0.8	300	0.38	21%	8.8	13,900	1.58	24%
Eastern	11.9	6,000	0.50	18%	5.4	1,000	0.19	8%
Luapula	9.6	7,600	0.79	29%	0.3	50	0.17	36%
Northern	43.6	38,700	0.89	17%	4.0	4,500	1.13	11%
N. Wester	9.4	6,500	0.69	28%	11.7	6,000	0.51	23%
Southern	7.1	2,200	0.13	9%	15.0	8,400	0.56	12%
Western	40.7	19,500	0.48	21%	19.3	11,100	0.58	27%
Total	130.5	84,900	0.65	21%	77.6	51,450	0.66	21%

Source: Census of Agriculture, 1970-71

Table 13.13:   CASSAVA AND LEGUME PRODUCTION BY PROVINCE, 1969-70

Province	Cassava				Legume 1/			
	Ha '000	Production (tons) 2/	Yield t/ha	% of Total Sold	Ha '000	Production (tons)	Yield t/ha	% of Total Sold
Central	1.6	1,430	0.89	3%	4.0	2,010	0.50	43%
Copperbelt	8.5	5,350	0.63	46%	13.3	5,000	0.38	48%
Eastern	2.2	3,610	1.64	30%	12.8	2,730	0.21	19%
Luapula	41.2	51,060	1.24	19%	4.9	2,220	0.45	36%
Northern	40.3	53,650	1.33	14%	25.6	9,020	0.35	27%
N. Western	34.0	40.120	1.18	23%	4.6	2,650	0.58	31%
Southern	0.25	200	0.80	10%	5.0	2,290	0.46	23%
Western	33.6	20,840	0.62	18%	4.9	2,110	0.43	19%
Total	161.7	176,260	1.09	19%	75.1	28,030	0.37	31%

1/ Legumes are principally beans, but also include cow peas, sun hemp, and pigeon peas.
2/ Cassava meal equivalent.
Source: Census of Agriculture, 1970-71

parts of Luangwa Valley. Sorghum tends to displace maize as a major subsistence crop in the lower-rainfall areas, as it is more resistant to drought; it is also used for local brewing, and has been grown commercially for brewers. An improved variety of finger millet was bred at Mount Makulu in the 1960's, and some new varietal research is being conducted on both these crops at present.

49.   Cassava is an important staple in the river valleys and swamps of the high-rainfall areas of the Luapula, Northern, North Western and Western Provinces, and it was introduced in the 1930's to the northern plateau areas as a famine-relief crop. Its value as a cheap constituent of animal feeds has been studied, but as yet not developed: neither has its potential use as a source of starch. These uses may have development potential. Only 20% of production of sorghum, millet and cassava is sold, and that mainly through informal local channels. However, in the vicinity of the Copperbelt market, nearly 50% of cassava production is traded.

50.   Beans are an important subsistence crop, and nearly a third of the beans produced are traded locally or to major markets through informal channels. Principal production areas are Northern, Eastern (Northern Districts) and Copperbelt Provinces. Varieties are generally local mixed ones, but white haricot and speckled sugar beans are available as pure seed, and a breeding and agronomy research program has been carried on at the Northern and Copperbelt Research Stations. In some areas, sesame, pigeon peas, and cowpeas are grown, amongst other legumes, while in Southern Province some more progressive farmers grow sunhemp as a green manure crop.

Objectives and Proposals

51.   In suitable areas, a bean component should be included in the proposed regional crop projects; while a feasibility study should be considered for cassava production close to TAZARA for starch and stock feeds. Further research is needed on sorghum varieties for the low-rainfall areas, and beans on a national basis.

Fruits and Vegetables

Background

52.   The production of fruit and vegetables has increased considerably over the period 1968-1974, with the estimated total annual value of production rising from K 2.3 million in 1968 to K 3.8 million in 1974. Table 13.14 gives approximate quantities of production for this period.

Table 13.14: NATIONAL MARKETED PRODUCTION OF
FRUIT AND VEGETABLES, 1968-74
(Tons)

Year	Fruit	Vegetables	Year	Fruit	Vegetables
1968	2,200	15,500	1972	5,900	27,700
1969	3,100	17,200	1973	5,500	20,000
1970	4,800	21,000	1974	6,000	25,000
1971	5,600	24,000			

Source: Ministry of Rural Development.

53.   The majority of production is close to the major markets and is
carried out by a few large-scale commercial farmers and many smallholders, a few
of whom have irrigation. The ban on imports in 1970 was partly responsible
for the rapid expansion of the production of onions, potatoes, tomatoes,
cabbage and bananas; and the setback in 1973 was caused by Government-imposed
price control, which has since been lifted.

Performance

54.   Fruit. Together with some large-scale growers, two Projects Divi-
sion irrigated schemes, one of 13.4 ha at Chiawa on the Zambezi in Central
Province, and one of 68 ha at Mununshi in Luapula Province supply much of the
commercial banana market. The major problem is eelworm, and yields on the
Government schemes are averaging only 20-22 tons/ha. Pineapples are grown
by smallholders on 382 ha at Ikelenge, near Mwinilunga, and much of the
crop is sold fresh on the Copperbelt, but some is canned at the local Indeco
Cannery. Citrus is dominated by a few commercial producers, but a national
nursery program with twelve nurseries in the provinces distributed 32,000
seedlings in 1973 and 50,000 in 1974. In 1975, 80,000 seedlings will be
distributed: 10,000 in each province. This successful nursery program, run
by the Agriculture Department, is also distributing seedlings of guavas,
pawpaws, avocados, leechees, grenadillas and mangoes to improve both nutrition
and cash incomes in the rural areas. One large-scale producer is successfully
marketing peaches near Lusaka. The potential for apple and grape production
is being investigated. Another large-scale producer is pioneering the export
of fruit to Europe, particularly strawberries, melons and avocados. Low
freight rates, set to encourage use of almost empty backloads for cargo
flights from Europe, offer some scope for expansion in this field, but such
cargo space is unreliable and the trade calls for considerable expertise and
flexibility.

55.   Vegetables. Production is dominated by onions, tomatoes, potatoes
and cabbage, for which there is the highest demand, but a variety of other
vegetables are grown for the high-income groups or for relish for the general

populace. Self-sufficiency has been reached in onions, tomatoes and cabbage, and only potatoes are now imported in fresh form, though there still is a considerable import of canned vegetables.

56.   Research into vegetable and fruit production is being carried out at the Kafue Irrigation Research Station and on the Copperbelt, where an FAO Horticultural Training School also exists at Chapula. West German aid is assisting with research, and is planning a large-scale production project at Munkumpu on the Copperbelt for citrus, canned vegetables and wheat production under irrigation. This **development, together with further expansion of large-**scale commercial growers and of small-scale producers in peri-urban areas, should satisfy local demand. Extension efforts in the more distant rural areas should focus on improved nutrition and sale to local urban markets. A horticultural extension follow-up program has been initiated, and a Horticultural Crops Development Committee is being set up to include representatives of grower, marketing and consumer interests. The Committee will advise on production, marketing, pricing and processing policies.

Objectives and Proposals

57.   Government should continue to encourage, by distribution of seeds, seedlings and extension advice, greater production of fruit and vegetables for nutritional value and local sale through the Village Productivity Committees. At the commercial level, large-scale farming needs little assistance, apart from Government restraint from price controls. A major effort in peri-urban development should be made with small-scale irrigation (based on gravity-fed irrigation, where possible) for vegetable and fruit production. A proposal for large-scale vegetable production to satisfy canned vegetable requirements is being prepared under a West German aid project at Munkumpu on the Copperbelt.

Other Crops

58.   Some other crops are being investigated or developed in Zambia; those worthy of mention are cashew nuts, oil palms and pasture legumes and grasses.

59.   Cashew. Some 800 cashew trees were established in the Mongu area of Western Province in the period 1958-63, and, with little extension advice in the intervening period, these trees are now being harvested for cash sale. The best trees yield 35 kg/year. A processing plant for extracting kernels from raw nuts has been established by the university. This plant will be moved and set up in Mongu next year. Since 1973, seedlings have been produced and distributed in the Mongu area to farmers and institutions, research has been carried out at the local station, and Government has been assisting in the expansion of smallholder production for which there is a large ready market.

In view of the limited crop potential of Western Province, cashew development, which will provide useful additional income to smallholders in the Mongu area, should be encouraged.

60.   Oil Palms. In the late 1950's, oil palms from Nigeria were introduced in the Luapula Valley, but these varieties, though now mature, are unsuited to local conditions. A new research effort was instituted in 1973-74 with varieties from Malaysia. Depending on the outcome of agronomy trials, consideration could be given to a nucleus estate with outgrowers for oil production in the Valley, but the prospects are not good, and scarce research expertise might be better directed elsewhere.

61.   Pasture. With more farmers becoming involved in intensive beef production, considerable interest is being shown in pasture establishment and the introduction of legumes. Stargrass propagated by runners is favored for permanent pastures, Rhodes Grass for leys, and various legumes, of which the main ones are stylosanthes, siratro, glycine and dolichos. A ready market is thus emerging for seed production for legumes and Rhodes Grass, and, in view of harvesting problems in large-scale production, might be an ideal crop for smallholders in supervised schemes.

ZAMBIA

AGRICULTURAL AND RURAL SECTOR SURVEY

WATER RESOURCES: POTENTIAL, USE AND DEVELOPMENT

Table of Contents - Continued

Acronyms and Abbreviations

DWA   -   Department of Water Affairs

l/s/m -   Liter per second per meter (of draw down)

M   -   Million of cubic meters

NIRS   -   National Irrigation Research Station (Kafue)

ppm   -   Parts per million

ZESCO -   Zambia Electricity Supply Corporation, Ltd.

ZNEC   -   Zambia National Energy Corporation

Conversion Table
Metric Units - British Units

1 m³/sec	(m^3/s)	=	35.31 cfs (cusec)	
1 liter/sec	$(1/s)$	=	0.035 cfs (cusec)	
1 centimeter	(cm)	=	0.3937 inches	
1 meter	(m)	=	3.28 feet	= 1.09 yards
1 kilometer	(km)	=	0.621 miles	
1 sq. meter	(m^2)	=	10.76 sq. feet	= 1.19 sq. yards
1 hectare	(ha)	=	10,000 m^2	= 2.47 acres
1 sq. kilometer	(km^2)	=	0.386 sq. miles	
1 cu. kilometer (Million cu. meters)	(km^3) =	=	810,728 acre feet	
1 cu. meter	(m^3)	=	1.3 cu. yards	
1 liter	(1)	=	0.22 imperial gallons	
1 kilogram	(kg)	=	2.205 lbs	= 0.0011 short tons
1 meter/sec	(m/s)	=	1.9455	
$(°F - 32) . \frac{5}{9}$		=	°C	

ZAMBIA

AGRICULTURAL AND RURAL SECTOR SURVEY

WATER RESOURCES: POTENTIAL, USE AND DEVELOPMENT

Introduction

1. This annex aims at a country-wide synthesis of estimated water resources, and proposes a development program for their prospective use in the agricultural sector and rural areas. The contents were derived from a critical analysis of verbal information and existing documents (Appendix I).

2. A series of five maps showing the distribution of water resources, rainfall distribution, monthly rainfall by region, a breakdown of water usage, and irrigation development potential, appears at the end of the main report.

Water Resource: Potential, Use and Management

Water Resources Potential

3. Average Medium-Term Water Balance. At first glance, the country's water potential, estimated over 15 years (1955-69), is impressive: 90 billion cubic meters (km^3) of yearly run-off, renewable water belonging to the hydrological cycle, and 150 km^3 of water in storage (Appendix II). Run-off is a small proportion (12%) of the 760 billion (km^3) precipitation. However, Zambia's water balance is that of the semi-arid tropics, with a high proportion (88%) going in evaporation.

4. The yearly run-off comprises the flood run-off, 74 km^3, and the base flow, 16 km^3. Deep percolation and underground flow into neighboring countries, estimated at about 24 km^3, are included in the evaporation element of the water balance. The distribution of water resources is shown in Map IBRD 11544 at the end of the main report.

5. Stable Run-Off. The natural conditions in the country--existence of large underground reservoirs, lakes, swamps, flood plains--favor the natural regulation of the base flow, about 11 km^3 of which originates from groundwater (12% of total run-off).

6. The flood run-off is partially regulated by man-made reservoirs. The estimated total live storage 1/ of 22 km^3 includes 50% of the regulated

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1/ The useful water volume of a reservoir; the rest being dead storage.

flow from the Kariba Reservoir. 1/ Mulungushi and Mita Hills Dams, as well as several hundred small capacity dams (up to 500,000 m^3/unit), are not included in this estimate.

7. The stable river run-off, the most useful water of the country amounts, therefore, to 38 km^3 per year, or 42% of the total run-off. It would place Zambia among the well-off African countries in terms of water resources if the run-off were artificially regulated by man-made reservoirs, and if 22 km^3 or 24% of the total run-off did not occur where it is almost useless to Zambia--at less than 200 km before entering Mozambique. Because of this, the country can benefit only from the 16 km^3 of naturally regulated run-off, or 18% of total run-off.

8. Water in Storage. A conservative estimate of the volume of water in storage within the country in underground reservoirs, swamps, lakes and dead storage of man-made reservoirs is more than 150 km^3. This could be as high as 250-300 km^3, depending on the effective porosity of the groundwater reservoirs. The stored water is distributed in various underground or surface reservoirs.

9. Atmospheric water and, more important, moisture in the soil and in the unsaturated zone 2/ have not been estimated because of the lack of adequate data. Since they have a residence time of less than a year, they are included in the evaporation element of the water balance. Water stored in river channels is negligible at country level.

10. Water Occurence and Distribution. Rainfall decreases almost regularly from 1,400 mm/year in the north to 700 mm/year in the south (Map IBRD 11547). The yearly rainfall is concentrated from November to April (the rainy season) over a period which varies between six months in the north and four months in the south (Appendix III and Map IBRD 11547). The rainy season may be interrupted by variable periods of drought. Over a 50-year period, the recurrence of low rainfall years was about two per decade. Such low rainfall years affect mainly the southern region, where yearly minima of 400-600 mm/year create drought conditions (Appendix IV).

11. Run-off drains away through the upper Zambezi catchment, including the Kafue and Luangwa sub-catchments and through the Chambeshi-Luapula River System which is, in fact, the upper Zaire catchment. A smaller catchment, Lufubu, drains into Lake Tanganyika. For planning purposes, four river basins may be considered: Zambezi Kafue, Luangwa and Chambeshi-Luapula, including Lufubu.

1/ The waters have not yet been legally apportioned between Zambia and Rhodesia.

2/ Between ground level and the hydrostatic level of the water table where infiltrated water is temporarily stored in the soil and evaporated or circulating slowly downwards.

12.   The river regime is quite simple, the major part of the yearly
run-off (83%) is drained during the rainy season through a river network which
is dense except in the west. During the dry season, the base flow (17%) is
drained by the four main rivers and some tributaries. Perennial water exists
in the main rivers, in all the tributaries of the Zambezi down to Livingstone,
in most of the Chambeshi-Luapula tributaries, in some of the Kafue, and in a
few tributaries of the Luangwa.

13.   The base flow, 16 km^3, occurring from May to early November, is
variously regulated by groundwater reservoirs (Kalahari Sands for the Zambezi,
limestone for the Kafue), by lakes (Bangweulu for the Luapula), by swamps
(Lukangwa for the Kafue, Bangweulu for the Luapula), and by flood plains
(Barotse for the Zambezi, Busanga and the Kafue Flats for the Kafue). The
low flow takes place during the two-month (September-October) period, with a
total discharge of 686 cubic meters per second (m^3/s). The lowest flow
discharge recorded within a 15-year period (1955-69) is 338 m^3/s (Appendix II).

14.   Good quality water--less than 500 parts per million (ppm) of total
salt content--is generally available in all seasons, including during the
low-flow period.

15.   Groundwater occurs almost all over the country, at least within the
first 350 feet explored to date. It is located in various water-bearing for-
mations: Kalahari Sands (80,000 km^2), limestones (10,000 km^2); alluvial
deposits (60,000 km^2); and in the Karoo and basement complex. Groundwater
occurrence is well documented over the country and discharge data per bore-
hole are available according to the different water-bearing formations (Ap-
pendix V). Discharge data have been compiled for over 2,000 boreholes (Ap-
pendix VI) they vary by water-bearing formation from one to eight l/s/borehole
with an unknown drawdown. 1/ With a frequency of 80%, the following dis-
charges could be obtained in a borehole:

	Discharge/Unit	Specific Yield [2] (l/s/m)
Limestone aquifer	20 - 40 l/s	4.5 - 9.2
Kalahari sand aquifer	10 - 20 l/s	0.7 - 3.3
Alluvial deposits aquifer	1 - 15 l/s	0.7 - 1.2
Basement and other aquifers	1 - 1.5 l/s	0.1 - 0.4

1/   Height between the water level before pumping (hydrostatic level) and
the lower water level reached by pumping (piezometric level).

2/   Discharge in liter per second per meter of drawdown (see previous
definition).

The effective discharge potential per borehole is still unknown due to inadequate exploration techniques, and these figures should be considered as a minimum, subject to improved exploration and drilling.

16.   Depth to water generally ranges from 5 m to 10 m, with extremes of 2 m to 25 m. Fluctuation of the hydrostatic level 1/ is about 2 m to 3 m between the end of the rainy and dry seasons. All aquifers are saturated, and depletion is not noticeable. Good quality water, ranging from 100 to 500 ppm of total salt content, could be expected almost everywhere with a few exceptions in the Southern Province in the Lusitu area (2,000-6,000 ppm). The main components NaCl and $CaCo^3$, range respectively between 4-50 ppm and 5-250 ppm.

17.   The proportion of productive or successful boreholes (over 0.1 1/s) is about 70% in the public sector where the drilling of a borehole is preceded by a siting phase; the siting consists of a geological and geophysical micro-survey with a view to locating two or three sites per borehole. However, the proportion of productive boreholes remains variable (Appendix VI).

18.   Water Losses. The major portion of the water resources is lost back to the water cycle within the country (670 km^3/year). Natural evapotranspiration remains the major loss with about 560 km^3. Deep percolation and underground flow into neighboring countries is estimated at about 24 km^3 (Appendix VII and Map IBRD 11546).

19.   The average evaporation ranges from 1,470 mm/year in the north to 2,290 mm/year in the south and 2,300 mm/year in the west. The peak period is September-October, with an average of 325 mm/month, while the lowest month is less than 100 mm/month.

Present Water Uses

20.   Hydropower represents the major user of water resources at present. In 1973, hydropower accounted for 91% of the electricity generated in Zambia (Appendix VIII and Map IBRD 11548). Although power generation is usually a nonconsumptive use, under the circumstances in Zambia where the generating stations, such as Kafue 2/, are located downstream of the river and have been allocated rights of water use, they become in effect consumptive users as far as future upstream needs are concerned.

1/   The upper part of the saturated zone or water table.

2/   Kafue Gorge Station on the Kafue River generates 78% of the country's hydrogenerated electricity.

21.   The eight existing hydro-stations are generating power mostly on the run-of-river flow: the run-off regulated in favor of hydropower by dam-reservoirs (Kafue Gorge, Mulungushi, Mita Hills) is still very low, 30 m^3/s (33% of the hydropower requirements). In 1978, after completion of the Itezhitezhi Dam, upstream of the Kafue Gorge it will reach 225 m^3/s, or 86% of the hydropower requirements estimated at 5.8 km^3/year.

22.   Domestic Water Supply. About 75% of the urban and 10% of the rural population is served by piped-water systems. The total use, including wastage and leakage, is about 0.3 km^3/year. Another 40% of the rural population is served by wells and boreholes, with a total use of about 0.025 km^3/year. The rest of the population uses river or stream water for a yearly total of 0.01 km^3 (Appendix IX). Therefore, only 0.35 km^3/year of the 90 km^3 of water resources (0.4%) is accounted for by domestic water use. About 0.25 km^3 could be re-used after treatment. An optimistic forecast would raise domestic water use to about 0.625 km^3 (or 625 million m^3) /year in 1986.

23.   Irrigation, as implemented in 1973, requires 0.075 km^3/year, with a peak discharge of 8.5 m^3/s to cover the needs of 8,300 hectares, of which a 6,500 ha scheme of sugarcane represents a critical peak demand of 7.5 m^3/s on the Kafue River. 1/ Water requirements for irrigation in Zambia, taking into account a 70% irrigation efficiency, vary from 900 mm/year to over 1,100 mm/year.

Requirements for Irrigation

Province	mm	Province	mm
Central	915	North Western	963
Copperbelt	932	Northern	906
Eastern	1,126	Southern	1,013
Luapula	988	Western	1,033

24.   To sum up, the present water uses of the country are:

	Annual (km^3)	Peak Demand (m^3/s)
Hydropower	2.835	90
Domestic Use	0.350	15
Irrigation	0.075	8.5
	3.260	113.5

Of the 3,260 km^3/year, a volume of 0.945 km^3 is regulated by dam-reservoirs (30 m^3/s). The peak demand not regulated by man-made reservoirs is therefore 83.5 m^3/s, which represents a withdrawal from the low-flow discharge of 686 m^3/s or 12%, and from the lowest discharge of 338 m^3/s, or 24%.

1/   In 1979, the scheme will be 11,700 ha requiring a peak demand of 12.3 m^3/s.

25.   The water use per caput in Zambia is 800 m³/year, but without use for hydropower is only 104 m³/year per caput, a typical figure for a developing country. Water mobilization in Zambia is very low, especially in the agricultural sector and rural areas, and use shows a distortion in favor of hydropower, mainly for the mining industry.

26.   Multiple-Use Conflicts. Within the Zambezi, Luangwa and Chambeshi-Luapula Basins there is enough water, even at the low-flow period, to satisfy present and medium-term water demand without any conflict. In the Kafue Basin, however, potential conflicts are foreseeable: limited water resources, mainly at the low-flow period; insufficient naturally regulated run-off; high water demand for hydropower located downstream, fast-growing irrigation for industrial crops (sugarcane); increasing demand for water supply for the country's major cities; and single-purpose (hydropower) dam construction in a basin that has the best prospects for agriculture production.

27.   For the medium-term, possibilities of compromise exist because of the differing rates of increase in demand for hydropower, domestic water supply or irrigation, the last being the slowest. However, the time has come, at least for the Kafue Basin, to plan the medium-term allocation of water resources based on an accurate water inventory and a wise policy for water use.

Water Resource Organization, Regulation and Funding

28.   The allocation of water resources to potential users is properly the responsibility of Government. Such responsibility is currently entrusted to a Water Board which acts on an ad hoc basis according to specific requests. To this effect, the Water Board was created and attached with a full-time secretary to the Ministry of Rural Development (MRD). The Water Board is mainly concerned with the allocation of water rights for surface water. Under the chairmanship of a Minister of State, it includes four ex-officio members, including the Director of Water Affairs, and three ordinary members.

29.   Responsibility for coordinating national water resource development and for planning its balanced utilization lies with MRD.

30.   Domestic water supplies are the responsibility of various central and local government agencies: Ministry of Local Government and Housing. Department of Water Affairs (DWA) of the Ministry of Rural Development, Building Branch of the Ministry of Power, Transport and Works (MPTW), muni-cipalities and town councils. Their responsibilities are summarized in Appendix X.

31.   Rural water supplies are the responsibility primarily of the Department of Water Affairs and the Building Branch (BB) of MPTW. Since 1972, the BB's responsibility has been progressively transferred to DWA, which is also taking over responsibility for local authority (rural and town-ship council) guidance. The Provincial Water Engineers of DWA are also

responsible for the construction of rural water supplies financed by other ministries, and of water points for cattle watering. The organization of DWA is indicated in Appendices XI and XII.

32.   Irrigation development is the responsibility primarily of the Department of Agriculture (DA) within MRD, mainly through the Land Use Services, in coordination with the Projects Division and with DWA. More specifically, DWA acts as an advisor and sometimes as a constructor of the source of water for irrigation. At province level, the DA has an Agricultural Engineer who is responsible for local irrigation.

33.   The generation of the country's hydropower, except at the Kariba Project is the responsibility of the Zambia Electricity Supply Corporation (ZESCO), which functions under the Zambia National Energy Corporation (ZNEC) of the MPTW. ZESCO is also responsible for the construction of dam reservoirs required for a regulated run-off adequate for power generation. The main dam reservoirs involved are: Kafue Gorge, completed in 1970 (0.8 km^3 live storage), and Itezhitezhi, on the Kafue, likely to be completed in 1978 (4.2 km^3 live storage).

34.   Management. Water affairs are managed at the central government level and through the administrative pattern of the provinces and districts. The central level is responsible for general management, planning and administration. The provincial and district levels are responsible mainly for operations, repairs and maintenance. Because of a heavy volume of administrative work, limited professional use is made of the technical qualifications and experience of the Provincial Water Engineer.

35.   The provincial management pattern is adequate for rural domestic water supply which represents the bulk of water activities. It is no longer adequate, however, for water planning and for water-rights allocation, which would be better dealt with at basin level. The rather critical water situation in the Kafue Basin, for example, could best be handled by a Water Basin Authority, even the embryo of which does not exist in the present water affairs management.

36.   The manpower situation in the field of water is characterized by the absence of Zambian engineers and the extreme shortage of sub-professional nationals. At present, the country's water affairs are managed entirely by expatriates. Thus, there is a chronic need for the planning of appropriate training programs in water resource development and management for Zambian nationals.

37.   Government Funding. Since independence (1964), Zambia has financed its domestic water supply programs without external assistance. However, large-scale water development projects have been financed by the private sector (Mulungushi and Mita Hills Dams), or with external assistance (Itezhitezhi Dam, sugarcane irrigation supply).

38.   The Government, through the Ministry of Finance and via the Ministry of Local Government and Housing, loans money to local urban authorities for water supply.

39.   The Ministry of Rural Development has funds budgeted and entrusted to DWA for township water supply and for rural water development. In 1973, the budgeted allocation to DWA for water supply was K 700,000 (of which K 400,000 was for rural water supply) to cover recurrent charges, and K 2.400,000 (K 400,000 of which was for rural water supply) of capital fund.

40.   At provincial level, rural water supply benefits mainly from the Provincial Development Committee funds for cooperatives and village water supply, In 1973, the provincial allocation was K 1,020,000 (Appendix XIII). Rural water supply benefits also from the Rural Council Water System Finance. This fund of about K 140,000 per year is mostly in a deficit position. Other departments, Education, Health, etc., also allot funds to DWA (up to K 160.000 per year) for schools, hospitals, etc.

41.   Annual allocations for rural water supply throughout the country range as high as K 1,900,000:

	K
Provincial Development Committees	1,100,000
DWA	500,000
Rural Council Water System	140,000
Other Ministries (Education, Health, etc.)	160,000
Total	1,900,000

42.   No specific budgeted amount is allocated for irrigation development to the Department of Agriculture of MRD.

43.   External Assistance. The Bank Group is providing funds for the hydropower complex of Kafue Gorge, Iteshiteshi; of the US$115 million loan for this project, it is expected that US$100 million will be spent on the construction of the dam and power stations. The total project cost is estimated at K 172 million (US$260 million).

44.   The 1973-77 UNDP Country Program, with an Indicative Planning Figure (IPF) of US$ 15 million, includes two water-related projects in the irrigation sub-sector: the Chapula Irrigation Project in the Copperbelt Province (US$0.5 million) and assistance to the National Irrigation Research Station, Mazubuka, Southern Province (US$0.14 million). In 1976, the Chapula Project will become a National Irrigation Institute, and will receive continued assistance from UNDP.

45.   The Federal Republic of Germany is providing assistance for:
(a) a survey of Munkumpu area and a large-scale irrigation scheme of 17,000
ha potential, with a feasibility study over 4,600 ha as a first phase: and
(b) in cooperation with UNDP, the Kafue National Irrigation Research Station.
It is also considering technical assistance for a study of wastage in Lusaka's
water system.

46.   The USSR implemented a drilling program for the period of the
SNDP (1972-76). This program for domestic water supply in the Eastern
Province is being carried out with a team of Russian experts and five per-
cussion rigs. As of November 1974, 145 boreholes had been drilled in the
basement complex, with an 83% efficiency rate. 300 boreholes are likely to
be drilled during the project, which will also train Zambians in drilling
techniques. At the end of the SNDP the drilling rigs will be handed over
to the DWA against deferred payment.

Present and Prospective Water Use for Agricultural and Rural Areas

Rain-fed Agriculture

47.   The rainy period (November-April) coincides with the period of
highest temperatures, thus creating optimal conditions for vegetative growth
of a wide variety of seasonal (summer) crops, of which maize is the prin-
cipal one. Low-rainfall years (550 mm/year or less), which occur one or two
times per decade (Appendix IV), and drought periods during the rainy season
may affect crop production. The lack of production data does not, however,
allow a close correlation.

48.   Although rain-fed agriculture can be practiced throughout the
country, crop production will be closely related to the annual and seasonal
vagaries of rainfall. The southern region, particularly, suffers from
occasional drought. Also, farming activity remains limited to a five-month
period. Irrigation would introduce an element of certainty to agricultural
production and also provide for a longer period of farming activity which
would allow double cropping.

Irrigation

49.   Irrigation in Zambia is limited to 7,700 ha, of which a large-scale
scheme of 6,500 ha of sugarcane represents the bulk. The remaining 1,300 ha
are scattered over the country through small- or medium-scale 1/ schemes
(Appendix XIV). All water sources, except groundwater, are used for irriga-
tion; groundwater is used only on a few commercial farms.

1/   Small-scale scheme: up to 20 ha)
      Medium-scale scheme: 20-200 ha)   arbitrary criteria for this report.
      Large-scale scheme: over 200 ha)

50.   Large-Scale Irrigation. Irrigation should contribute to the
achievement of such national objectives as reduction of food imports, eco-
omic progress, and more efficient use of natural resources. As a first
step the Zambia Sugar Company (ZSC) now irrigates an area of 6,500 ha
producing 84,000 tons/year of sugar. Around 1976, self-sufficiency could be
reached with an irrigated area of 8,250 ha producing 97,500 tons/year. Still
later, the area would be increased to up to 15,400 ha (200,000 tons of sugar),
with a view to exporting sugar and/or to keeping pace with the growing demand.

51.   Increased production of wheat is also a major governmental goal.
The 1973-74 import bill for wheat was K 10 million, and this figure is likely
to increase to K 50 million by 1981. Wheat has been successfully grown in
Zambia only under irrigation in the dry season. Some 65,000 ha of irrigated
wheat could be needed to reach self-sufficiency by 1995 1/ in state and
private commercial ventures in large-scale irrigation with small holders'
farms. At present, irrigated wheat is still on small-scale schemes of
commercial farmers and on state trials. Other crop production (rice,
vegetables, fruits coffee, sugar, etc.) important to the country could
require an additional 40,000 ha. With no complementary resource constraints
100-120,000 ha 2/ under irrigated agriculture could be a long-term Government
objective.

52.   Is such a target compatible with the availability of water and soil
resources? Theoretically, the water requirements would be 1.2 km^3/year
with a peak demand of about 100 m^3/s, and the stable run-off, including
groundwater flow, could provide such an amount without incurring major ex-
penses for the source of water. In fact, however, problems of water avail-
ability already exist locally in the Kafue Basin, for example, where most of
the country's water requirements are concentrated.

53.   Soil surveys have been carried out throughout the country on a
reconnaissance basis. Moreover, semi-detailed soil surveys over about 100,000
ha are completed or under completion. A semi-detailed land-use map of the
country is also under completion. Knowledge on soils which are suitable for
irrigation is sufficient to identify the country's irrigation development
potential through large-scale schemes (Appendix XV and Map IBRD 11545).

54.   A total area of 140,000 ha with suitable soils and terrain for
large-scale irrigation can at present be identified. Of this area, a total
of 110,000 ha could benefit from stable run-off (run-of-river), with minor
capital cost for the source of water and its transfer to the land. The

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1/   To achieve self-sufficiency in 1975 would have required 30,000 ha.

2/   Wheat 65,000 ha; sugar 15,000 ha; rice 5,000 ha; fruit, vegetables
     10,000 ha; open 5-25,000 ha. These are indicative figures.

remaining 30,000 ha would require the construction of dam-reservoirs at reasonable costs. This does not take into account the huge irrigation potential of the Kafue Flats, where an area of over 100,000 ha could be irrigated from river water if more flood run-off were regulated by the heightening of Itezhitezhi Dam.

55.   The Kafue Flats deserve special attention because of their huge irrigation potential. The heavy clay soils close to the river 1/ and the portion of the red soil fringe or flat margins (about 10,000 ha at Nega-Nega), which is also close to the river, could be irrigated, especially for wheat. However, water availability remains the limiting factor. A total of 12.4 m^3/s water rights had already been awarded against the 15 m^3/s lowest flow of the river. An amount of 2.6 m^3/s remains to be allocated. Another 4.4 m^3/s will be made available to agriculture from the Itezhitezhi Dam-Reservoir when it is completed in 1978. Theoretically this discharge of 7 m^3/s could irrigate 6,400 ha during October. 2/ If wheat were irrigated in the flats, the remaining 7 m^3/s would be ample for 15,000 ha, since the main irrigation period is July-August. This area would be further increased through the heightening of the Itezhitezhi Dam for irrigation purposes, an action which is under serious consideration at present. It should be closely related to a large-scale development program of irrigated wheat and to the sugarcane program of ZSC.

56.   Cost of Large-Scale Irrigation (1974 prices). 3/ The capital investment cost of land and water development (surface irrigation), excluding irrigation works, amounts to about 656 K/ha. It includes the pumping station on run-of-river, the water conveyance from water source to the scheme, the night·storage reservoir, and the land preparation and levelling. Costs could vary from K 557/ha in southern schemes to 738 K/ha in northern ones. Land preparation and levelling (clearing and grading) represent 45% of costs (Appendix XVI). The capital investment cost of irrigation works (gravity system) is an additional 984 K/ha (926 in the south, 1,066 in the north). Therefore, the capital cost of a large-scale irrigation scheme would be about K 1,640/ha, 4/ and the final cost K 2,590/ha, including K 328 for contingencies and design and K 622 for buildings, centralized equipment and farm machinery.

1/   According to the successful experience of the Kafue Pilot Polder (1956-64) and to the Tate and Lyle Report (August 1974).

2/   According to the water rights awarded to Zambia Sugar Company: 7.1 m^3/s for 6,500 ha and not considering the evaporation likely to take place between the dam and the area to be irrigated.

3/   Based on price increase of: 1971: 6%; 1972: 6%; 1973: 17%; 1974: 25%.

4/   For a scheme of about 3,00-4,000 ha.

57.   With a cost of water of K 0.036/m^3, recurrent expenses have been estimated at about K 360/ha and per year.

58.   An alternative to usual surface irrigation might be polder irrigation. According to a recent study (July 1974) on a 9,600 ha irrigated wheat area within a polder in Kafue Flats comprised of heavy clay soils, the capital investment cost per hectare decreases from K 3,460 on 1,200 ha to K 1,250 on 9 600 ha. The rate of implementation is 1,200 ha/year, preceded by a two-year cropping experiment phase on 140 ha. The capital cost includes the pilot polder and experiment cost, the development machinery and the infrastructure. but excludes agricultural costs. If the capital cost of agriculture and recurrent costs (operating, direct farming and general expenses) are included, the cost per ha will be K 4,200 on 1,200 ha and K 1,550 over 9,600 ha. After the first year of scheme implementation (1,200 ha), the revenue is K 634/ha, it stabilizes at K 575/ha after the last year of implementation. Obviously, capital-intensive polders should not be utilized initially in a large-scale wheat production scheme which would be better initiated on the fringe of Kafue Flats under usual surface irrigation.

59.   Medium- and Small-Scale Irrigation. These schemes are intended to be planned and implemented at provincial and district levels, or by the private sector. They should represent a flexible means of agricultural production which could easily form part of a rural development strategy. Because of the schemes' low water requirements, they can be located almost anywhere in the country and thus within easier access to water sources than large-scale irrigation schemes. Because of its diffused occurence, groundwater could play a major role in such schemes. The co-existence of good soils and available water has far greater prospect.

60.   Cost of Medium- and Small-Scale Irrigation. The major limits on development of medium- and small-scale irrigation are socio-economic criteria rather than natural resource conditions, except in the eastern region where water resources are severely limited. In order to illustrate the main possibilities of medium- and small-scale irrigation, three cases have been appraised by the Mission: (a) a 160-ha commercial farm (Appendix XVII); (b) a 60-ha Government farm (Appendix XVIII); and (c) an 8-ha local community scheme (Appendix XIX). The capital investment cost of water development and irrigation works is as follows (1974 prices 1/):

(a)   160-ha commercial (sprinkler irrigation)   K 812/ha

(b)   60-ha Government farm (surface irrigation)   K 1,910/ha
                           (sprinkler irrigation)   K 1,235/ha

(c)   8-ha community schemes (surface irrigation)   K 2,255/ha

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1/   Based on price increase of: 1971; 6%; 1972: 6%; 1973: 17%; 1974: 25%.

61.   The capital cost of water source (boreholes) and irrigation works at the commercial farm is the most viable one. Even this cost could be slightly reduced (to K 750) with an improved borehole construction technique and technical guidance.

62.   The 60-ha Government farm is more a pilot and experimental scheme than a normal crop production scheme. Heavier equipment costs than necessary have been incurred. Investigation of water sources potential and location was kept to a minimum. Groundwater potential was not explored. Sprinkler irrigation is but a graft on the surface irrigation system. Such costs per ha should be considered as a maximum. Recurrent expenses for surface irrigation have been estimated at K 350/ha/year, with a cost of water of K $0.040/m^3$; for sprinkler irrigation at K 290/ha/year, with a cost of water of K $0.047/m^3$. Normally, a scheme on this scale might be expected to have a capital cost of K 1,300/ha for surface irrigation, and K 1,050/ha for sprinkler irrigation.

63.   For the 8-ha community scheme, the K 2,255/ha capital cost for water works is high, because of the small area that has been put under irrigation. Experience suggests that a 20-ha scheme may be the optimum size, and a capital cost of K 690/ha close to reality.

64.   From a 1970 study of small irrigation schemes, 1/ the capital cost of water and irrigation works was (in K/ha):

	1970	1974 Estimates 2/
Source of water by pumping + surface irrigation	500-700	820-1,150
Source of water by pumping + sprinkler irrigation	490-530	800-870
Source of water by gravity diversion + surface irrigation	365	600

Should storage become necessary, experience in the Eastern Province suggests that the construction cost of man-made reservoirs of 150,000 to 300,000 m^3 capacity is between K 0.23 and $0.46/m^3$ 3/ of stored water. A capital investment cost of K $0.30/m^3$ represents a fair average. Therefore, the capital cost of the water source comes up to K 2,000/ha to 2,500/ha for a scheme of not more than 40 ha.

1/   Italconsult Report, December 1970. A small irrigation scheme was about 200 ha.

2/   Based on price increase of: 1971: 6%; 1972: 6%; 1973: 17%; 1974: 25%.

3/   1974 prices.

65.   The following figures, including water source, land preparation and irrigation works, could be considered as fair estimates (1974 prices K/ha). 2/

	Source of Water		
	Pumping		Gravity Diversion
	Surface Irrigation	Sprinkler Irrigation	
Large-Scale Irrigation 1/	1,640-2,700 2/	higher than 1,640	–
Medium-Scale Irrigation (20-200 ha)	1,150-1,300	810 3/-1,050	600
Small-Scale Irrigation (up to 20 ha)	400-500 4/	700-800 4/	690

66.   Research, Training and Management.   Irrigation in Zambia is still in its infancy; it is practiced on scattered schemes as a preliminary test of new crops, including coffee, citrus, pineapples, bananas, rice, maize, wheat, and vegetables.   Although there is little experience in and knowledge about irrigation, steps have been taken to rectify this situation.

67.   In 1973, the Government with the technical assistance of UNDP and West Germany, established a National Irrigation Research Station (NIRS) on the soil margin of the Kafue Flats near Mazabuka.   The NIRS objective is to facilitate (a) experimentation under Zambian conditions in soil-water-plant relationship for development of irrigated agriculture, and (b) determination of irrigation systems, agronomic practices and suitable crop varieties.

68.   In 1975, with the assistance of FAO/UNDP, the 60-ha Government farm at Chapula, 15 km southwest of Kalulushi (Copperbelt), will be turned into a National Irrigation Institute with the following objectives:

(a)   To run training courses for technical field personnel from the eight provinces of Zambia; and

(b)   To conduct short courses for Natural Resources Development College (NRDC) students.

1/   For a scheme of about 3,600-4,000 ha.

2/   1,860 K/ha for sugarcane irrigation over 4,020 ha (ZSC data computed in Nov. 1974); the 2,700 K/ha figure refers to polder irrigation.

3/   Commercial farm.

4/   Rough estimates.

69.   Irrigation Policy and Strategy. It is expected that an Irrigation
Coordinating Committee (ICC) will be created (Appendix XX) to conceive the
irrigation policy at national level with a view to reducing staple food
imports and creating new "poles" of technical and economic progress. This
committee should take into account the necessity of encouraging irrigation
development in the private sector. Development planning and programming
should be done at the national level for large-scale irrigation. Large-scale
irrigation should contribute to the intensification of agricultural produc-
tion, and should be implemented as soon as possible through pilot development
schemes of about 200 ha, initially, followed after two years by an annual
rate of implementation of 1,000 to 2,000 ha. Medium and small-scale irriga-
tion should help to increase the incomes of the local population and also to
improve agricultural production. For large-scale irrigation, two or three
zones of development can now be identified: the Kafue Flats and mainly the
flat margins, Munkumpu and Mpongwe areas, the Chambeshi Flats. Because water
and soil resources are generally adequate for medium- and small-scale irri-
gation, these schemes are not restricted geographically, and thus should be
developed on commercial farms in peri-urban areas and around important vil-
lages; these schemes should also serve as the focal point for creating new
communities and settlements.

Rural Water Supply and Development

70.   While irrigation development in Zambia is still in its infancy,
rural water supply development has already made notable progress. About
54% of the rural population (1,540,000 of a total of 2,850,000) is served by
piped systems wells or boreholes. The remaining 46% (1,310,000) is still
using unimproved water supplies--rivers, streams, ponds, etc. 1/

71.   The rural population is forecast to increase to 3,400,000 by the
end of the fourth NDP (1986). If rural community size during that period
remains at the current average of 200 persons, about 10,000 new water supplies
will be needed in the next 12 years. In addition, many of the existing water
facilities will require improvement during the same period.

72.   Technical skill and organization for rural water supply lie with
DWA. Development capital funds are allocated by DWA, by the Provincial
Development Committees (PDC) and by other departments for schools, hospitals,
etc. (see paras 39 and 40). Insufficient funds for recurrent expenses
result in a large number of inoperative rural water supplies (up to 30%) due
to lack of maintenance. (A 12-year new water supplies program of about K 14
million, for example, might result in a waste of over K 4 million if mainte-
nance is not guaranteed.)

73.   Rural water supplies are of four types (in order of importance):
hand-dug wells, boreholes small dam-reservoirs, and small supplies pumped
from perennial streams and rivers. Government policy emphasizes the digging

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1/   WHO/IBRD, "Water Supply and Sewerage Sector Study," (October 1974).

of wells by self-help under DWA guidance; the standard cost of a hand-dug
well has been established at K 1.000. Boreholes are drilled where hand-dug
wells are not feasible; the standard cost, based on a 70% efficiency rate, is
K 3,000 per unit. Small dam reservoirs with an average capacity of 7,000
m^3/unit are constructed on non-perennial tributaries for two purposes:
domestic supply (or irrigation) and cattle watering. Some of the dam-
reservoirs have a capacity of up to 45,000 m^3. They serve a variety of uses,
including small-scale irrigation. Pumped water supplies from perennial
streams are a rarity. Hand-dug wells and boreholes are usually fitted with
hand-pumps, made locally by DWA at the provincial level; windmills or diesel-
driven pumps are also used.

74.   A rough estimate of the country's present capacity for constructing
new water supplies. based on samples at provincial level and taking into
account local problems and constraints, is about 700/year, including 170
boreholes. In recent years, construction has varied between 660 and 770 new
water supplies per year.

75.   Development Policy and Strategy. A need to intensify rural water
supply development is clear. It should be done at the provincial level
through a rural water development program established from a technical
inventory of the existing rural water supply situation. An example of how
this might be drawn up is shown in Appendix XXI. The rural water development
program should originate at district level and be formulated at provincial
level. Water sources for medium- and small-scale irrigation development, as
well as points for cattle watering, should be fully integrated into the rural
water development program.

Cattle Watering

76.   Because of a lack of centralized data and information, it was dif-
ficult to appraise the cattle watering situation. The problem was approached
through data obtained in sample inquiries. The cattle population of the
country is estimated at about 1.6 million head. Ranches are equipped with
water points of two types: boreholes (65%) and small dam-reservoirs (35%),
with a distribution of a water point for every 200 to 250 ha. Costs of bore-
holes and small reservoirs are K 2,000 and K 1,000 respectively per unit.

77.   The capital cost invested in water points for ranches is estimated
roughly at between K 3.7 million and K 4.5 million. Based on a sampling
made on a 4,800-ha ranch with 3,300 head of beef cattle, the capital invest-
ment cost for watering ranch cattle during the dry season has been estimated
at K 18.5 to K 22.7/head. It should be noted that one water point per 200 ha
represents intensive watering points development.

78.   The 1.5 million cattle living on the open range (including 1.3 million head of beef cattle) are watered during the dry season mainly from lakes and perennial streams, but also from small dam-reservoirs (about 5,000 to 10,000 m^3), constructed at a cost of between K 1.50 and K 2.00/m^3 of stored water. A capital cost of K 1.70/m^3 represents a fair average. The capital investment cost for watering livestock during the dry season through small dam-reservoirs is about: K 12.25/head of beef cattle; K 2.15/head of sheep It simply is not possible to estimate the total capital cost for open-range cattle watering. Mention should be made that in the Eastern Province, for instance, 100 small dam-reservoirs were constructed before 1971. Since then, the Government has allocated K 10,000 to K 15,000 annually per province, or sufficient funds for the construction of one reservoir.

79.   The Western Province is the most densely populated province with cattle under tropical semi-arid conditions. The region of the Mulonga and Siloana Plains, where rather important nomadic and semi-nomadic herds are grazing, deserves special attention because of the recurrence of droughts (two or three per decade) and the absence of well points in this area. A **development of well-distributed water points would greatly** improve the grazing **potential of this area.**

Constraints and Recommendations on Water Development and Use

80.   A successful water development and use program will depend on the reduction of constraints relative to manpower, equipment, technical short-comings and finance, as well as organizational and legal inadequacies. To this end, a joint effort of GRZ action and external assistance will be needed.

Manpower

81.   Constraints. Long delays and inadequacies in recruitment proce-dures have resulted in a constant vacancy level of 25%. Although "Zambian-ization" reached a general level of 55% of the work force in 1973, almost none of the engineering positions and an insufficient number of the technical assistant jobs (65%) were held by Zambians. Lack of specialized education and training facilities, and poor incentives in the fields of hydraulic engineering, groundwater technology, irrigation technique, etc., constitute the main constraints.

82.   Recommendations. Recommended action to solve the manpower problems (in order of priority) are:

(a)   Organization of training courses for sub-professionals, possibly within the Natural Resources Development College (NRDC);

(b) Creation of a National Irrigation Institute at Chapula
     (Copperbelt Province) as a follow-up to the FAO/UNDP
     irrigation project;

(c) Selection of junior civil servants of the DWA and the
     Department of Agriculture for sponsorship to attend, under
     special contractual agreement, School of Engineering courses
     at the University of Zambia;

(d) Provision of attractive incentives for careers in water and
     irrigation engineering; and

(e) Improvement of recruitment procedures.

Equipment

83.   Constraints. Pumps should be considered the most important means
for water withdrawal from streams or aquifers. High discharge pumps (over a
few liters per second), including engines, are imported. Lack of foreign
exchange together with long delays caused by import formalities, provoke a
constant shortage of both pumping equipment and spare parts needed for proper
maintenance of existing equipment. Hand pumps are made locally by Government
at provincial level. Manufacturing and workshop inadequacies limit the
production of these items however.

84.   Boreholes are the safest water source for domestic water supply,
and a fair water source for small- and medium-scale irrigation. The present
borehole groundwater development program does not exceed 250 boreholes per
year (including 170 by the public sector). The boreholes are constructed with
the country's 46 drilling rigs, the repair and maintenance of which require
spare parts from abroad and improved local workshops (Appendix VI). Special
screens for sandy aquifers are manufactured abroad.

85.   A shortage of lorries is a general problem with serious implica-
tions in drilling performance and in operation and maintenance of water sys-
tems.

86.   Recommendations for the solution of problems relating to equipment
(in order of priority) follow:

(a) Increase in imports of high-discharge pumps and spare parts
     (foreign exchange cost estimate: US$0.1 million/year);

(b) Improvement of local manufacture of hand pumps through
     external technical consultations, and assistance for work-
     shop equipment (foreign exchange cost estimate: US$0.3 million);

(c) Increase the quantity and standardize the type of Government
     drilling equipment (foreign exchange cost estimate: US$0.9 mil-
     lion); and

(d) Increase the quantity and standardize the type of lorries and other transport vehicles (foreign exchange cost estimate: US$0.5 million).

87.   Technical Shortcomings. In the areas of irrigation, rural water supply, and cattle watering, there is no comprehensive planning; nor is there a clear definition of medium- or long-term goals.

88.   Groundwater data are scanty and difficult to retrieve. Exploratory activity, as in the case of the limestone aquifer, for example, has been almost completely neglected. Groundwater exploration to select the siting of boreholes is based on minimal local investigation. Information on potential groundwater resources is inadequate for planning their use or for their consideration as an alternative water source.

89.   Run-off data are better, but broader in scale, and require critical analysis before use. Data collection and storage need improvement. Smaller-scale information on the upper catchment of tributaries is not available. The water potential of tributaries for medium- and small-scale irrigation, especially at the low-flow period, remains a guess. Low-flow study of river run-off has also been neglected the close relationship between surface and groundwater flow, and their possible conjunctive use, have not been considered by planners.

90.   Technical and economic information on the use of groundwater for irrigation purposes at the medium- and small-scale levels is lacking. There is also insufficient data concerning the potential use of groundwater for large-scale irrigation, for instance, in the Copperbelt from the limestone aquifer (Mpongwe).

91.   Technical Recommendations. Actions required to correct these shortcomings should include:

(a) Establishment of a national plan for large-scale irrigation;

(b) Technical inventory at provincial level of the rural water supply situation and of the needs for medium- and small-scale irrigation; this to be followed by the establishment of a medium-term rural water development program;

(c) Pilot irrigation from the limestone aquifer; survey of the feasibility of borehole irrigation using this source in the Copperbelt and Central Provinces, with special attention to the Mpongwe area;

(d)   Improvement of the run-off gauging stations network, with
      emphasis on the tributaries' upper catchments, and first
      priority given to the Kafue Basin. (About 50 additional
      stations would be required);

(e)   Establishment of a central water archive based on modern
      methods of data collection, processing and retrieval; and

(f)   Preparation of a map of the country's groundwater potential
      based on existing knowledge.

92.   Finance. Capital funds allocated for water supply are scattered
among various ministries. The total annual amount is sufficient when the
constraints mentioned above are considered. However, yearly budget cuts
introduce limitations.

93.   Recurrent funds are insufficient. This situation affects the
quality of operation and maintenance of water supply systems.

94.   No budgetary funds have been allocated as yet for irrigation
development.

95.   Recommendations. Actions required to correct the financial limita-
tions (in order of priority) include:

(a)   Increase of recurrent funds to improve operation and
      maintenance of existing water supplies; for this purpose,
      an additional K 400,000/year would be required (foreign
      exchange cost estimate: US$150,000/year);

(b)   Exemption of yearly budget cuts in the sector of water
      development;

(c)   Creation of a budget allocation for irrigation development;

(d)   External assistance for equipment and large-scale
      development projects; and

(e)   Allocation of all funds related to water supply directly
      to the province.

96.   Organizational and Legislative. The Department of Water Affairs
(DWA) should remain within MRD. It should not limit itself to water supply
development, but should create an irrigation service confined to the water
source and water conveyance to the irrigation works.

97.   The ultimate constraint to water development within economic
limits will be the limited amount of water available during the low-flow
period. Judicious water use requires careful planning and allocation, con-
servation, and management at basin level. Kafue Basin is the first example

in the country of the need for a river basin authority. DWA should there-
fore be reorganized at central level. Since the provincial pattern is some-
what similar to the basin distribution, (Kafue Basin, for example, includes
mainly the Copperbelt and Central Provinces), this reorganization would not in-
volve drastic changes.

98.   Still another constraint is that irrigation affairs are poorly
organized within MRD. Thus, if a major development policy comes into exis-
tence in this sector soon, the Government lacks the necessary institutions
and organization to cope with the new situation.

99.   The Water Act of Zambia, moreover, has no provision for the control
of groundwater withdrawal or for the international segments of the Zambezi,
Luapula and Luangwa Rivers.

100.   Recommendations. Action required to correct the organizational and
legal constraints should include (in order of priority):

    (a) Creation of an Irrigation Coordinating Committee with
         responsibility for defining a national policy for irriga-
         tion development, formulating a policy on the pricing of
         water, etc. (see Appendix XX).

    (b) Strengthening of DWA in the irrigation areas of water
         supply and conveyance

    (c) Reorganization of DWA at the central level, according to
         a river basin approach to water development and management;

    (d) Reorganization and strengthening of the land-use services
         of MRD in the irrigation sector (see Appendix XXII, p.5 for
         project outline); and

    (e) Revision and modification of the Water Act with a view to
         making it a useful instrument for sound management of Zambian
         water resources.

Development Proposals

Proposals for a National Water Strategy and Policy

101.   Mobilization of the country's water resources should be intensified
so as to make full use of this abundant natural resource. Maximum use should
be made of run-off that is already regulated, subject to a sound allocation
of such water according to quantitative and qualitative requirements and the
most economical utilization for production.

102.   Such an approach implies that the formulation of a water plan
might best be accomplished at the regional or river basin level. In this
connection. the Kafue River Basin deserves top priority, since projected water
requirements are already conflicting with limited water resources as cur-
rently regulated.

103.   With regard to water use in the agricultural sector and rural areas,
the water strategy should be conceived as follows:

(a) Large-scale irrigation should be confined to the main rivers
     and lakes and to some important groundwater reservoirs;

(b) Medium- and small-scale irrigation should benefit also from river
     tributaries and groundwater reservoirs (see Appendix V); and
     thereby have a widespread distribution over the country with
     emphasis on commercial farms and Rural Growth Areas;

(c) Rural water supply should be developed throughout the country
     without any limitation from the water source standpoint, but
     should be concentrated in rural growth areas; groundwater,
     through hand-dug wells and boreholes, should be the most used
     source of water; and

(d) Cattle watering points, using the same water sources but some-
     times requiring small storage of surface water, should be
     developed.

Irrigation Program Proposals

104.   Large-scale irrigation could be implemented in four areas: the
Kafue Flats, Munkumpu and Mpongwe, Kandu-Mswebe, and the Chambeshi Flats,
with a rate of implementation of 1,200-2,000 ha/year, after a two-year pilot
development phase to be started mainly in the Kafue Flats and Munkumpu of
200 ha for irrigated wheat. Given existing and expected resources, it is
unlikely that more than 15,000-20.000 ha could be under crop by 1986, excluding
sugarcane, or 30,000-35,000 ha including this crop. At the end of the third
NDP (1981), a target of 5,000-8,000 ha (or 17.000-20,000 ha including sugarcane)
could be reached.

105.   Medium-scale irrigation could be implemented both by existing com-
mercial farmers (if they are encouraged by a more favorable pricing policy)
and by the Government in peri-urban areas. Assuming an annual rate of im-
plementation of ten 50 ha/schemes, a development of about 3,000 ha could be
achieved by the end of the third NDP (1981)

106.   Small-scale irrigation could be established in the rural growth
areas 1/ around villages and also in settlements, with a rough estimate of
50 to 100 villages representing a possible target of 1,000-2,000 ha. Small-
scale irrigation should be integrated with the rural water supply development.

107.   The proposed long-term irrigation development program for Zambia
suggests the following targets (in 1,000 ha):

	1977-1981	1982-1986	Total
Large-scale Irrigation/2	5-8	10-12	15-20
Medium-scale Irrigation	3	4	7
Small-scale Irrigation	1	1	2
Total	9-12	15-17	24-29

108.   The cost (1974 prices 3/) of the proposed program, including water
source, land preparation and irrigation works, is as follows (K million):

	1977-1981	1982-1986	Total
Large-scale Irrigation	8.5-13.6	17.0-20.4	25.5-34.0
Medium-scale Irrigation	3.6	4.8	3.4
Small-scale Irrigation	0.7	0.7	1.4
Total	12.8-17.9	22.5-25.9	35.3-43.8

It is expected that approximately 30,000 ha would be irrigated in 1981, and
approximately 45,000 ha in 1986, including 15,000 ha of sugarcane, which is
considered a special program.

Rural Water Supply Proposals

109   During the next two NDP (1977-1986), the country's capacity for
constructing rural water supplies is planned to reach a rate of 1.000/year,
including about 700 hand-dug wells and 300 boreholes. In addition, some
water supplies (5%) will be improved with standpipes or house connections,
and some (10%) will be restored (deepened, etc.).

1/ See Appendix V.

2/ Excluding the special sugarcane program of 15,000 ha.

3/ A price increase coefficient is assumed as follows: 1975:   1.16; 1976:
    1.26; 1977:   1.40; 1978:   1.56; 1979:   1.79 1980: 1.95; 1981:   2.14
    (Application of Bank's guidelines, January 1975).

110.   The proposed long-term rural water supply development p·ogram for Zambia is as follows (water supply units):

	1977-81	1982-86	Total
Hand-dug wells	2,500	3,500	6,000
Boreholes	1,000	1.500	2,500
Improvements (standpipes, etc.)	250	250	500
Restoration (deepening, etc.)	500	500	1,000
Total	4,250	5,750	10,000

111.   The cost (1974 prices) of the proposed program is as follows (K millions):

	1977-81	1982-86	Total
Hand-dug wells	2.5	3.5	6.0
Boreholes	3.0	4.5	7.5
Improvements (standpipes, etc.)	1.5	1.5	3.0
Resporation (deepening, etc.)	0.5	0.5	1.0
Total	7.5	10.0	17.5

It is expected that adequate rural water supply (piped systems, wells or boreholes) will be serving approximately 75% of the rural population in 1981, and approximately 90-100% in 1986.

Cattle Watering Proposals

112.   While the private sector is investing heavily in the development of water points on ranches. the Government still lacks both a policy and a plan in this area. Since cattle behavior is only semi-nomadic, at the most, cattle watering development programs could be conceived and carried out at the provincial and district levels. In the absence of adequate data, however, it is difficult to make a logical proposal. An inventory by district and province of the existing watering points and their conditions should first be taken.

113.   In the case of the Mulonga and Siloana Plains in the Western Province, a special watering point development program is required. Such a program would require the drilling of about 120 to 150 boreholes at a total cost not exceeding K 0.5 million (see Appendix XXII for project outline).

114.   Cost Summary of Long-term Agricultural Water
                    Use Development Program

                    (K million, 1974 prices)

	1977-1981	1982-1986	Total
Irrigation	12.8-17.9	22.5-25.9	35.3-43.8
Rural Water Supply	7.5	10.0	17.5
Cattle Watering	0.5	-	0.5
Total	20.8-25.9	32.5-35.9	53.3-61.8

115.   Medium- and small-scale irrigation, representing an estimated cost
of K 5 million for 1977-81 and K 4 million for 1982-86, should be integrated
with rural water supply and cattle watering into a rural water development
program.

116.   Therefore, the rural water development program to be conceived and
carried out at the provincial and district levels would be as follows (K mil-
lion 1/):

	1977-81	1982-1986	Total
Medium- and Small-Scale Irrigation	4.3	5.4	9.7
Rural Water Supply	7.5	10.0	17.5
Cattle Watering	0.5	-	0.5
Total	12.3	15.4	27.7

117.   Concurrently, a large-scale irrigation development program, in-
cluding land preparation, and construction of the water source and of the
irrigation works, should be conceived and carried out at the national level.

External Assistance Proposals

118.   In addition to internal action, external assistance is needed in
order to implement and successfully carry out the program proposals outlined
above.

119.   The external assistance activities which follow are indicative, but
not exhaustive of the kinds of programs that are needed. Suggested activities
appear in a tentative order of priority and are presented in outline form
only; further elaboration and formulation of these activities is needed at
some future point.

120. Major Project: (Outlines of all Projects are presented in Appendix XXII):

(a) Intensification of water development in rural areas for domestic supply, irrigation (medium- and small-scale), and cattle watering. Pre-project activities amount to about US$30,000. Subject to further evaluation and formulation, project activities are estimated at approximately US$1 million, with possible loans of roughly US$9 million.

(b) Program of irrigated wheat and other crops on commercial farms and smallholdings, to be implemented during the third and fourth NDP (1977-1986) over 5,000-8,000 ha, after a pilot phase over 200 ha. The location is shown on Map IBRD 11545. Pre-development activities amount to about US$600,000. Subject to further evaluation and a feasibility study, project costs are estimated at approximately US$8 million. Possible loans are roughly estimated at US$5.5 million.

(c) Borehole irrigation in the Copperbelt and Central Provinces to survey and demonstrate the irrigation potential of the limestone groundwater reservoir which could be exploited through public and private sector efforts. Pre-development activities amount to approximately US$1 million.

(d) Study of irrigation potential in the Chambeshi River Valley to further ascertain the feasibility of large- and/or medium-scale irrigation. If possible, a first development phase will be implemented. Pre-development activities are estimated at about US$150,000. Subject to positive findings, the cost of a first development phase would be about US$650,000.

121. Other Projects or Activities

(e) Cattle watering program in the Western Province to construct about 150 boreholes in order to better use the grazing potential of the Mulonga and Siloana Plains. Pre-project activities amount to about US$160,000. Project activities could be of the same order, possibly as a Government counterpart.

(f) Establishment of a Kafue Basin water plan as a consequence of the conception of a strategy and policy of water management in the entire Basin. Project activities amount to about US$250,000. They could be preceded by the creation of a coordinating committee, which would become the water authority. An amount of about US$5,000 may be needed for this project.

(g) Pre-feasibility study on multi-purpose utilization of Iteshiteshi Dam-Reservoir on the Kafue River to prepare pre-feasibility reports on the multi-purpose use of the water regulated by the dam-reservoir and a feasibility study for a possible heightening of the dam. Project activities amount to about US$20,000.

(h) Planning the Kafue Flats' development related to water for the optimum utilization of land and water resources for the development of irrigated agriculture, livestock, the conservation of wildlife, etc. Project costs amount to about US$1.2 million; pre-projects activities (project formulation) to approximately US$10,000.

(i) Establishment of a central water resources archive based on modern methods of data collection, processing and retrieval. Activity cost amounts to about US$180,000. This project could be carried out in conjunction with the activity which follows.

(j) Establishment of a map of the country's groundwater potential based on existing knowledge. Activity cost amounts to about US$60,000.

(k) New analysis and mapping of water resources from LANDSAT imagery, and training of Zambians in preparation and interpretation of LANDSAT mosaics. Cost amounts to US$500,000.

122.   Summary of External-Assistance Program (Details in Appendix XXII):

Reference	Project or Activity Title	Phasing 1/	External Inputs (US$ million)
	Major Projects		
a	Intensification of water development in rural areas	PPA PA L	0.03 1.0 3.8
b	Program of irrigated wheat and other crops (Map IBRD 11545)	PPA PA L	0.6 1.0 5.5
c	Borehold irrigation in Copperbelt and Central Provinces (MAP IBRD 11545)	PPA PA L	0.1 1.0 1.0
d	Study of irrigation potential in Chambeshi River Valley (Map IBRD 11545)	PPA PA L (?)	0.2 0.7 2.0
	Other Projects or Activities		
e	Cattle watering program in Western Province	PPA PA	0.2 0.2
	Major Projects		
f	Establishment of a Kafue Basin Water Plan	PPA PA	0.01 0.3
g	Pre-feasibility study on multi-purpose utilization of Itezhitezhi Dam-Reservoir on the Kafue River	PPA PA	p.m. 0.02
h	Planning the Kafue Flats development related to water	PPA PA	0.01 1.2
i & j	Establishment of a central water resource archive and of a map of the country's groundwater potential	PA	0.3
k	Preparation and analysis of LANDSAT mosaics and training of Zambians	PA	0.5

1/   PPA = Pre-project Activities.
     PA = Project Activities.
     L   = Loans (about 0.30-0.50 of the estimated program cost).

ZAMBIA: WATER RESOURCES: POTENTIAL, USE AND DEVELOPMENT

A LIST OF USEFUL DOCUMENTS
(in chronological order)

1. Verboom, "Study of Chambeshi Flats," early 1960's.

2. "FAO-Multipurpose Survey of the Kafue River Basin:" General, Soil, Climatology and Hydrology, Ecology, Wildlife, Fishery, Livestock, FAO/SF: 35/ZAM, 7 Vol., (1968).

3. Karl Aubrecht, "Land Use in Luangwa," (1969).

4. Italconsult, "Multipurpose River Basin Surveys and Studies:" General, Hydrology, Hydrogeology, Soil, Agriculture and Live- stock, Market and Commodity Analysis, Electric Power, Irrigation Projects. 8 Vol., (Rome, December 1970).

5. Sir Alexander Gibb and Partners, "Copperbelt Water Resources Survey," (London, 1971).

6. Republic of Zambia, Ministry of Rural Development, Department of Water Affairs, "The Surface Water Resources of Zambia," (January 1971).

7. Republic of Zambia, Department of Meteorology, "Totals of Monthly and Annual Rainfall for Selected Stations in Zambia," (March 1972).

8. G.A.N. Starmans, and M.S.E. Shalash, "Water Consumption for Irrigation in Zambia," Ministry of Rural Development, DWA, (May 1972).

9. Anglo-American Corporation Ltd., "Wheat Production in Zambia," (July 1974).

10. Tate and Lyle Technical Services, "Investigation of Production Prospects for Wheat in Heavy Clay Soils in the Kafue River Flats," (August 1974).

11. IBRD/559-ZA, "Water Supply and Sewerage Sector Study," (October 1974).

ZAMBIA: ESTIMATED WATER RESOURCES

1. Water balance[1] of Zambian territory

Basins	Area x 1000 km^2	Water balance elements in km^3/year				
		Precipit.	Runoff			Evapor.
			total	flood [2]	baseflow	
	(a)	(b)	(c)	(d)	(e)	(f)
Zambezi [3]	256	240	30	21.8	8.2	210
Kafue	155	160	11	9.4	1.6	149
Luangwa	145	134	16 [4]	15.0	1.0	118
Luapula	178	208	27 [4]	22.4	4.6	181
Tanganyika	16	18	6	5.4	0.6	12
	750	760	90	74.0	16.0	670 [5]

2. Runoff coefficient and low flow

	Runoff regulated by underground reservoirs, lakes, swamps (e/c)	Low flow discharge in m^3/s	
		Average	Lowest
Zambezi	0.27	375 [6]	250 [6]
Kafue	0.15	46	16
Luangwa	0.06	29	13
Luapula	0.17	226	55
Tanganyika	0.04	10	4
	0.17	686	338

3. Stable river runoff in km^3/year

Regulated by:

        Underground reservoirs 11
        Lakes, swamps, flood plains 5
        Man-made reservoirs .... 27 [7]

                Total 38

                % of Runoff 0.42

4. Water in storage in km^3 [8]

Underground reservoirs

    Kalahari sands 50
    Limestone 10
    Alluvial deposits 6
    Other (basement,
        Karoo) 18
                            84

Lakes [9]

    Bangweulu 22
    Wantipa 4
    Others 4
                    30

Swamps

    Bangweulu 10
    Mweru 1.3
    Wantipa 1.6
    Kawambwa 1.4
    Kafue flats 4.7
    Lukanga 4.6
    Busanga 1.4
    Others 3
                            28.0

Man-made reservoirs [10]

    Kariba 7.3
    Itezhi Tezhi 0.7

                    8.0

Total

                150

---

[1] average (1955-69), rounded figures; [2] flood runoff; [3] Zambian part
of the basin and its own water crop; [4] of which 6.0 from the Chambeshi
before Bangweulu swamps catchment and 21.0 after the same (gain: 1.5 in
spite of evapotranspiration over the swamps); [5] including deep percola-
tion and groundwater flow into neighbouring countries (about 24 km^3); [6]
international waters; [7] live storage; Kariba dam national apportionment:
17 + Kafue Gorge dam: 0.8 + Iteshiteshi dam; 4.2 (when completed); several
hundreds small capacity dams: negligible; [8] minimal assumptions except
for man-made reservoirs; [9] Lakes Mweru and Tanganika not considered as
international waters; [10] dead storage.

Source: Mission Estimates

1970 Monthly Rainfall in Millimeters 1971
(Number of Days with Rainfall above 0,01 Inches)

PROVINCE (Admin. Center)	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Total Year mm
WESTERN (Mongu)	--	--	-- (2)	46 (6)	143 (17)	145 (20)	250 (22)	204 (18)	80 (9)	54 (8)	38 (1)	-- (1)	960 (104)
SOUTHERN (Livingstone)	--	--	-- (2)	5 (2)	160 (12)	140 (14)	312 (24)	52 (13)	28 (6)	-- (3)	--	--	697 (76)
N.WESTERN (Solwezi)	--	--	-- (2)	83 (11)	314 (21)	238 (26)	294 (23)	253 (16)	129 (15)	94 (10)	--	--	1,405 (124)
COPPERBELT (Ndola)	--	--	4 (2)	38 (9)	295 (19)	360 (30)	362 (27)	263 (26)	100 (14)	23 (5)	3 (1)	--	1,448 (133)
CENTRAL (Kabwe	--	--	--	14 (4)	180 (16)	170 (14)	281 (23)	153 (14)	24 (4)	10 (2)	--	--	832 (77)
EASTERN (Chipata)	3 (1)	--	--	36 (3)	170 (14)	365 (23)	415 (21)	400 (6)	36 (9)	52 (11)	8 (2)	--	1,485 (100)
NORTHERN (Kasama)	2 (2)	--	--	35 (3)	189 (16)	242 (25)	123 (23)	198 (23)	294 (18)	93 (10)	4 (1)	--	1,180 (121)
LUAPULA (Mansa)	--	--	15 (1)	44 (5)	232 (23)	316 (25)	262 (24)	400 (22)	151 (10)	41 (6)	--	--	1,461 (116)

NOTE: The Government Administrative Center indicated thus (Mongu) has been selected as the meteorological reporting station representative of each Province.

*Close to average year (6% below), except for Ndola, Chipata, Mansa (above)

Source: From Totals of Monthly and Annual Rainfall, 1970-71, Department of Meteorology, Lusaka

ZAMBIA
AGRICULTURAL AND RURAL SECTOR SURVEY
LONG TERM RAINFALL DISTRIBUTION, (1919–1970),
Northern and Southern Regions

Inches

mm

74.32

62 — — 1560
60 — — 1510
58 — — 1460
56 — — 1410
54 — — 1360
52 — — 1310
50 — Average — 1260
48 — — 1210
46 — — 1160
44 — — 1110
42 — — 1060
40 — — 1010
38 — — 960
36 — — 910
34 — — 860
32 — — 810
30 — Average — 760
28 — — 710
26 — — 660
24 — — 610
22 — — 560
20 — — 510
18 — Drought Conditions — 460
16 — — 410

19 20   22   24   26   28   1930   32   34   36   38   1940   42   44   46   48   1950   52   54   56   58   1960   62   64   66   68   1970

Rainfall year 1st July ——▶ 30th June next year
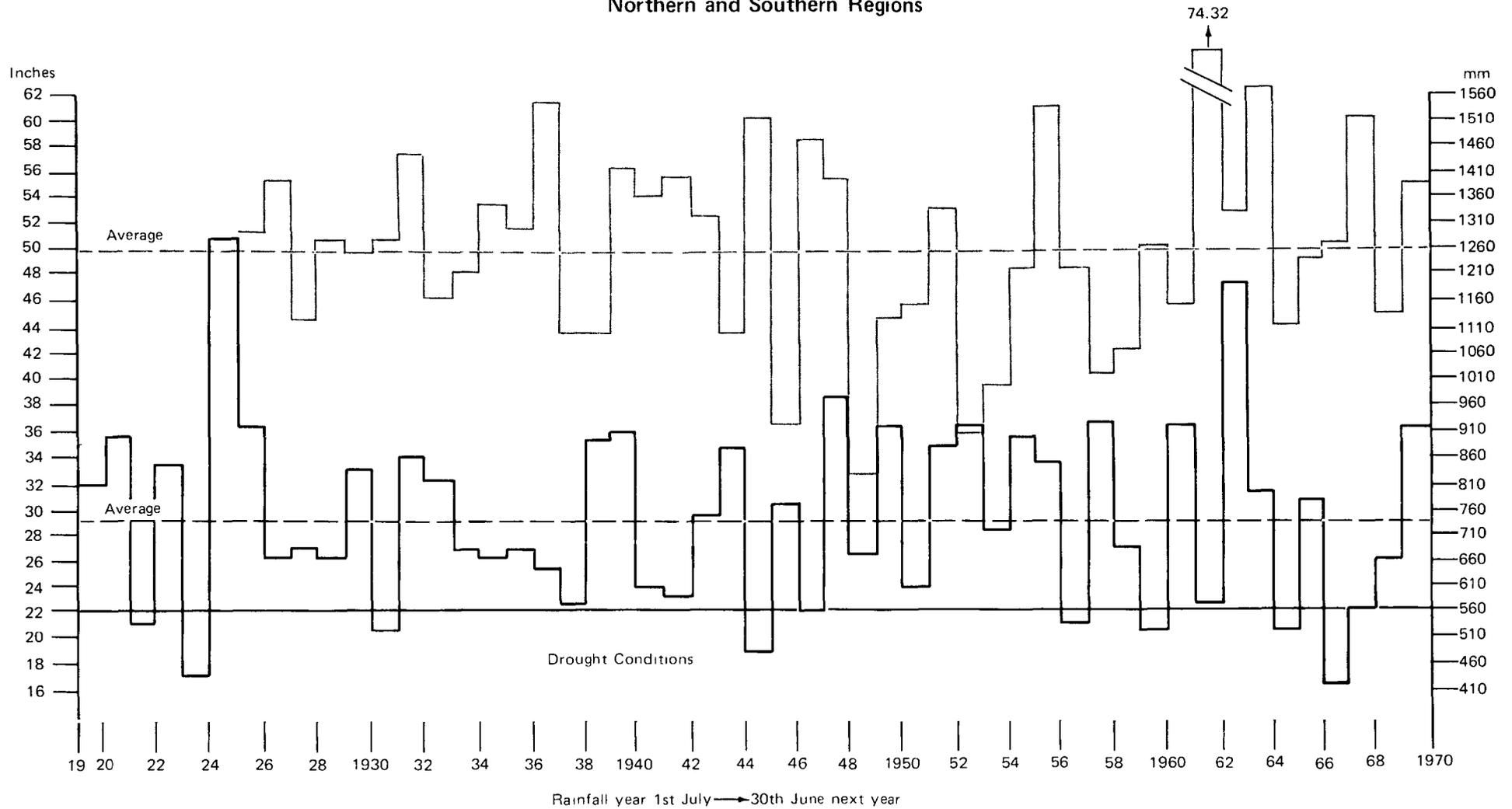
—————— Kasama   Lat 10°13′, S   Long 31°08′, E   Alt. 1230 m (Northern Region)

—————— Kalomo Boma Lat. 16°58′, S   Long. 26°29′, E   Alt 1250 m (Southern Region

Location (see map IBRD—11509)

Source   Mission, from Totals of Monthly and Annual Rainfall
for selected stations in Zambia, March 1972

World Bank—9782

ZAMBIA: GROUNDWATER OCCURRENCE AND DISCHARGE DATA

Province	Area	Water-bearing formation	Yield (l/s) per borehole 6" diam.* range	max.
Southern	Livingstone district	basalts; overlaid sometimes by sand-filled valleys	2.5 - 3	5
	Kalomo-Choma	granites; max. weathered depth: 37m	1 - 1.2	1.5
		quartz veins, shear zones	2.5 - 3.8	5.0
	Mazabuka district	Upper Katanga; limestone, dolomite	1.3 - 3.8	12.5
		argillites	poor	0.5
		Lower Katanga; phyllites	0.4 - 0.5	0.7
		lower schists	0.5 - 0.8	1.3
	Gwembe Valley	sandstones		1.5
		shales and mudstones	poor	0.6
Central		limestones, dolomite	1.5 - 6	50
		phyllites	0.4 - 0.5	0.7
		schists	1.0 - 2.5	
		quartzite ·	poor	
Copperbelt		limestone, dolomite	2. - 10	75
		basement schists	0.4 - 0.5	0.7
		basement granites	0.7 - 0.9	1,2
Northern		basement schists	0.4 - 0.5	0.7
		granite -gneiss	0.5 - 1,2	1.5
		quartzite	poor	
	Mpika	Plateau sandstone	1.7 - 2.1	2.5
Luapula	Kawambwa	Plateau sandstone	1.5 - 2.5	3
	Luapula Valley	granite, gneiss	0.5 - 1.2	1.5
	Kashiba	sandstone, shales	poor	
	Mansa	granite, shallow weathered	0.3 - 0.5	1.0
Western	Most of Province	Kalahari sandstone	1.5 -12.5	25
	eastern part	Karoo formation, basement	0.5 - 1.5	3
North Western	Most of province	Katanga formation limestone	1.5 - 5	10
		shales	poor	
	Part of province	Kalahari sandstone	1.5 -12.5	25
Eastern	Luangwa Valley	alluvial deposits	1 -10	15
	Most of province	basement complex	0.5 - 2	5

*Inadequate pumping tests; unknown drawdown.

Source: Mission Estimates

ESTIMATE OF MINE PUMPING FROM THE LIMESTONE RESERVOIR IN COPPERBELT PROVINCE (1970)

Location	m^3/s	m^3/day	$Mm^3/year$	Remark
Mufulira	0,925	80,000	29.2	30.000 m^3/day returned to Kafue River
Chibuluma	0,520	45,000	16.4	23.000 m^3/day returned to Mweru-beshi River
Luanshya	0,635	55,000	20,1	
Chingola	0,920	80,000	29,2	
Konkola	2,900	250,000	91,3	200.000 m^3/day returned to river
	5,900	510,000	186.2	

GROUNDWATER ABSTRACTION FORECAST FROM SAME LOCATIONS (INCLUDING 30% WASTE)

1980 :   835,000 m^3/day (9.6 m^3/s ; 302.4 $Mm^3/year$)

1990 : 1,010,000 m^3/day (11.7m^3/s ; 368.5 $Mm^3/year$)

2000 : 1,160,000 m^3/day (13.5 m^3/s ; 425.3 $Mm^3/year$)

ESTIMATED NATURAL RECHARGE OF THE LIMESTONE RESERVOIR: 200 to 220 mm/year

Source: Sir Alexander Gibb Report, 1971.

GROUNDWATER ABSTRACTION FROM LIMESTONE RESERVOIR AROUND LUSAKA (1961-65): 8,8 $Mm^3/year$

Source: Italconsult Report, Hydrogeology Vol., December 1970.

ZAMBIA: GROUNDWATER EXTRACTION THROUGH BOREHOLES

A - Public and Private Sectors*

1. **Usual borehole characteristics:** diam: 6"; average depth: 30 - 100 m.
   max. depth: 105 - 120 m.

2. **Discharge (l/s):** (unknown drawdown)

	average	maximum
limestone, dolomite (Katanga)	3.8 - 7.6	75 -- 150
Kalahari sands (tertiary)	3.8 - 5.1	12.5 - 25
schists with quartzites, limestone (Katanga)	1.3 - 3.8	9 - 15
sandstones with shales, mudstone (Karoo)	0.6 - 3.2	4.5 - 6
schists and micaschists,)		
quartzites, granites, gneisses,)		
schists and granites (basement))	0.6 - 2.5	4.5 - 8

3. **Proportion of productive (successful) boreholes:** (Over 0.1 l/s)

		Performance in 1970		
granites	: 63%			
schists, quartzites, sandstone, limestone	: 70 - 73%	Productive	:	1518
schists with granite, with lime-stone and basalts	: 86 - 94%	Dry	:	573
Kalahari sands	: 100%			————
				2091
Average (1970)	: 70%			

4. **Distribution of boreholes:**

Central Province	:	1120	limestone, dolomite	:	550
Southern "	:	600	granite	:	480
Eastern "	:	120	schists	:	420
Northwestern "	:	55	schists with quartzites	:	140
Western "	:	15	sandstone	:	130
Copperbelt "	:	120	quartzites	:	110
Northern "	:	50	schists with limestone	:	90
Luapula "	:	11	Kalahari sands	:	15

5. **Drilling performance:**
   (for an average depth of 30 - 40 m/borehole)

   18 boreholes/year/percussion rig in basement
   22 boreholes/year/percussion rig in limestone
   30 boreholes/year/percussion rig in Kalahari sands

B - Public Sector Only

6. **Historical data:**

Year	Total Boreholes	Productive	Dry	Efficiency
1968	108	84	24	77%
1969	167	145	42	74%
1970 1/	183	137	46	69%
1971	303	243	60	80%
1972	171	132	39	77%
1973	172	126	46	73%

7. **Distribution by constructor (1973):**

					No. of Rigs
DWA	26	22	4	85%	7
USSR team	69	57	12	83%	5
Waterwells Ltd.	35	22	13	63%	24
Sidco Ltd. (Yugo-slavia)	20	11	9	55%	2
Geomin Ltd. (Romania)	15	8	7	53%	2
Saaimon	7	6	1	86%	3
	172	126	46	73%	43 2/

8. **Distribution by Province 3/ - 1973:**

Copperbelt	13	8	5	62%
Central	17	14	3	82%
Eastern	69	57	12	83%
Southern	35	17	18	48%
Northern	5	3	2	60%
Luapula	21	19	2	90%
North Western	12	8	4	67%
	172	126	46	73%

9. **Drilling Cost by Province 3/ - 1973:**

	Total	per borehole	per metre
Copperbelt	26,600	2,046	33,1
Central	27,340	1,608	25,6
Eastern	102,340	1,483	42,1
Southern	59,580	1,702	24,6
Northern	13,490	2,696	68,4
Luapula	43,050	2,050	33,7
North Western	34,800	2,900	47,5
	307,200		
average cost:		1,706	34,6

---

*Items 1 to 4: statistical analysis (1970) out of 2091 boreholes

1/ end of the first NDP.
2/ including 39 percussion rigs; but not taking into account another 3 percussion rigs of Tobacco Board of Zambia
3/ Western Province is not included as a jet technique is being used in the province instead of usual drilling.

Source: Items 1-4 Italconsult Report.
Items 5-9 Compiled by Mission from various sources.

ZAMBIA: THEORITICAL WATER LOSSES

1. Direct evaporation from water surface (see Map IBRD 11546).

Water surface	area (km^2)	evaporation mm/year	evaporation km^3/year
Kariba Lake	5 600	2 291	12.8
Tanganyika lake	2 100	1 869	4.3
Bangweulu Lake	2 260	1 862	4.2
Mweru Lake	2 700	2 045	5.5
Wantipa Lake	390	1 869	0.7
Other lakes	1 000	1 900	1.9
Bangweulu Swamp	7 770	1 862	14.5
Mweru Swamp	965	2 045	2.0
Wantipa Swamp	1 160	1 869	2.2
Kawambwa Swamp	975	1 869	1.8
Lukanga Swamp	3 470	2 037	7.0
Busanga Swamp	1 100	1 486	1.6
Other swamps	1 000	1 900	1.9
Barotse Flood Plain	16 200 [1]	2 306	18.7
Kafue Flats	3 860 [1]	2 245	4.3
Chambeshi Flats	1 750 [1]	1 862	1.6
Other flood plains	1 000 [1]	1 900	1.0
	53 300		86.0

(1) temporary flood: 6 months

2. Losses per basin (km^3)

Basin	area (km^2)	direct evaporation	natural evapotranspiration	deep percolation	total
Zambezi	360 700 [1]	33	270	14	317
Kafue	151 000	14	130	3	147
Luangwa	143 800	1	120	2	123
Luapula	99 500 [2]	38	40	5	83
	755 000	86	560	24 [3]	670

1/   including the Angola portion
2/   including Chambeshi and Tanganyika Basins
3/   including groundwater flow into neighbouring countries.

Source: Mission Estimates

ZAMBIA: HYDROPOWER CAPACITY AND PRODUCTION, 1973

Generating stations (at 30th June 1973)

Stations [1]	Installed capacity (MW)		Units generated in 1972/73 (kwh 000)
Kafue Gorge	4 x 150	: 600	2,713,567
Victoria Falls A	(2 x 1) + (2 x 3)	: 8)	
" " B	6 x 10	: 60)	583,285
" " C	4 x 10	: 40)	
Lusiwazi	2 x 3	: 6	10,218
Musonda Falls	3 x 1	: 3	9,434
Chisimba Falls	(2 x 1.2) + 4 X 0,3)	: 3.6	7,721
Lunzua River	4 x 0.25 1	: 1	4,575
Mulungushi	(1 x 6.4) + (2 X 6)	: 18.4	83,360
Lunsembwa (Mita Hills)	(1 x 6) + (2 x 5)	: 16	72,320
		756	3,484,480 [2]

Supply of electricity (million kwh)

Generation in Zambia	:	3,841
Import to Zambia		607
		4,448
Gross consumption in Zambia:		4,990

1/ see map 4

2/ Hydropower proportion of electricity generated in Zambia : 91%

Source: Zambia Electricity Supply Corporation (ZESCO)

ZAMBIA: DOMESTIC WATER SUPPLY, 1973

Distribution and water service

	Population	served with piped water	Water use total (Mm^3/y)	per capita(m^3/day)
Urban	1 208 000 (30%)	906 000 (75%)	134 - 234	0.4 - 0.7
Rural	2 852 000 (70%)	285 000 (10%)	42 - 73	0.4 - 0.7
	4 060 000 (100%)	1 191 000 (30%)	176 - 307	

Urban water service

- with central water supply (60% by house connections, 40% by standpipes)

Cities (3)	Municipalities (5)	Townships (11)	
Lusaka	Chingola	Choma	Kasama
Ndola	Kabwe	Kalomo	Mbala
Kitwe	Livingstone	Mazabuka	Mansa
	Luanshya	Monze	Chipata
	Mufulira	Pemba	Kafue
		Mongu	

Rural water service

Type	Dwellings (1000's)	Population (1000's)	Water use total (Mm^3/y)	per capita (m^3/day)
Private taps	17	70 (2.5%)	5	0.2
Shared taps	56	229 (8%)	8.3	0.1
Wells or boreholes	300	1,240 (43.5%)	22.7	0.05
River or stream	270	1,113 (39%)	4.2	0.01
Other	48	200 (7%)	0.8	0.01
	691	2,852 (100%)	41.0	

Forecast 1986

	Population	Served		Water use total (Mm^3/y)	per capita (m^3/day)
Urban	3,500 000	with piped water	3,200,000(90%)	467	0.4
rural	3,400 000	" " "	880,000)	128	0.4
rural		" wells or boreholes	1,700,000) (75%)	31	0.05
	6,900,000		5,780,000(83%)	626	

Source: "Water Supply and Sewerage Sector Study," IBRD Report No. 559-ZA, Oct., 1974, and Mission Estimates.

ZAMBIA: WATER SUPPLY RESPONSIBILITIES BY FUNCTIONS, 1973

Place or Category	Preinvestment and Feasibility Studies	Engineering Design	Finance	Construction		Operation and Maintenance
				Supervision	Actual Work	
Cities (3)	City & Consults.	City & Consults.	MLGH & City	City	City & Contract	City
Municipalities (5)	Mun. & Consults.	Mun. & Consults.	MLGH,GG & City	Mun.	Mun. & Contract	Mun.
Township Councils	Consults. & DWA	Consults. & DWA	MLGH & TC	TC & DWA	TC & Contract	TC, BB & DWA
Rural Councils	DWA	DWA	DWA	DWA	DWA & Contract	DWA & BB
Villages	DWA	DWA	DWA	DWA	DWA & Contract	Villages, DWA & BB
Institutions	BB & DWA	BB	Resp. Agency	BB	Contract	Agency or DWA

Abbreviations: MLGH - Ministry of Local Government and Housing (loan)
GG   - Government Grant
Mun. - Municipality
DWA   - Department of Water Affairs   (Ministry of Rural Development)
TC   - Town Council
BB   - Buildings Branch (Ministry of Power, Transport and Works)

Source: DWA and BB
from IBRD Report No. 559-ZA, "Water Supply and Sewerage Sector Study."

ZAMBIA

ORGANIZATION OF THE DEPARTMENT OF WATER AFFAIRS 1973

```
                    ┌─────────────┐
                    │ DIRECTION   │
                    │ (Director)  │
                    └─────────────┘
                           │
         ┌─────────────────┴──────────────────┐
  Data and Planning                      Water Supply
 (Chief Water Engineer)              (Chief Water Engineer)
         │                                    │
   ┌─────┴─────┐                        ┌─────┴─────────┐
Hydrological Branch   Hydrogeological Branch   Drilling Section    Construction and
(Principal Hydrologist) (Senior Hydrogeologist) (Senior Water        Maintenance
                                                 Engineer)       (Senior Water Engineer)
                           │
                  ┌─────────────────┐
                  │ Water Services  │
                  │ Staff in Provinces │
                  └─────────────────┘
```
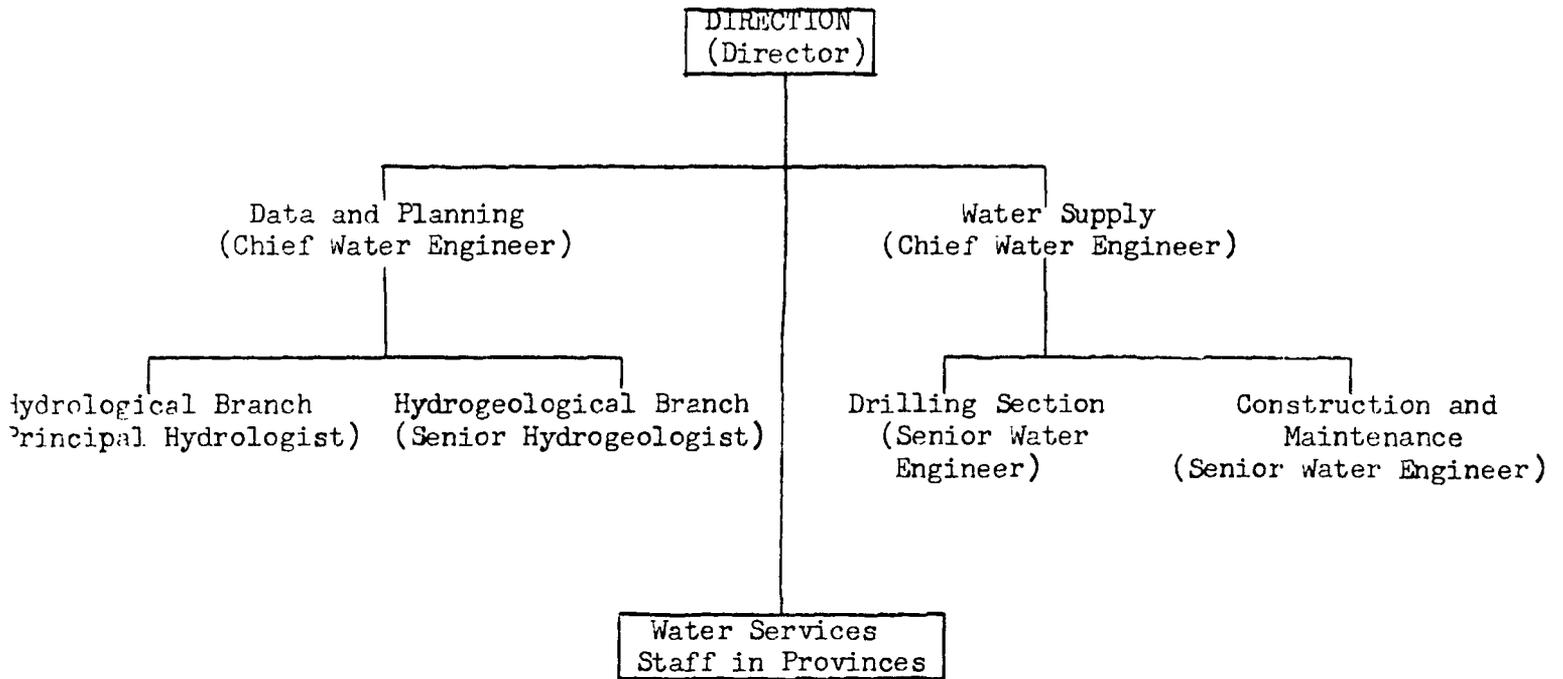
Distribution of Higher Grade Staff
(selected from staff-list 1973)

	Central	Provinces	Districts
Superscale	9	1	-
Professional	5	6	-
Admin./exec./ techn.	18	19	8

ZAMBIA

TYPICAL ORGANIZATION OF THE PROVINCIAL WATER SERVICE
WITHIN THE DEPARTMENT OF WATER AFFAIRS 1972

```
┌─────────────┐                    ┌─────────────┐
│ PROVINCIAL  │                    │ PROVINCIAL  │
│ AGRICULTURAL│ - - - - - - - - - -│   WATER     │
│  ENGINEER   │                    │  ENGINEER   │
└─────────────┘                    └─────────────┘
                                          │
                                          │
                                    Executive
                                     Officer
                                          │
                                   Stores        Clerical


        Water Engineer                    Senior Engineering
     (Township Water Supply)                  Assistant
                                          (Rural Water Supply)


   Senior Mechanical          Water Supply          Engineering Assistant
    Superintendent           Superintendent         (In charge of District)
   (Mechanical and         (Construction, Treat-
  Electrical Maintenance)   ment and Distribution)

                              Plumbers, Builders
```

ZAMBIA: 1973 BUDGET FOR WATER SUPPLY
(in K.000)

	Townships	Rural	Total
A. Allocated To DWA			
1. Recurrent Expenditures			
Authorized Provision	300	400	700
Actual Expenditure	375	364	739
Balance	(75)	36	(39)
2. Capital			
Authorized Provision	2,000	400	2,400
Actual Expenditure	1,555	296	1,851
Balance	445	104	549
3. Recurrent Expenditures for SNDP			
1972	300	360	660
1973	300	400	700
1974	300	440	740
1975 (1) requested	400	500	900
1976 (1) requested	500	500	1,000
	1,800	2,200	4,000

	Province	Authorized Provision	Actual Expenditure	Balance
B. Allocated to the Provinces (capital only)				
	Copperbelt	100	100	--
	Central	105	89	16
	Northern	100	25	75
	Western	80	76	4
	Eastern	300	288	12
	Luapula	100	99	1
	North-Western	120	121	(1)
	Southern	115	113	2
	Total	1,020	911	109

Source: 1973 Zambia Budget

ZAMBIA: EXISTING IRRIGATION SCHEMES
BY PROVINCE (1974)

Map Reference [1]/	Province	District	Scheme	Area (ha)	Crop
a	Southern	Gwembe	Buleya Mulima	100	Fruit, vegetables
b		"	Siatwinda	80	" "
c		"	Bishop of Monse	40	Bananas, "
d		Mazabuka	Zambia Sugar Cy.	6,500	Sugar cane
e		"	National Irrigation Research Station (NIRS)	30	Wheat, various
f	Central	Kafue	Chiawa	20	Bananas
g		Chilanga	Liempe farm	30	Wheat
h		Chisamba	Grobler farm[2]/	130	Onions, maize
i		Feira	Feira pilot irrigation	20	Vegetables
j		Central	Dean farm [2]/	30	Citrus, vegetables
k	Copperbelt	Ndola rural	Chapula	60	Vegetables
l		" "	Ipafu	40	"
m		" "	Kafubu	60	"
n	North Western	Mwinilunga	Mwinilunga	50	Pineapple, vegetables
p		Zambezi	Training settlement	30	Vegetables
q	Western	Mongu	Kabompo	2	Rice
r		"	Pilot irrigation	5	Vegetables
s	Eastern	Lundazi	Lundazi scheme	6	"
t		Chadiza	Rukizye	4	"
u		Chipata	Makungwa	4	"
v		Petauke	Lusowe	2	"
w	Northern	Kasama	Ngoli	80	Coffee
x		Mporokoso	Kapatu	40	Fruit, vegetables
y		Kasama	Kasama scheme	2	Vegetables
z		Mbala	Mbala "	2	"
ab		Chinsali	Chinsali "	20	Rice
ac		Mpika	Malashi	4	Citrus
ad	Luapula	Mwense	Mununshi	80	Bananas
ae		Kawambwa	Mushota	20	Vegetables
af		Mansa	Kawambwa scheme	240	Tea
ag		"	Research station	2	Rice trials
			Grand total :	7,693	

[1]/ Shown on Map IBRD 11548.

[2]/ These are indicative only. There are over 30 commercial farms with over 20 ha under irrigation mainly for fruit, vegetables, sugar and wheat.

Source: Mission Estimates.

ZAMBIA: POTENTIAL LARGE-SCALE IRRIGATION DEVELOPMENT BY RIVER BASIN

(Letters (aa)-(zz) refer to location shown on Map IBRD 11545)

Zambezi Basin

(aa) Chavuma - Palata: an area of 1,000 ha is irrigable on the left bank
of the river; soils are sandy loam with sandy clay loam sub-soil.
Limestone is available in the vicinity to amend the soil; land
preparation would be required to eliminate the 2-4 ant-hills/ha;
the water source would be from the river which has a discharge of
43 m^3/s at the low-flow period. This compares with the water
requirement of 10 Mm^3/year with a peak demand of 1.2 m^3/s. A
water canal of 0.8-2 km would be needed.

(bb) Kabompo: an area of 1,000-2,000 ha is irrigable on the right bank
of the river; soils are sandy loam; cost of land preparation would
be on the low side. The water source would be from the river which
has a discharge of 36 m^3/s at the lowest flow. This compares with
the water requirement of 20 Mm^3/year with a peak demand of 2.5 m^3/s.

(cc) Barotse Flood Plain: an area of about 20,000 ha is irrigable of the
river terraces of both banks; soils are sandy to sandy clay loam;
cost of land preparation would be on the low side. The water source
would be the river flood (Jan. - April), which keeps the soils wet
until May. Only three months of supplementary irrigation is, therefore,
required from the river or the natural channels. Medium-scale
irrigation is feasible for hay (ensilage) and also for rice, with good
prospects for smallholders or farmers, considering that four years of
research have already been conducted in this area. Outside the Flood
Plain, and mainly west of the river, small patches of sandy clay
loam soils around the dambos, totaling up to 1,000 ha, could be put
under crop. The water source would be the natural outcropping
groundwater with little or no irrigation. These areas are suitable
for rice during the rainy season, and wheat during the dry season,
the latter crop with a 1,200 kg/ha production requiring only fertilizers
and manpower and no irrigation. They are suitable for a development
pattern of two-three ha/unit.

(dd) Sinamalima: an area of 2,000 ha is irrigable on the left bank of
Kariba Lake on excellent soil and without any foreseeable drainage
problem. An additional 1,000 ha area of saline soil, subject to
reclamation, is available for rice production. Little or no land
preparation would be required as topography and slope are adequate.

The water source would be from Kariba Lake, without any limitation; good sites exist for a pumping station; a water canal of 3 km would be needed. The water requirement for irrigation would be 20 Mm^3/year with a peak demand of 2 m^3/s. The optimum crop products could be rice and wheat.

(ee) Chiawa: an area of 3,000 ha is irrigable on the left bank of the river in scattered patches of fairly good soils (class 2); little or no land preparation would be required. The water source could be from the Kafue River and/or the Zambezi River; the former is already regulated by Gorge Dam, and in 1978 will be regulated by the Itezhi Dam· the latter is regulated by Kariba Lake. The lowest discharge of the Kafue is 40 m^3/s (increasing to 180 m^3/s in 1978). the lowest discharge of the Zambezi is 1 000 m^3/s. This compares with the water requirement of 30 Mm^3/year, with a peak demand of 3 m^3/s. A water canal of 3 km would be needed from the Zambezi.

Kafue Basin

1. ## Main River

(ff) Mpongwe: an area of about 10,000 ha is irrigable far away from the left bank of the river; soils are excellent to good (class C_1 and S_1, and C_2 and S_2). Because of good slope and topography, with only two ant-hills/ha, land preparation would be kept minimal. The water source would be boreholes into the groundwater limestone reservoir, with possible discharge of 10-40 1/s per borehole; the reservoir groundwater potential is unknown but represents the major part of the Kafue low-flow the water requirement for irrigation would be 60 Mm^3/year with a peak demand of 5 m^3/s; implementation of irrigation in this area would produce technical and social problems.

(gg) Munkumpu: an area of 17,000 ha is irrigable on the left bank of the river. The area is limited by the water availability at lowest flow, but not by the sandy loam soils which are excellent to good (class C_1 and C_2); minimal land preparation would be required because of good slope and topography with only two ant-hills/ha. The water source would be from the river, which has a discharge of 14.4 m^3/s at the low-flow period. This compares with the water requirement of 135 Mm^3/year with a peak demand of 10 m^3/s; other possible water sources are a river tributary with a 0.4 m^3/s discharge, and groundwater if the potential and well yield were better known. A first phase of 4,600 ha (2,300 wheat, 800 vegetables, etc.), with a water requirement of 37 m^3/s, is under a feasibility study. Implementation of irrigation in this area may produce social, as well as certain technical problems, to be solved.

(hh) <u>Kandu-Mswebe</u>: an area of about 10,000 ha is irrigable on the left
bank of the river from the western ridge of Lukanga Swamp to the west
and north of the Great Concession. The soils are excellent, the best
in the country semi-detailed surveys, which show that mixed farming
is feasible, have been completed. The water source could be the
Lukanga Swamp, via a multi-km-long canal; but other water sources
have to be investigated. The water requirement for irrigation of this
area would be 80 Mm^3/year with a peak demand of 7 m^3/s. At 160 km
west of the Lukanga Swamp lies the Mutoya Flood Plain with heavy
clay soils (40,000 ha); the area is limited by the water available at
lowest flow of the Kafue River.

(ii) <u>Kafue Flats</u>: an area of only 15,000 ha is irrigable on both banks of
the river due to limited water availability. Two different types of
soils are present in the area: a) <u>the heavy clay soils</u> (725,000 ha)
could be reclaimed and irrigated, given water availability, high inputs
and high-level management. During a long period of experimentation on
a 300 ha pilot polder, wheat, cotton, soya and rice were grown success-
fully (1957-1964). Records of experimental yields (kg/ha) were:
wheat: 4,575; soya: 2,000; rice: 3,200 (Tate and Lyle Report, 1974).
The water source would be from the river, which recorded the lowest
discharge of 15 m^3/s (already committed at 67%), the water requirement
for irrigation on this type of soil would be 6 Mm^3/year/1,000 ha with
a peak demand of 0.9 m^3/s. Drainage requires serious consideration.
b) <u>The red soil fringe</u> or <u>flat margins</u> (64,000 ha) are very good soils
(class 1 and 2), located around the heavy clay soils; some drainage
would still be needed; a total area of 35,000 ha has been identified by
FAO in 1968. The water source would be from the river, or even better,
from the tributaries around the flats. The water requirement for the
irrigation of the identified area would be about 350 Mm^3/year with a
peak demand of 30 m^3/s.

2.   <u>Tributaries around the Kafue Flats</u>

All the soils to be irrigated by the tributaries are within the red-soil
fringe described under (ii) above. The following selection was made from the
identified 35,000 ha:

(jj) <u>Mwembeshi-Keembe</u>: an area of about 10,000 ha is irrigable on both banks
of the tributary. The slightly clay soils (class 1 and 2) have no
limitations beyond those required by good soil management. The water
source would be from both Mwembeshi and Keembe Rivers which have a
total discharge of 0.6 m^3/s at the low-flow period. The water
requirement for irrigation is estimated at 80 Mm^3 with a peak demand

of 8.5 m^3/s. To this end, two dam-reservoirs (capacity: 200 Mm^3) are required for a total capital cost of Ŀ 4,360,000 1/ (1968 prices), or a cost/ha of Ŀ 460.

(kk) Nangoma: an area of 6,000 ha is irrigable on the right bank of the tributary. Soils are class 1 and 2; a detailed survey remains to be made. The water source would be from the river. The irrigation water requirement would be about 50 Mm^3/year with a peak demand of 5 m^3/s. There is a need for a dam-reservoir (capacity: 100 Mm^3) for a total capital cost of Ŀ 2,400,000 1/ (1968 prices), or a cost/ha of Ŀ 410.

(ll) Nansenga an area of 6,000 ha is irrigable on the right bank of the tributary. Soils are good but their wetness deserves consideration. A detailed soil survey remains to be done. The water source would be from the river. The irrigation water requirement would be about 50 Mm^3/year with a peak demand of 5 m^3/s. There is a need for a dam-reservoir (capacity : 230 Mm^3) for a total capital cost of Ŀ 2,700,000 (1968 prices), or a cost/ha of Ŀ 425. 1/

(mm) Magoye-Chalimbana: an area of 500 ha is irrigable from the lake as the source of water. A detailed soil and feasibility study remains to be done. An additional area of 1,000 ha is also irrigable from the Magoye Tributary, subject to a dam-reservoir on Magoye River to meet the irrigation water requirement of 12 Mm^3/year, with a peak demand of 1.3 m^3/s.

Luangwa Basin

(nn) Kansangazi an area of 1,000 ha is irrigable in the densely populated Lupanda Valley. The detailed soil survey remains to be done; the water source would be from Kasangazi River, subject to a dam-reservoir (with a dam site still to be studied) in order to meet the irrigation water requirement estimated to be 10 Mm^3/year with a peak demand of 1 m^3/s.

(pp) Kakumbi an area of 3,000 ha is irrigable on the left bank of the main river. The soils are fairly good with adequate slope and topography requiring little land preparation. The water source would be from the river which has a discharge of 13 m^3/s at the low-flow period. This compares with the water requirement of 30 Mm^3/year with a peak demand of 3 m^3/s. A water canal of 0.6 km would be needed. A research station has been established.

Luapula Basin

1. Chambeshi Catchment

(qq) Mbala (west of): an area of 1.000 ha is irrigable. Soils are good but wet in some places; a detailed soil survey remains to be done.

1/ Pound Sterling.

The water source would be from the Mululwe River which has a discharge of 2 m³/s at the low-flow period. This compares to the irrigation water requirement of 3 Mm³/year with a peak demand of 0.3 m³/s.

(rr) Nondo-Ngoli: Two different schemes of 250 ha each of very good soils are irrigable. The water source would be from a small tributary which has very poor discharge at the low-flow period. As the irrigation water requirement would be about 2 Mm³/year with a peak demand of 0.3 m³/s, water availability would be a limitation.

(ss) Mulema: an area of 1,000 ha is irrigable on soils suitable for rice cultivation; a 20-ha plot has been experimented on. There is a need for a feasibility study. The water source would be from the river which has a discharge of 3.4 m³/s at the low-flow period. This compares to the irrigation water requirement of 10 Mm³/year with a peak demand of 0.8 m³/s.

(tt) Chambeshi Flats: an area of only 5,000 ha is irrigable due to limited water availability at lowest flow. Soils have generally a low fertility (pH: 4) in the flats, with a great potential for grazing and livestock. Some patches are potentially good soils. Irrigated agriculture could be coffee and pineapple. Agriculture should start with small schemes, and checks should be made to see if larger schemes could be considered if amended by lime. The water source would be from the river which has a discharge of 4.6 m³/s at the low-flow period. The other water sources would be the tributaries, but water availability could be a limitation if more than 5,000 ha were to be irrigated. Further study is required in this field. The irrigation water requirement would be about 30 Mm³/year with a peak demand of 3 m³/s. The major problems to be faced are soil fertility and water availability for large-scale irrigation.

(uu) Mpika area a total area of 5,000 ha scattered north and south of town in a few patches of good red soils are irrigable but require a detailed soil survey. The water source would be from small tributaries. As the irrigation water requirement could be about 30 Mm³/year with a peak demand of 3 m³/s, water availability is a limitation. However, on the Mufubushi Tributary, the water potential is sufficient to meet the irrigation requirements over 500 ha. This area deserves first priority; more investigation may prove larger land and water potential.

2. Bangweulu Catchment

(vv) Nsombo: an area of about 12,000 ha is irrigable north of Lake Bangweulu. Soils are sandy loam with sandy clay loam sub-soil on low pH. Land preparation would be kept minimal due to adequate slope with

only two ant-hills/ha. The water source would be from the lake without any limitation. The irrigation water requirements would be about 85 Mm^3/year with a peak demand of 8 m^3/s. A water canal of 3 km would be needed. An irrigation research station has been established.

(ww) Samfya: an area of 3,000 ha is irrigable west of Lake Bangweulu. Soils are sandy loam with low pH (fertility problem). The water source would be from the lake without any limitation; the irrigation water requirement would be 20 Mm^3/year with a peak demand of 2 m^3/s. A major problem to be faced is soil fertility.

3. Luapula Catchment

(xx) Matanda: an area of 1,000 ha is irrigable on the right bank of the river. Soils present a problem of fertility due to low pH. The water source would be from the river, which has a discharge of 55 m^3/s at the low-flow period. This compares with the irrigation water requirement of 6 Mm^3/year with a peak demand of 0.7 m^3/s.

(yy) Kawama-Kafubu: an area of 3,000 ha is irrigable on the right bank of the river and around the swamps; it is a most promising area with deep red soils, but with a problem of fertility in some patches. The water source would be from the river, lagoons, and tributaries without any limitation on the irrigation. Water requirement would be only 20 Mm^3/year with a peak demand of 2 m^3/s.

(zz) Kawambwa: an area of 1,000 ha scattered in patches is irrigable. The good quality of soils makes it a very promising area for crops including tea. The water source would be from small tributaries. Since the irrigation water requirement would be 6 Mm^3/year, with a peak demand of 0.7 m^3/s, water could be a constraint.

ZAMBIA POTENTIAL

SUMMARY

Map IBRD
11544

Basin	Catchment	Reference	Scheme	Area(ha)	Water available	insufficient
Zambezi		aa	Chavuma	1,000	x	
		bb	Kabompo	2,000	x	
		cc	Barotse Plain	20,000	x	
		dd	Sinamalima	2,000	x	
		ee	Chiawa	3,000	x	
Kafue	main river	ff	Mpongwe	10,000	x	
		gg	Munkumpu	17,000	x 2/	
		hh	Kaindu-Mswabe	10,000	x	
		ii	Kafue Flats	15,000	x 2/	
	tributaries flats	jj	Mwembeshi	10,000		x
		kk	Nangoma	6,000		x
		ll	Nansenga	6,000		x
		mm	Magoye	1,500		x
Luangwa	tributary	nn	Kasangazi	1,000		x
	main river	pp	Kakumbi	3,000	x	
Luapula	Chambeshi	qq	Mbala(W. of)	1,000	x	
		rr	Nondo-Ngoli	500		x
		ss	Mulema	1,000	x	
		tt	Chambeshi Flats	5,000	x 2/	
		uu	Mpika area	5,000		x
	Bangweulu	vv	Nsombo	12,000	x	
		ww	Samfya	3,000	x	
	Luapulu	xx	Matanda	1,000	x	
		yy	Kawama-Kafubu	3,000	x	
		zz	Kawambwa	1,000		x

140,000

water available   :   110,000 ha

water insufficient 1/   :   30,000 ha

140,00 ha

1/ water could be made available with dam-reservoirs at reasonable cost.

2/ area limited by the water availability at lowest flow.

Source: Mission Estimates

CAPITAL COST AND

TECHNICAL ASPECTS OF LARGE-SCALE IRRIGATION SCHEMES

(1970 prices [1])

    Six proposed irrigation schemes totaling 17,000 ha have been studied in 1970: Kafue Flats (Nega Nega), Lake Kariba (Buleya), Luangwa (Kakumbi), Chambeshi, Bangweulu and Luapula. The last three are in the north while the first three schemes are in the south. The scheme areas vary between 2,000 and 4,000 ha. This appendix is a summary of the technical aspects, mainly pump on run-of-river with gravity irrigation, and of the capital cost per ha (average) which is more expensive in the Northern region.

1. **Source of water**   :   pumping or gravity diversion on run-of-water
                            pumping more economic

2. **Irrigation system**   :   gravity or sprinkler; gravity more economic

3. **Typical irrigation Unit**   :   area : 1,150 x 550 m = 63.25 ha = 56. 28 ha net

                             - contains 14 irrigation fields of net area:

                             4 ha/unit including drainage system, canals and roads

4. **Layout**   :   minimum land leveling (1,000 m^3/ha; extremes 850 - 1,400); water conveyance from source to district canals through asbestos-cement pipelines

5. **Water supply**   :   peak demand : 0.6 - 0.7 1/s per hectare for 10 hrs/day with a night storage; surface system system efficiency : 0.5

6. **Implementation**   :   by successive stages, with a first stage as pilot scheme

7. **Capital investment Cost**   :   (K per ha, rounded figures), gravity irrigation

		average	extremes
a	: land and water development (1, 4, 5 above)	400	340 - 500
b	: irrigation works (2, 3 above)	600	500 - 785
c	: a + b	1,000	840 - 1,285
d	: a + b + contingencies + design costs	1,200	1,000 - 1,460
e	: d + buildings + centralized equipment + farm machinery	1,580	1,530 - 1,650

        Cost of c: 63% of total cost

        Recurrent expenses   :   K 220 per ha per year

        Cost of applied water   :   0.022 K/m^3

8. **Geographical distribution of capital cost**

	Northern schemes		Southern schemes	
	average	extremes	average	extremes
a	450	433 - 503	340	336 - 347
b	650	536 - 784	565	497 - 623
c	1,100	1,040 - 1,220	906	840 - 970
d	1,310	1,242 - 1,458	1,090	1,007 - 1,163
e	-	- -	1,580	1,532 - 1,650

[1] 1974 prices should take into account a price increase of 64% from 1970 prices.

Source: Italconsult, (December, 1970)

COMMERCIAL FARM MEDIUM SCALE IRRIGATION

(Boreholes Irrigation)

This appendix, related to borehole irrigation, is the first of two

examples given (see also Appendix XVIII) of a medium-scale irrigation scheme. It

is one of the rare cases in Zambia of irrigation from groundwater.

Location	:	Chisamba, 50 km north of Lusaka, on line of rail; a
		commercial farm of 1,600 ha, of which 160 ha is under irrigation.
Cropping pattern	:	onions : 80 ha; alfalfa : 10 ha; maize : 40 ha;
		others: 30 ha; (including fallow).
Water source	:	initially from a small dam-reservoir on a tributary (1944)
		to irrigate some 10 to 20 ha; from 1964, boreholes drilled
		into the alluvial deposits aquifer and the limestone aquifer.
Boreholes characteristics	:	depth : 30 to 60 m;
		water level : 5 to 7 m from ground level;
		diameter : 6"
		discharge : 7 to 50 l/s per borehole; drawdown : few metres;
		average cost : K 1,500/unit, plus pump : K 1,500/unit;[1]
		number : 15 drilled in 10 years. The last 7 are kept
		as stand-by in view of cost increase of drilling;
		capital investment cost : K 45,000, of which K.23,000 is
		necessary for present irrigation of 160 ha.[1]
Irrigation system:		electric pumps in boreholes;
		2 reservoirs for overnight storage of 3 tanks per reservoir;
		total capacity : 5,000 m^3 for about 8-10 hours pumping;

pumping hours from boreholes to reservoirs : 8 hrs/day
   "   "   "   "   " the field : 12 "/ "
   "   "   TOTAL : 20 "/ "

overhead irrigation by sprinklers including 6" diameter

asbestos cement main pipes below ground level and

aluminium above ground portable pipes; booster pump feeding

the over head system; capital investment cost: K. 107,000.[1]

Application of water	:	present experience during 4 months of the growing period: 10,000 m^3/ha; with sprinkler irrigation : 90 percent efficiency; experience proved excess water could be reduced 25 percent; therefore, correct application: 7,500 m^3/ha.
Cost of water	:	unknown.

			total	per ha
Capital Investment costs[1]	:	water development :	23,000	143
		irrigation works :	107,000	667
			130,000	810
		K 810/ha		

[1] 1974 prices.

Source: Mission Estimates

GOVERNMENT FARM MEDIUM-SCALE IRRIGATION

FROM CHAPULA RIVER (COPPERBELT)

(UNDP/FAO-Assisted Pilot Project)

This appendix gives an example of technical aspects and costs incurred on a medium-scale irrigation scheme with surface and sprinkler irrigation from lifted wate

ECONOMIC ASPECTS AND WATER COSTS[1]

EQUIPMENT

Main Pump Units : Twin Wright Rain WRF64 (6"/4") units. Total output :

70.5 1/sec = 254.2 m^3/h. Total manometric head 48 m.

Booster Pump : Wright Rain WRF43 (4"/3") unit. Total output 11.3 1/sec =
(feeding the
sprinkler 40.8 m^3/h. Total manometric head 48 m.
system)

Reservoir/ : Reservoir provides overnight storage for about 10 hours pumping

2,270 m^3 capacity.

Surface : Area commanded : 54.7 ha
Irrigation

Sprinkler : Area commanded : 9.6 ha (24 acres)
Irrigation

POTENTIAL

Yield of (A) Main Pump Units = 254.2 m^3/hx20h = 5,084 m^3/day

(B) Booster Pump Unit = 40.8 m^3/hx20h = 816 m^3/day

Hence: Surface irrigation supply = A - B = 4,268 m^3/day

The sprinkler system may irrigate 1.63 ha/day (efficiency: 0.7)

The surface system may irrigate 5.7 ha/day (efficiency: 0.5)

Total irrigable area during the peak season (1 ½ month):

Sprinkler 1.63 x 6 = 9.6 ha (against 9.6 ha commanded area)

Surface 5.7 x 6 = 34.2 ha (- 54.7 " " ")

Total: 43.8 ha (- 64.3 " " ")

INVESTMENT COSTS[1]

Item	Capital costs (Kwacha)	Yearly amortization Charges[2]
A. Surface Irrigation System		
Pumping Station	9,190	1,950
Rising Main	9,600	950
Overnight storage	6,200	700
Control Structure	2,300	200
Conveyance Structures	18,000	1,700

---

[1] 1973 prices.

[2] at 0.07 interest rate with write-off period of 5 to 20 years according to sub-items not indicated.

Item	Capital costs (Kwacha)	Yearly amortization at 0.07 int. rate (Kwacha)
Siphons and Wooden Gates	1,500	200
Clearing and Grading	36,700	3,600
Total investment	83,700	9,300

Specific costs on the commanded area (54.7 ha):

Investment cost $\quad$ 1,530 K/ha[1]

Yearly ann. charges $\quad$ 170 K/ha

B. Sprinkler Irrigation System

Pumping Stations	2,700	560
Distribution Network	3,350	480
Clearing of Bush	9,500	270
Total investment	9,500	1,440

Specific costs on the commanded area (9.6 ha):

Investment cost $\quad$ 990 K/ha[2]

Yearly ann. charges $\quad$ 150 K/ha

---

[1] 1,910 K (1974 prices) based on price increase of 25% on 1973 prices.

[2] 1,235 K (1974 prices) based on price increase of 25% on 1973 prices.

RECURRENT EXPENSES [1]/

A. Surface Irrigation System   9,600

Specific recurrent expenses on the irrigated area: 280.00 K/ha [2]/

B. Sprinkler Irrigation System   2,200

Specific recurrent expenses on the irrigated area (9.6 ha):   230 K/ha [3]/

IRRIGATION COSTS

	Surface Irrigation	Sprinkler Irrigation
- Amortization of investment costs	170,000	150,000
- Maintenance and operation	280,000	230,000
Total annual costs:	450,000	380,000

WATER COSTS (K/m^3)

Surface Irrigation: 0.032

Sprinkler Irrigation: 0.038

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[1]/   1973 prices.

[2]/   K 350 (1974 price) based on price increase of 25% on 1973 prices.

[3]/   K 291.53 (1974 price) based on price increase of 25% on 1973 prices.

COMMUNITY SMALL-SCALE IRRIGATION

Chunga Scheme, 1960 (15 km north-west of Lusaka)

The purpose of this appendix is to give an example of small-scale community development through irrigation, and of the technical approach and capital cost.

Source of water	:	Chunga stream, tributary of Mwembeshi river; - the disposal from Lusaka treated sewage repre-sents a regulated flow of 5,000 m³/day (60 1/s) into the Chunga stream; - weir : 4 m high, 5 m wide; to raise water at terrace level; - capital investment cost : K. 9,000 1/
Irrigated area	:	32 small holdings of 0.25 ha/farmer.
Irrigation	:	gravity irrigation, run-of-river system; - main furrow, constructed by farmers, plus field canals; - Scheme's water requirement: 500 m³/day or 62.5 m³/ha for 150 days irrigation : 9,375 m³/ha " 100 " " : 7,500 m³/ha no water partition, no water allocation; free volume available; - capital investment cost 1/: K. 2,000 for furrow cross-over, culverts, road.

Capital investment cost (K) 1/ :

	weir contract	:	9,000
	irrigation works	:	2,000
	TOTAL	K.	11,000
	capital input per small holding	:	K. 343 2/
	" " " ha "	:	1,375

Revenue	:	Mainly from vegetables, K. 300 to K. 500 per year farmer.

1/   1970 prices.

2/   Could be as low as L 550 for a 20 ha acre.

Source: Partly Simon B. Zukas & Partners, Nov., 1973. "A Low Profile Approach to Rural Development" and Mission Estimates.

PROPOSED IRRIGATION COORDINATING COMMITTEE (ICC)

Composition : Chairman: Permanent Secretary of the Ministry
of Rural Development)MRD)

Alternate: Director of DWA, Head of Land Use
Services

Members: Irrigation Research, Projects Division,
Water Service of DWA, Senior Soil Sur-
veyor, Commercial Farmers Bureau, Senior
Economist, MRD Planning Unit, SAA/FAO
Representative of UNDP and IBRD,
Irrigation Engineer Sugar Estate, etc...

Terms of Reference : 1. Define a national policy for irrigation development.

2. Formulate a policy on pricing of water.

3. Plan and program large-scale irrigation development
on a basin-wide approach.

4. Supervise and draw priorities for implementation of
medium- and small-scale irrigation schemes a
provincial level.

5. After preparation of detailed proposals by a
provincial working group, review, comment upon and
approve the project proposals.

Organization : A technical Secretary assisted by a small staff should
act on a permanent basis, and prepare the agenda of
the periodic sessions of the Committee.

Prospective : The ICC should include four river basin subcommittees
under the chairmanship of a Provincial Water Engineer.
Membership of each subcommittee should include the
Provincial Agricultural and Land Use Planning Officers
provinces concerned.

: The Irrigation Coordinating Committee, with its
permanent Technical Secretariat, should lead to the
creation of a Government organization as irrigation
development becomes more important.

TECHNICAL INVENTORY OF THE EXISTING RURAL WATER SUPPLY SITUATION

FOR A RURAL WATER DEVELOPMENT PROGRAM

(Example of Luapula Province)
Summary of Priorities

Priority	Description	Districts in Luapula					Total of 5 Districts (37 Chiefs)
		Mansa (10 Chiefs)	Kawambwa (4 Chiefs)	Samfya (11 Chiefs)	Nchelenge (5 Chiefs)	Mwense (7 Chiefs)	
1	Village water supplies requiring improvement or repair	9	25	15	14	78	71
2	Villages far from river or stream	97	4	31	4	17	153
3	Villages using water from periodic stream	348	69	51	20	73	561
4	Villages using impure water from perennial stream	66	150	164	6	191	577
5	Villages using pure water from perennial stream[1]	53	-	170	-	-	223
6	Villages using water from lake or river[1]	50	-	129	184	-	363
7	Villages with insufficient water supply[2]	17	4	16	9	4	50
8	Villages with adequate water supplies	3	14	22	4	22	65
	Total	643	266	598	241	315	2,063
	Less villages with 1 + 7 priority	3	1	9	7	-	20
	Final number of villages	640	265	589	234	315	2,043

1/ Recorded as poor water supplies as the water source is exposed.
2/ Equipment criteria: - well equipped with wind mill is adequate for: 100 people
                       - "   "   " hand pump "   "   " : 200 people
                       - piped water supply is adequate for over   : 600 people

PROJECT OUTLINES

1. INTENSIFICATION OF WATER DEVELOPMENT IN RURAL AREAS

Long-Term Objective	:	(a)	To serve 90% to 100% of the growing rural population with adequate water supplies by 1986 (about 10,000 additional water supplies).
		(b)	To develop peri-urban and village irrigated agriculture up to 7,000 ha (medium-scale) and 2,000 ha (small-scale) by 1986.
		(c)	To construct adequate watering points for cattle population.
Immediate Objective	:		To intensify during the third NDP (1977-1981) water development in rural areas for domestic supply and cattle watering, and to develop the construction of water sources and irrigation works for medium- and small-scale irrigation.
Location	:		All provinces
Activities and Requirements	:	(a)	Inventory and status of existing water supplies and watering points; identification of potential irrigation schemes; duration: six months; local enterprise and external consultation for above and project formulation.
		(b)	Establishment of a five-year rural water development plan by province from the districts, and preliminary operations for its implementation through annual programs; duration: one year; local expertise and external consultation; specifications for additional equipment; preparation of sub-contracts, etc. ...
		(c)	Construction of wells, boreholes, small dam-reservoirs (ponds), irrigation works, etc.; implementation, operation, and maintenance; duration: five years, possibly ten years; external expertise, equipment, loans, sub-contracts.

External Inputs	:	For activity (a):	consultants: 4 m/m	US$ 10,000

		(b):	consultants: 8 m/m	20,000
		(c):	experts and consultants: 6 m/y	180,000
			equipment	1,800,000
			sub-contracts	300,000
			loan	2,000,000

Remarks : Activities (a) and (b) could be considered as pre-project activities.

: Activity (c), equipment, could be included in the loan to become 3.8 million.

2. BOREHOLE IRRIGATION IN COPPERBELT AND CENTRAL PROVINCES

Long-Term Objective : To irrigate 7,000 ha or more by 1986 through public and private interests.

Immediate Objective : To survey and demonstrate the irrigation potential of the limestone groundwater reservoir.

Location : Mpongwe area, south of Kafue River, for survey and demonstration; Copperbelt and Central Provinces for exploration (Map IBRD 11545).

Activities and Requirements : (a) Formulation of the project; one month; external consultation.
(b) Geophysical exploration with hydrogeological mapping; 12 months after external consultation; sub-contract.

Mpongwe Area

(c) Construction of exploration and exploitation boreholes; one year; sub-contract.

(d) Detailed soil survey coordinated with (c) above, and few months of consultation. Location of irrigated areas.

(e) Irrigation trials to serve also as long-term pumping tests; one or two years; management and consultants, equipment.

(f) Simulation of propective use; three months; sub-contract.

(g) Feasibility study.

Other Areas

(h) Construction of exploration boreholes with piezometers; two years; sub-contract.

(i) Continuous pumping tests of few days; sub-contract.

(j) Simulation of irrigation potential and evolution time-space; sub-contract.

External Inputs	: For activities			
	(a)+(b):	consultants 2 m/m US$	8,000
		sub-contract	100,000
	(c):	sub-contract	100,000
	(d):	consultants:3 m/m	10,000
	(e):	experts and consultants: 5 m/m	150,000
		equipment	200,000
	(f)+(g):	sub-contract	100,000
	(h)+(i)+(j):	sub-contract	250,000
		TOTAL	918,000
		Possible loans (later on)	1,000,000

3. ESTABLISHMENT OF A CENTRAL WATER RESOURCES ARCHIVE

Long-Term Objective : To develop a nation-wide water resources data collection and record system.

Location : Lusaka

Immediate Objective : To establish a Central Water Archive, including the necessary system for the collection, processing and retrieval of water resources data.

Activities and Requirements : (a) Inventory of existing data; one month; one external consultant and local expertise.

(b) Critical analysis of existing logs (drilling, geophysics, etc.); three months; external and local expertise.

(c) Organization of an archive system: report on proposals, purchase of equipment, computer time, office set-up, etc.; one year; local expertise and consultant.

External
Input
: For activity (a): consultant: 1 m/m   US$ 4,000
               (b): consultant: 3 m/m   12,000
               (c): consultant: 4 m/m   16,000
                    equipment   100,000
                    computer time, etc.   50,000

                                        TOTAL   182,000

Remarks
: This activity could be carried out together with the activity on the establishment of a map of the country's groundwater potential (see project outline no. 4).

4. ESTABLISHMENT OF A MAP OF THE COUNTRY'S GROUNDWATER POTENTIAL

Long-Term
  Objective
: To develop a nation-wide system of information on water resources with special emphasis on groundwater resources.

Immediate
  Objective
: To prepare a map of the country's groundwater potential, based on present knowledge improved by a critical analysis of existing data.

Location
: At Lusaka and/or outside the country.

Activities
  and
  Requirements
: (a) Inventory and critical analysis of existing groundwater resources data; two months; external and local expertise.

(b) Preparation of a hydrogeological map at an adequate scale (1,000,000 for instance) for planning and exploitation purposes; six months; external expertise.

(c) Preparation of an explanatory note of the hydrogeological map; two months; external and local expertise.

(d) Printing of the map and of the explanatory note; two months; sub-contract.

External   :   For activity (a): consultants: 2 m/m   US$ 8,000
  Inputs   (b): consultants: 6 m/m   24,000
                              (c): consultants: 2 m/m   8,000
                              (d): sub-contract   20,000

                                             TOTAL   60,000

Note: All activities could be sub-contracted.

Remarks   :   This activity could be carried out together with the
               activity on the establishment of a central water
               resources archive (see project outline no. 3). Longer
               term mapping should be developed using LANDSAT
               imagery (see project outline No. 11).

5. PROGRAM OF IRRIGATED WHEAT AND OTHER CROPS

Long-Term   :   To reach a target of 15,000-20,000 ha area of additional
  Objective   large-scale irrigation by 1986, excluding the 15,000
                   ha special program of sugarcane.

Immediate   :   To implement during the third NDP (1977-1981) a
  Objective   large-scale irrigation program of about 5,000-8,000
                   ha, mainly for irrigated wheat through smallholders'
                   farms, and to reorganize and strengthen the land use
                   services of MRD in the irrigation sector.

Location   :   Map IBRD 11545

                Kafue Flats: on the red soils of the flat margins
                    and on the heavy clay soils;

                Munkumpu Region (65 km north of Lukanga Swamps):
                    within a 17,000 ha area studied by German
                    bilateral assistance.

Activities   :   (a) Creation of an Irrigation Coordinating Committee;
  and   reorganization of the land use services of MRD
  Requirements   in the irrigation sector; local expertise;
                           possible external consultation (also for the
                           formulation of b and c thereafter).

                  (b) Implementation of a 200-ha pilot development
                       scheme of irrigated wheat for experimentation
                       and feasibility study; duration: two years;
                       external requirements: experts and consultants,
                       equipment.

(c) Implementation of a five-year large-scale irrigation program of about 5,000-8,000 ha at a rate of 1,500 ha/year, with 80% irrigated wheat.

External Inputs	:	For activity				
		(a):	consultant: 3 m/m	US$	10,000	
		(b):	experts and con-			
			sultants: 5 m/y		150,000	
			equipment		450,000	
		(c):	experts and con-			
			sultants 10 m/y		300,000	
			equipment		500,000	
			loans (not including medium- + small-scale irrigation)		5,500,000	
				TOTAL	6,910,000	

6. STUDY OF IRRIGATION POTENTIAL IN THE CHAMBESHI RIVER VALLEY

Long-Term Objective : To develop large- and medium-scale irrigation in the vicinity of the Tazara line of rail.

Immediate Objective : To further ascertain the feasibility of large- and/or medium-scale irrigation to serve as a first development phase.

Location : Between Bwela Flats and Mbati, including the valley's high terrace.

Activities : (a) Detailed soil survey; one year; local or external expertise.

(b) Study of surface and groundwater withdrawal potential; one year; sub-contract.

(c) Detailed identification of land and water development schemes, including formulation of a first phase development project; six months; external consultation.

(d) Implementation of the first phase development project, including crop production study: rice, wheat, sugarcane.

External Inputs : For activity (a): consultant: 3 m/m US$ 10,000

(b): sub-contracts 100,000

(c): consultants: 6 m/m 20,000

(d): experts and con-
sultants: 5 m/y 150,000

equipment 300,000

sub-contracts 200,000

TOTAL 780,000

Remarks : Implementation (d) is subject to favorable outcomes to the development activities (a), (b), plus (c).

7. CATTLE WATERING PROGRAM IN WESTERN PROVINCE

Immediate Objective : To construct about 150 boreholes in order to use the grazing potential of Mulonga and Siloana Plains.

Location : Mulunga and Siloana Plains, west of the Zambezi River, between latitude 16° and 17°30'.

Activities and Requirements : (a) Formulation of the project, including careful identification of the type of drilling rig (very mobile and light) and number (possibly two) suitable for that area; and other equipment specifications; one month; external consultation.

(b) Planning and programing of the location of water points for range and water use; purchase of equipment; six months; external consultation.

(c) Construction of boreholes; two-three years; sub-contract.

External Inputs : For activity (a): consultant: 1 m/m US$ 4,000

(b): consultants: 2 m/m 8,000

equipment 150,000

(c): sub-contract 150,000

TOTAL 312,000

8. ESTABLISHMENT OF A KAFUE BASIN WATER PLAN

Long-Term   : To create a Kafue Basin Water Authority (KBWA)
  Objective

Immediate   : To establish a strategy and policy of water
  Objective   management in the Kafue River Basin and to form a
                      water plan.

Location   : The entire river basin with headquarters in Lusaka.

Activities   : (a) Preparation of a preliminary simulation model of
  and   water resource occurrence and use (present and
  Requirements   potential).

                      (b) Simulation of an alternative water and uses
                           allocation according to a time-space distribution,
                           including possible construction of hydraulic
                           structures on the river and tributaries and of
                           boreholes in the groundwater reservoirs.

                      (c) Obtainment of a series of optimal technical and
                           economic solutions.

Note: Requirements for (a), (b) and (c): one year by a specialized firm.

External   : For activities (a), (b) and (c): sub-contract
  Inputs   US$ 250,000

Remarks   : The creation of the Kafue Basin Water Authority
                      should logically be a follow-up of the project.
                      However, a coordinating committee could be created
                      at the inception of this project as a preliminary
                      (pre-project) activity to be carried out with the
                      assistance of an external consultant who would also
                      formulate the project.

9. PRE-FEASIBILITY STUDY ON MULTI-PURPOSE UTILIZATION OF ITEZHITEZHI
    DAM-RESERVOIR ON THE KAFUE RIVER

Final   : To decide on the heightening of the Itezhitezhi Dam
  Objective   (mid-1975 at the latest).

Immediate   : To prepare pre-feasibility reports on multi-purpose use
  Objective   of water regulated by the Itezhitezhi Dam-Reservoir on
                      the Kafue River and a feasibility study of possible
                      heightening of the Dam.

Location   :   Lusaka

Activities   :   (a)   Preparation of a pre-feasibility report on:
   and   i)   expected irrigated agricultural
   Requirements   development in the Kafue Flats;

                              ii)   water requirements of (i), including livestock
                                    and wildlife, indicating annual and monthly
                                    distribution;

                             iii)   cost of development and timing;

                              iv)   economic benefits.

                        (b)   Preparation of a report on estimates of cost
                              to increase the lay-out of the Itezhitezhi
                              Dam in stages.

                        (c)   Appraisal of reports (a) and (b), and formula-
                              tion of a feasibility study for possible
                              heightening of the Dam.

Note: Requirements for (a) and (b):   three months; local expertise and
                                       external consultant.

                           (c):   two months; external expertise.

External   :   For (a): consultants' assistance: 1 m/m US$ 3,000
   Inputs   (b): expertise by SWECO; consultant of ZESCO
                           (c): consultants: 3 m/m   15,000

                                                   TOTAL   18,000

Remarks   :   The two reports on (a) and (b) should be submitted
                       in February 1975.

10.   PLANNING THE KAFUE FLATS DEVELOPMENT RELATED TO WATER

Long-Term   :   To maximize the land and water development for
   Objective   irrigated agriculture, livestock and wildlife.

Immediate   :   To plan the optimum utilization of water for agri-
   Objective   culture through a reclamation study.

Location   :   An area of about 1,400,000 ha (14,000 km^2), including
                       the heavy clay soils and the red soils of the flat
                       margin (Map IBRD 11545).

Activities   :   (a)   Study, including cost estimate, of the possible
and   embankment of the river (partial or total
Requirements   length), of poldering, feasibility study of the
                          construction of dam-reservoirs on the tributaries
                          according to previous studies, and of eventual
                          inter-basin water transfer; two years; external
                          expertise or sub-contract.

                    (b)   Study, including cost estimate, of the role of
                          groundwater, of vertical versus horizontal
                          drainage, and of possible uses of groundwater;
                          two years; expertise and consultants, equipment,
                          sub-contracts for geophysics, drilling simulation
                          models, etc.

                    (c)   Identification of zones for large-scale irrigation
                          schemes, for livestock development, for wildlife;
                          six months; sub-contract.

                    (d)   Establishment of a master plan for the optimum
                          utilization of water; six months; sub-contract.

External   :   For activity (a): sub-contract: two years US$ 300,000
                                  (b): experts and consultants:
                                                  5 m/y   150,000
                                       equipment   200,000
                                       sub-contracts (geophysics,
                                           drilling and models) 400,000
                                  (c)+(d): sub-contract: one year 150,000

                                                  TOTAL   1,200,000

Remarks   :   A three-man mission for one month is required
                    (US$ 10,000) for the detailed formulation of the
                    project. The mission will be a fact-finding one
                    to appraise the project feasibility.

11. EARTH SATELLITE MAPPING AND ANALYSIS OF HYDROLOGY

Long-Term Objective	:	To develop Zambia's capability to utilize earth satellite (LANDSAT) imagery for rational resource development and management.
Immediate Objective	:	Use LANDSAT imagery to help identify ground and surface water potentials, and train Zambians in mapping, ground-truthing, interpretation and analysis.
Location	:	Nationwide, with overseas courses.

Activities
and
Requirements

:

(a) Preparation of color mosaics of all of Zambia from 28 LANDSAT scenes of 2 or more seasons.

(b) Ground-truthing with, as needed, supplementary air photography.

(c) Interpretation and analysis of mosaics and preparation of overlap of water resources.

(d) Application of methodology to agricultural, livestock and fisheries resource evaluation; to crop forecasting; and to other activities such as geologic mapping.

(e) In stages (b) - (d), train qualified Zambian personnel in all activities.

External
Inputs

:

Consultants: 24 man years and travel: US$400,000
Support, computer time,
  aircraft rental and
  equipment: US$100,000
                                        US$500,000

ZAMBIA

AGRICULTURAL AND RURAL SECTOR SURVEY

LIVESTOCK DEVELOPMENT

Appendix   I: Offtake in Traditional Cattle Keeping
Appendix II: Livestock Development Scheme in Progress
Appendix III: Outline for Training Programs for Livestock
                Enterprise Managers

ZAMBIA

AGRICULTURAL AND RURAL SECTOR SURVEY

LIVESTOCK DEVELOPMENT

Background

1.   Livestock production in Zambia is insufficient to meet the meat and
dairy product demand of the local organized market. In the last five years,
the annual imports of meat have ranged from 47,000 head to 94,000 head equi-
valents. In 1973, beef imports amounted to about one third the domestic mar-
keted slaughter but previously they equalled or were greater than the marketed
domestic slaughter. Over 80% of all dairy produce sales are imported, and
in 1973, milk imports alone increased to an equivalent of 63% of the total
annual domestic sales of 32 million liters. The supply and demand situation
in the traditional market system cannot be quantified.

2.   Most of the livestock products reaching the organized domestic
markets are produced by commercial farmers who operate along the line-of-
rail and in the Copperbelt region. Commercial producers, most of whom are
expatriates, have statutory tenure to their land, and they are able to produce
considerably in excess of their consumption needs. Normally, the traditional
farmer has only communal tenure to grazing land for cattle and individual
rights to crop land under customary law. Traditional farmers produce very
little, if any, product for the organized market, although they may actively
trade in unorganized markets or with their neighbors. Some traditional
producers are moving into a class called "emergent farmers." Generally this
means that they are able, for reasons of production efficiency and presence
of market infrastructure, to produce and sell beyond consumption needs for
the organized market.   Some of them are gaining statutory land tenure, while
others still operate on communal property. The following table shows the
cattle ownership and production situation in a broad sense. 1/

1/   These data are taken from MRD information and are compiled by the
     Veterinary Service. They differ from the census data compiled by the
     Central Statistical Office. The main difference is that the census
     shows 2,600,000 head of cattle owned by traditional farmers. Also,
     the total offtake, including home and local slaughter and sales for
     the organized market, is shown to be 8% in the census. This indicates
     that some 100,000 cattle are slaughtered annually for home and local
     consumption, in contrast to MRD estimates of 40,000 head.

Producer	No. of Cattle	Annual Slaughter Offtake for Organized Market
Commercial Beef	275,000 Beef Cattle	12% - 15%
Commercial Dairy	7,000 Dairy Cattle	
Traditional Farmer /a	1,570,000 Multi-purpose Cattle	2% - 4%

/a   See Appendix I: Offtake in Traditional Cattle Keeping.

Description of Cattle Production 1/

Central Line-of-Rail Region

3.   For descriptive purposes, this region may be considered as three
areas: the Central, the Southern, and the Copperbelt. In the Central Area,
where maize and cotton growing predominate, one finds approximately half of
Zambia's commercial beef farmers. Traditional farmers in this area own some
223,000 head of cattle (15% of the traditional herd), which are grazed
communally. Most of the commercial pig and poultry production and most of
the 75 commercial dairy farmers in Zambia are also in this area. In the
Southern Area, there is some commercial beef and dairy production, mainly
near Mazabuka, Choma, Monze and Livingstone. Five commercial dairymen have
their own market cooperative. In this area, an estimated 657,000 cattle
(42% of the traditional herd) are husbanded by traditional farmers who also
cultivate. Part of this herd is grazed on the Kafue Flats in the dry season.
The predominant cattle breed is Tonga. In the Copperbelt, about 7,000 head
are owned by commercial producers who supply livestock products to the popula-
tion working in the copper industry. The largest dairy unit in the country,
Kafubu State Dairy, with over 800 milk cows, is located in this area.

Western Kalahari Region

4.   In this region, which comprises the former Barotseland Protector-
ate, cattle production is mostly traditional, and the Barotse breed is pre-
dominant. It is estimated that 200,000 head (13% of the traditional herd)
are grazed on the flood plain of the Zambezi River when the river is low
(August through February or March) and on the edge of the flood plain in the
flood season. During the dry period, there is ample grazing for cattle, but
during the wet period the poor grazing at the edge of the flood plain causes
the cattle to lose weight. This weight loss is estimated to be about 100

1/   See Map IBRD 11541 for further description of cattle location.

pounds each year for a mature cow. Another 170,000 head (11% of the traditional herd) are located elsewhere in the western area. The slaughter offtake for these cattle is low, partly because calves have to compete for milk used in home consumption (or sold locally in the form of soured milk), and partly because of the poor feeding available during the flood season.

Eastern Region

5.   In this region, where the predominant breed is Angoni, the tsetse fly zone restricts cattle production to parts of the Chipata, Katete, Lundazi and Petauke Districts. Some 170,000 head are owned by traditional farmers and grazed on communal lands. There is very little commercial production in this area.

Northern Plateau Region

6.   About 90,000 head of cattle are owned by traditional farmers in the Northern Province, where the tsetse fly restricts the use of land available for cattle production, and, in general, the people lack a tradition of livestock keeping. Some 40,000 head are kept under communal grazing systems in the North Western and Luapula Provinces. An area of the North Western Province, between Mwinilunga and the Copperbelt, has high potential for cattle development but is used very little at present.

Cattle Marketing and Slaughtering

7.   The Cold Storage Board (CSB) operates the processing plants and carries out much of the live-cattle marketing. The CSB also manages the import of beef products. Private buyers and butchers have become more active in recent years, mainly because they can offer higher prices than the CSB which sells meat to private retail butcher shops at wholesale prices fixed by the Government. Private buyers send their purchased cattle to CSB plants for custom slaughter, and then retail the meat from private butcher shops. Since private buyers are not tied to a fixed wholesale price, and since retail prices are favorable, private buyers have more leeway to offer higher prices (30%) to producers than CSB. Also, they offer convenient purchase and shipping arrangements to producers. In 1973, CSB slaughtered 104,000 head, about 50,000 of which were bought by private buyers.

8.   The CSB livestock buying program is carried out at 185 buying points, 97 of which are located in the Central Line-of-Rail Region, 34 in the Western Kalahari Region, 21 in the Eastern Region, and 33 in the Northern Plateau Region. Not all of these buying points have scales. One week before a sale, buyers go to the area to advertise the sale. After the sale, drovers take the cattle from the buying points to collection centers from which they

are trucked to slaughter facilities. Lack of trained graders, insufficient cash to pay producers at the time of sale, and ineffective advertisement of sales are some of the problems encountered. These problems result in inefficiencies, which cause producers to lose confidence in the CSB buying system. CSB's marketing problems are aggravated by periodic outbreaks of Foot and Mouth Disease, Bovine Pleuro Pneumonia and East Coast Fever, which result in restrictions on cattle movements.

9.   On the advice of the Ministry of Rural Development, the Zambian Cabinet sets the grade prices to be offered, based on estimated conversion to cold-dressed-weight meat. At the sale, Government graders grade the livestock and thereby establish the per weight or head price. In December 1974, the live-weight prices per hundred kg, based on percent cold-dressed meat, were K 79.80 for 52%, K 72.20 for 46% and K 52.15 for 43% conversion, respectively, to cold-dressed meat.

10.   At present, there is slack in CSB production facilities, which, under normal operating conditions, could slaughter twice as many cattle as have been slaughtered in recent years. The capacities are as follows:

Location	Daily Slaughter Capacity (Head per 8-hr. shift)	Storage Capacity (Tons) Freezing	Storage Capacity (Tons) Cold Room
Lusaka	350	125	70
Livingstone	100	0	10
Chipata	25	0	10
Mongu	30 /1	10	10
Mbala	25	0	0 /2
Kitwe	50	0	0

/1 Estimate. Operation started in 1975.
/2 Transported to chilling plan at Kasama.

11.   Local officials estimate that over 40,000 animals are slaughtered in villages every year. This slaughter is often associated with wedding and funeral ceremonies, but is also frequently carried out to provide cash from meat sold on the spot to villagers. Often, the traditional farmer prefers to sell his livestock in this way, rather than waiting for a CSB sale at which his animals are sometime discriminated against on the basis of quality (i.e., the grader decides the animals are too old or too emaciated to be processed).

12.   Data for accurate projection of supply and demand of beef products is not available. Based on the strong demand for imported beef in recent years, however, a gap clearly exists between domestic production for marketed slaughtering and consumer demand. There is no reason to believe that the rate of increase of offtake from commercial production will meet the rate of

increase in consumer demand. Nor, at the present prices, can an increase in beef offtake for the organized market from traditional production be expected. Rising incomes in urban areas will maintain the rising demand. While the incentives for commercial beef production are sufficient to expect a normal growth rate (about 3% per year) in offtake, the overall result will be a persistence of the gap between supply and demand in the future.

Milk Marketing and Processing

13.   Domestic milk is bought and processed by the Dairy Produce Board (DPB), which also has a monopoly on milk collection and distribution. The DPB operates factories in Kitwe, Kabwe, Lusaka and Mazabuka which manufacture a wide variety of dairy products. The DPB also manages the importation of dairy products. Imported dried milk powder, which made up two-thirds of the organized market supply of 32 million liters in 1973, is reconstituted and marketed by the DPB. The DPB has been operating at a trading loss in the last few years.

14.   Many emergent farmers and commercial producers sell milk at the farm gate or at local markets because they receive higher prices than the DPB offers (1 kwacha versus 40 ngwee per imperial gallon). In parts of the traditional sector, particularly in the Western Province, farmers produce soured milk which is sold locally. Production is seasonal, and sales depend on supply in excess of consumption needs. This product is storable without refrigeration. In many cases, the sale of soured milk is the principal cash return from cattle raising. Interestingly, the taste for soured milk is so developed that some townspeople buy fresh milk and then sour it before consumption.

15.   The growing demand for dairy products comes at a time of decreasing production. Unlike beef production, there is a disincentive for dairy production in the form of product prices below costs of production. Currency repatriation restrictions also make it undesirable for commercial dairy producers to invest in capital improvements and larger herds. Further, commercial dairy management skill among emergent farmers is poor, and thus production increases from this sector cannot be expected to have significant impact on supply. In 1973, about 63% of the milk products marketed by DPB came from imported dried milk powder; and it is projected that this percentage will increase to over 80% in the near future. Local production by small farmers is discouraged by the sale in the rural provinces of long-life milk processed by the DPB in Lusaka. This milk is sold at a subsidized price, often below the already low price fixed for sales of fresh milk.

Pigs and Poultry

16.   Modern commercial production for both pigs and poultry requires high-priced inputs of concentrate feed and intensive husbandry practices. These requirements inhibit the rapid development of improved production in the traditional sector where pigs and poultry tend to be regarded as scavenger enterprises demanding little attention.

17.   Poultry production has been successfully developed in Zambia: in 1973, some 10 million dozen eggs and 6.2 million table birds were marketed. Zambia is not only self-sufficient, but has a growing export trade in day-old chicks. Most poultry production is carried out by large-scale, expatriate farmers who operate in an industry that has been left free of Government control. Some small farmers, located mostly near the urban areas, have been brought into poultry production through the Rural Poultry Development Scheme which was started in 1969.

18.   Pig production is located mostly in the line-of-rail provinces. A survey conducted in 1972-73 showed a population of 6,925 head of breeding stock in these provinces, 52% of which were located around Lusaka, 26% in the Copperbelt, and 22% in the Southern Province. Zambia Pork Products Ltd. (ZAPP) manages the slaughtering facilities and marketing system for commercial production. ZAPP is not a monopoly buyer or distributor, however. In 1973, official line-of-rail slaughterings by ZAPP amounted to 35,228 head, while slaughtering by private butchers in all of Zambia was estimated at 12,192 head. Based on production projections from the breeding herd, unrecorded slaughterings could well have exceeded recorded slaughterings. In the Eastern Province, there is a traditional herd of 50,000 to 70,000 pigs of local breeds. This offtake is consumed almost entirely locally. Larger-scale production is inhibited in this area by the existence of endemic African Swine Fever, which restricts movement of live pigs or unsterilized meat products. This situation could be improved by enlarging processing facilities and improving marketing.

19.   It is estimated that 64,000 pigs would have to be slaughtered to fully satisfy the annual urban demand, which is estimated to be increasing by 10% per year. Before 1973, imported pork products made up the deficit from local producers. In 1973, however, the shortage of pork products for importation at acceptable prices resulted in lower imported quantities (11,000 head versus 45,000 to 50,000 head equivalents in previous years). While lower imports stimulated local production, the high cost of concentrate feed inhibits the growth of local production to the degree that it cannot be projected to adequately meet the demand. Efforts by MRD and ZAPP to assist the development of pig production are under way. These efforts are adequate, and there is no indication that further assistance would be contributive.

Services

20.   Credit. Although some livestock producers get credit for animal
purchase from the Agriculture Finance Company, most livestock credit
comes from the Cattle Financing Company (CFC) of the Rural Development
Corporation (RDC). Under a program called "The Grazier Scheme" for establish-
ed and new beef producers, the CFC offers support for 85% of the purchase
price for livestock. Money is paid directly to the seller, with limits
placed on the amount loaned per animal and the number of animals per borrower.
Under the plan, animals are branded, and farmers agree, under threat of
repossession, to carry out certain husbandry practices and to keep the cattle
in the specified locality. CFC maintains four regional offices to supervise
loans. Since 1969, about 200 farmers per year have been supported by cattle
loans from the CFC. Almost all of the loans have been to commercial farmers,
although some credit opportunities have been directed at emergent farmers;
few, if any, loans have been extended to the traditional sector, however.

21.   Animal Health. The veterinary service has a staff of 30 veterinar-
ians, 85 senior veterinary assistants, 189 veterinary assistants, and 35
livestock officers (diploma graduates). Some commercial producers use the
services of the few private veterinary practitioners in Zambia.

22.   Control programs for tsetse fly and East Coast Fever (ECF) are
carried out on a continuous basis, while programs for Foot and Mouth Disease
and Contagious Bovine Pluero Pneumonia (CBPP) consist of surveillance and
control when outbreaks occur. Foot and Mouth Disease occurs sporadically and
is limited mostly to the southern and western regions. Zambia restricts
animal importation to sources which are free of Foot and Mouth Disease, and
control efforts for this disease have been very effective. CBPP occurs mostly
in the western region; outbreaks of this disease are associated with the
movement of cattle from Angola. Efforts to control CBPP have also been
successful, and farmers have gained increased confidence in Government through
the control program. ECF is endemic in the northern and eastern regions of
Zambia, where dips for cattle have been built by the Government. The dip
construction program is proceeding at a rate of about five dips per year.
In general, farmers see the value in dipping cattle, although some resistance
to this process has been encountered in the northern area. A marked increase
and extension of the incidence of ECF has recently (February 1975) been
reported in the Eastern Province.

23.   As in many areas of Africa, the control of trypanosomiasis through
programs against the tsetse fly has not always been successful in Zambia,
where the incidence of cattle trypanosomiasis is relatively high (500,000 to
700,000 animals were treated annually in the years 1971 through 1973).
Information available from the Eastern Province shows the impact on cattle of
intensive spraying against tsetse fly: deaths in this province decreased

from 662 in 1972 to 225 in 1973. In several areas, however, the barriers have not been able to contain the tsetse fly influence. This is due in part to erratic spraying, but also, in the opinion of the MRD Tsetse Fly Control (TFC) Office, to the two-kilometer interval between game and stock fences. In order to achieve effective results, the TFC Office believes that the interval between the fences must be increased to five kilometers. In the southern area, fly influence has spread to high-potential agricultural areas because funds were not allocated for spraying in 1973-74. 1/ Such break-throughs of the barrier are to be deplored.

24.   Animal Husbandry Research. The Animal Husbandry Central Research Station in Zambia is at Mazabuka. At present, research is concentrated on crossbred dairy animal production under conditions similar to those found in traditional farming—i.e., almost exclusive forage feeding on a seasonal basis in which cows are milked seven months and dry five months. The station also imports and distributes frozen semen to commercial producers. Additional research projects under way at Mazabuka and other field research locations are: the evaluation of indigenous and crossbred beef bulls, the supplementary feeding of bulls with urea, and the examination of production characteristics of indigenous and crossbred sheep and goats.

25.   Training. In Zambia, education and training facilities for the livestock industry are limited, and all veterinarians must be trained outside of the country. Only recently have animal science students started to graduate from the five-year program of the University of Zambia's School of Agriculture. The Natural Resources Development College graduates 16 students per year in a three-year diploma course in livestock science and production. At Mazabuka, students are given a two-year course in preparation for jobs as veterinary assistants. A College of Agriculture at Monze offers courses for animal husbandry extension staff at the certificate level. It is from these institutions that the Government draws its staff for technical assistants in the veterinary and extension service. This output, however, is insufficient to meet the needs.

26.   Farmers are trained at 8 farm institutes and 24 farmer-training centers which are operated by the Extension Training Section of the MRD. Training of farmers is also carried out as part of some livestock development schemes. Such training is done by extension field staff on the farm. Only a few farmers benefit from this training, however. Part of the State Beef and Dairy Ranch Development Program is aimed at training managers for commercial-size operations. To date, the output of qualified management personnel has been far less than expected and insufficient to meet the needs.

1/   Source: MRD Tsetse Fly Control Office.

27.   A specialized, short-term training program in the preservation
of hides has recently been started at the College of Agriculture in Monze.
At present there are about 20 students in the program who will return to
their localities to improve the production of hides prepared for export sales.

28.   Extension. The MRD Animal Husbandry Extension Service assists the
CSB in marketing operations, carries out farmer-training programs, actively
participates in field research projects, and also functions as the operational
agency for the livestock development schemes. The staff of this body consists
of six senior professionals in the headquarters office, and one professional
and two to four technical officers in each of the eight provinces. In
addition, a total of 720 junior technical officers and agricultural assistants
and 891 demonstrators work on crop and livestock production in agricultural
camps and stations throughout Zambia. At present, there are a number of staff
vacancies. The situation of inadequate staff and budget for transportation
greatly hinders the efficiency with which the Service can carry out its
assigned responsibilities.

Development Strategies

29.   This section offers suggestions on development strategies, policies
and programs which might alleviate or reduce the major constraints involved
in livestock production in Zambia. These constraints, briefly stated, are:
lack of trained manpower for animal husbandry extension, animal health and
commercial livestock management, price disincentives for dairy production,
and a lack of marketing systems for the livestock products of the traditional
farmer.

General

30.   Animal health and animal husbandry extension services must be im-
proved and expanded. In animal health, two to three qualified persons should
be given support each year for veterinary medicine education. In addition,
one or two of the current veterinary service staff should be offered an
opportunity for graduate study in epidemiology and administration of animal
health programs. This training is available in the U.S. and in the U.K.
Support should also be directed at increasing the number of para-professional
animal health technicians. In animal husbandry extension, training of persons
who have first-hand farm experience and who will live in rural areas should
be given high priority. The training facilities at Monze must be expanded.
Also, support for transportation and related costs is needed in order for
the extension service to carry out its responsibilities. Over a five-year
period, an estimated K 1.2 million (US$1.9 million) should be invested annually
in the improvement of animal husbandry extension and animal health services.

Of this, K 200,000 should be allocated to the improvement and enlargement of existing training centers, K 200,000 to the annual support of 30 to 40 trainees in extension and veterinary assistance, K 40,000 for graduate and undergraduate education of veterinarians, K 320,000 for supplies and transportation for the extension department, and K 440,000 for the support of animal disease control programs and tsetse fly control. 1/

31. In order to have greater impact on the traditional sector, animal husbandry research should focus more attention on improving the economic situation of the traditional farmer. To this end, agricultural economists should be consulted in solving such problems as the determination of the optimum mix of milk production and calf rearing under traditional cattle-keeping conditions. Demonstration of successful animal husbandry techniques should be emphasized in training programs. Published material on livestock production under conditions similar to those in Zambia should be reviewed, evaluated, catalogued and relocated for easy reference by animal husbandry technicians and students.

32. Although it is difficult to estimate the quantity, experienced observers agree that in most areas of Zambia more grazing resources exist than are currently utilized. One indication of this is the a high incidence of grass fires in certain areas. Use of all grazing lands and full development of the cattle industry would provide an improved opportunity to satisfy the nutritional needs of Zambians, and also provide foreign exchange savings. In the following discussions, beef and dairy production are discussed separately; it should be borne in mind, however, that most cattle serve a dual role and also that the cow fits into the farming mix to utilize under-employed land and labor resources.

Beef Production

33. Although not operating efficiently at present, the state ranches are potentially a good base from which to achieve a better performance in beef production. The ranches also have the potential for providing beef breeding animals for both commercial beef producers and for members of the

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1/ In September 1974, a conference to review agricultural education and training was held in Zambia. The proceedings of this conference indicate that Zambia is well aware of the problems facing agricultural education. The main recommendations of this conference, as well as additional discussion on the need for improvement of the extension service, may be found in the annex on Agricultural Services.

National Beef Development Scheme, which is discussed in Appendix II. Further, the state ranches can fulfill a training role and help Zambians to develop commercial ranch management skills through programs in which expatriate ranch managers work with trainees in on-the-ranch training programs. 1/

34.   Improvement in the operation of state ranches should be supported, so that they achieve more efficient production and training goals. New state ranches should not be started until those already in existence are judged to be operating well. At present, additional personnel to manage the ranches is needed. Because of a shortage of trained Zambians, it is likely that new management recruits will have to be expatriates. So as to ensure adequate time for the training of Zambians, these new recruits should be offered conditions of employment that will be satisfactory for a period of from five to ten years.

35.   In an effort to bring the small farmer into the commercial beef production scene, the National Beef Development Scheme was initiated. This scheme has merit from both the technical and the income distribution standpoints. Improvements in the operations of the state beef ranches and the extension service should result in providing the inputs needed to support the scheme. 2/

36.   In the traditional sector, a high calf mortality rate, caused primarily by poor neonatal nutrition, is a major constraint on the offtake of beef. In order to meet their own consumption needs, farmers give minimal amounts of milk to their calves. 3/ The alleviation of this condition by use of milk replacer is not economic and plans to subsidize the supply and distribution of replacer to farmers should be discouraged. Improved disease

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1/   See Appendix III for more discussion on training programs.

2/   See Appendix II.

3/   See Appendix I for more discussion on this topic.

control programs and summer grazing schemes 1/ offer the best opportunity
to increase beef offtake by increased production in the traditional sector.

37.   The limitation of pasture availability because of the tsetse fly
is a constraint on cattle production, particularly in the high-producing
areas in the Kalomo and Eastern Choma Districts. 2/ Also, in parts of the
Petauke, Chipata and Katete Districts, the tsetse fly influence is spreading
and adversely affecting crop and livestock production. In these areas and
pernaps in others where the agricultural production potential is relatively
high, support of the tsetse fly control programs is justified.

38.   Still another constraint, particularly in the case of emergent
farmers, is a lack of sufficient credit. The CFC should be supported and
encouraged to increase its efforts to identify farmers who would be responsive
to loans for cattle production. Personnel should be trained to analyze farmer
potential, design a production plan and give field supervision of loans.
This personnel, working either in the direct employ of the CFC or for the
extension service, could carry out the credit supervision work with other
extension activities. 3/ Improved animal disease control is an important
factor in the use of credit for cow purchases. Potential borrowers are
more willing to risk the debt burden and increase their resource inputs for
cattle production if they have reasonable expectation of assistance in
minimizing death losses.

1/   See Appendix II.

2/   See Map IBRD 11541 showing the spread of tsetse fly influence beyond
      the barriers.

3/   The experience of technicians trained by the Agriculture Finance
      Corporation in Kenya would be helpful. For some years, they experienced
      serious problems of poor repayment and default with their cattle loans
      to small dairy farmers. The loan supervision was carried out by
      extension personnel under a very loose arrangement. The Kenya AFC then
      trained and employed their own field staff, and this in part has resulted
      in an improved loan performance. In Zambia, if the arrangement were
      proper and if responsibilities were clearly understood, it is conceivable
      that the field loan supervision personnel could be in the employ of the
      extension service, rather than CFC. Such an arrangement is less desir-
      able but would probably be a necessity because of management and manpower
      efficiency. At least in the early stages, this efficiency is viewed to
      outweigh the more effective arrangement under which field loan super-
      vision staff are under the direct management of the CFC. In any event,
      such persons should not be assigned responsibilities as both extension
      agents and loan supervisors. The execution of these duties by the same
      person to the same farmers is a source of conflict which can result in
      inadequate performance of either or both functions.

Dairy Production

39.   The major constraint on commercial milk production is that the
price paid to producers by the DPB is too low even to maintain present pro-
duction levels, and thus is a certain disincentive to the expansion of dairy
farming. Producers are responding to the low prices by decreasing the amount
of concentrate fed to milk cows, shifting to dairy beef production, and not
investing in capital improvements in facilities and in larger herds. To
improve the situation, it seems clear that Zambia needs a national policy
on dairy pricing that will encourage production.

40.   Another problem facing the dairy industry is the disappearance of
dairy management expertise, most of which is expatriate. To a degree, this
is associated with the producer milk price disincentive, but it is also
caused by the strict legislation against the repatriation of currency. The
relaxation of this legislation announced in the 1975 budget should encourage
more expatriates to purchase the imports necessary to maintain and develop
dairy production. It remains to be seen, of course, whether this measure
will be adequate. To help improve conditions, the training of Zambians in
dairy management should be emphasized, and expatriate managers should be
required to demonstrate the successful training of Zambian apprentices in
specified skills and at certain time intervals. Training of dairy producers
on commercial farms has an advantage over training at state dairy farms in
that the former provide the economic realities of agriculture in the actual
training situation. 1/

41.   Today in Zambia, crossbred milk cows are being raised at Palabana
and at some of the rural dairies and state ranches. These animals are meant
to be used mostly by small farmers. The use of such cows, given their greater
need for high-cost feed, the large capital outlay for their purchase, and their
lesser comparative adaptiveness to the physical and disease environment, which
increases the risk at stake for owners, does not make economic sense under
the present conditions of the low producer milk price paid by the DPB. Even
with the higher prices obtainable at the farm gate, the payoff to the high
inputs for crossbred cow milk production remains doubtful and the economics
of dairying in Zambia now favors the native cow more than the crossbred cow.

42.   The research and extension activities in crossbred cow dairying
should be maintained at the present level only in order to ensure that Zambia
retains its position of experience with high-producing stock against the time
when relative prices change. In terms of applicability to the present-day
Zambian economic situation, the best return to dairy cow production research

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1/   See Appendix III.

is in the improvement of the genetic potential of native cattle through within-breed selection. Unless the Government adopts dairy product price policies which yield an acceptable return to production inputs, the relative lower production from the native cow will have to be accepted. In the same vein, the present use of crossbred cows in the Rural Milk Production Scheme does not make economic sense. The most sensible approach would be to revise price policies: failing this, however, the scheme should switch to use of selected native stock.

43.   The principal effort to bring the small farmer into commercial dairy production has been made through the Rural Milk Production Scheme. Although this scheme has defects--mainly in the high input-low output sense--the goals of demonstrating training and market establishment are very worthy and appear to be attainable. Efforts to maximize the impact of this scheme should therefore be encouraged. Growth centers, where farmer response to this scheme would be the greatest and where support infrastructure, i.e., market system and technical assistance, can be most efficiently developed, should be identified. These centers might well be in association with Rural Growth Areas identified for development of other types of agriculture production.

44.   Earlier in this section, it is indicated that the farmers who would be most responsive to development efforts are the commercial and emergent farmers. The agriculture resources managed by the traditional farmer are greater in size, but, because of lack of infrastructure, the need of farm output for home consumption and, in many cases, poorer resource quality, the productivity of the traditional farmer for the organized commercial market is much less. To achieve redress of income distribution and increase production to meet supply and demand gaps, emphasis must be placed on assistance to traditional cattle keepers. This is a difficult and costly task, the returns of which must be measured, at least in part, in terms of social benefits.

45.   Certainly, the improvement in extension and animal health services mentioned earlier will benefit the traditional as well as the commercial farmer. However, the best opportunity to develop dairy production in the traditional sector lies in the development of a market system which would accept the product of the traditional farmer, provide stable prices and an almost daily cash flow. Their product is small quantities of non-uniform quality milk or soured milk. Groups of villages or farms should be identified that are judged, based on environmental and farmer interest considerations, to have potential as growth centers for traditional dairy market development. These growth centers may well evolve in time into market cooperatives. Because of the high concentration of traditional livestock in the Southern Province and the existence of much of the needed infrastructure, this province would be the best area in which to encourage growth centers with a dairy

component. In some areas of the Western Province, livestock concentrations
and infrastructure are such that more conscious efforts and considerable
capital inputs are needed to establish growth centers, but these would be
justified and would have political advantage. At first, the market may simply
consist of distribution of soured milk from the traditional farmer to
nearby communities. Later, the processing of fluid milk into ghee, cheese,
and pasturized milk could be introduced.

46.   In the past, milk collection from traditional farmers has been tried
on a very short-term basis with poor results. Better results can be obtained
in the future if communication with farmers is improved and if milk collection
procedures are dependable from the beginning. The farmer's trust must be
earned first. His response will be slow. The development of a sound system
will require considerable patience and dedication.

OFFTAKE IN TRADITIONAL CATTLE KEEPING

1.   The measurement of offtake by cattle sold for meat does not reflect the offtake from the land as perceived by the traditional farmer. A major offtake for him is in milk, and he will deprive a calf of milk in order to insure his own consumption or cash needs. The resultant poor growth of the calf, or, in some cases, death of the calf, is weighed against this need for milk or cash from its sale. This milk "offtake" obviously decreases the number of cattle available for meat offtake. Also, the traditional farmer will retain cattle, as a sort of "savings account" for expenses such as school fees, bride price, and other social debts. His cost of keeping the animals is low, and he has poor access to commercial savings accounts. Another form of offtake is manure; given the low input costs, this "offtake" is a further disincentive to sell cattle.

2.   The question of "Why don't they sell their cattle?-- the economic advantage seems obvious" is frequently raised. An excellent study on this question--"The Role of Cattle in the Ila (a Zambian tribe) Economy," in African Social Research, Vol. 15, (June 1973)--makes the following three points:

   (a)   People will not sell more cattle unless the increased
         cash which they get in return can be spent on some-
         thing of equal investment value, or at least on visibly
         worthwhile durable consumer products.

   (b)   Few are likely to sell beyond a point which would
         make them unable to meet obligations and rights to
         help and be helped by a wide range of kin, both
         socially and economically; they will not willingly
         give up social egalitarianism of Ila society.

   (c)   Like many cattle peoples, Ila and Tonga are egali-
         tarian in outlook. While they respect a man who has
         become wealthy by his own efforts, which may include
         his having adopted more modern methods of production,
         it can be assumed that they will resist any develop-
         ment which favors the already wealthy--particicularly
         the man with inherited rather than earned wealth--
         at the expense of the less fortunate.

3.   From this, it would seem that in the long run, meat offtake from traditional farmers would be increased when a supply of "goods," such as schools, vehicles and housing is made available. Otherwise, the traditional farmer sees little advantage in selling his "savings accounts," given the food and social needs of his day-to-day life. The following table, also ex- cerpted from Fielder's work, shows the minimum number of cattle the Ila feel they need for self-sufficiency.

The Minimum Number of Cattle for Self-Sufficiency

(a) **Household needs**

Trained oxen for ploughing, etc.	4
Cows for reproduction and milk	6
Bulls, for reproduction only	1

Not Yet productive (saleable in emergency)

Untrained oxen	2
Heifers	3
Calves	4
Total	**20**

(b) But before he can think of selling regularly, the owner has other obligations: future bride-wealth payments; repayments on bride wealth already received; cattle to be killed at funerals or for covering costs on debts and cases. So he will want in addition to have available more cows (already received bride wealth, etc.), younger oxen (for funerals, etc.), heifers (for bride wealth), and the odd calf; say ten.

(c) To make doubly sure, after his experience of sudden losses in the past, he will not keep all his eggs in one basket. He will have a margin herded out with other people. These cattle help his less self-sufficient friends and relatives, and thus win him supporters in time of need; say ten.

Summary

	Bull	Oxen	Cows	Heifers	Calves	Total
Household needs	1	6	6	3	4	20
Obligations	—	3	4	2	1	10
Herded out	—	3	3	2	2	10
Totals /1	1	12	13	7	7	40

/1 These totals are close to typical District proportions.

LIVESTOCK DEVELOPMENT SCHEMES IN PROGRESS

Beef

1.   The National Beef Development Scheme, which was started in 1968, now
has 2,500 members. Six hundred are concentrated in the southern provinces
with some 46,000 cattle, 3,400 in the central provinces with some 20,000
cattle, and the rest are scattered over the remainder of Zambia and have
smaller herds. These members agree to carry out certain management practices
in order to receive inputs such as barbed wire and insecticides at subsidized
prices. Also they receive special attention from the extension service. The
management practices have to do with keeping their cattle in paddocks, rotational
grazing, spraying or dipping, vaccination, worming, castration and dehorning.
At present, plans are being made to modify this scheme so that Village Produc-
tivity Committees can act as members.

2.   The State Beef Ranches were started in 1967 under a Bank loan which
provided for land clearing, stocking and the employment of expatriate manage-
ment expertise. The stock for these ranches came mostly from expatriate-run
commercial ranches which were going out of business. Seven of these ranches
were started under the loan, and another 6 were started by the Government.
The loan was paid off and these ranches are now under a direct loan from
Barclay's Bank. Of these, 10 are now considered to be operational and have
35,000 cattle. They are under the general management of an expatriate. These
ranches have a history of problems related to higher costs of inputs than ex-
pected, lower carrying capacities than estimated and inability to provide
sufficiently well-qualified management. They are providing a training ground
for Zambian nationals in beef production, and also produce breeding females
and bulls for the National Beef Development Scheme. Efforts in both of these
areas have met with difficulty, so the results are less than expected. In
spite of this, the Zambia Cattle Development Limited (ZCDL) plans to continue
the effort.

3.   The Collective Ranches were started in 1968. Five ranches with from
200 to 1,800 head each are now in operation. The private cattle owners are
charged a fee for services and the ranch is run by a hired manager. The costs
of the ranches have been higher than expected and present plans are to phase
them out and turn them into settlement schemes.

4.   The Western Province Summer Grazing Scheme was started in 1968 and is
similar to the Zambezi Grazing Development Scheme. Seventeen paddocks capable
of holding 200 head were built inland from the flood plain. Acceptance of the
idea has been poor, however, and there have been problems in maintaining
facilities. It has been hard to justify the high inputs for a scheme which will
be used only for 5-6 months per year.

5.   The Zambezi Grazing Development Scheme, an extension of The National Beef Development Scheme, is designed to assist cattle keepers on the Zambezi Flood Plain by providing grazing land for use during the rainy season in areas considerably distant from the flood plain edge. Pastures of 200-10,000 acres have been allocated to certain groups or families on an informal basis. This idea has technical merit and quite probably will be accepted by some groups. Funding has only recently begun.

Dairy

6.   The Rural Milk Production Scheme was started in 1971 with funds from the World Food Program of the FAO from the sale of powdered milk. Farmers are loaned money interest free for the supervised purchase of 5-6 crossbred cows. All inputs are subsidized 100% the first year, 50% the next year and not at all after that. The farmers pay back the loan at K1 per cow per week. The conditions of the loan provide for leniency if cows die. Funds are available to enlarge this scheme from the present 100 participants who are located throughout Zambia. The scheme has been well received. The obvious high input/output ratio is viewed to be outweighed by the benefits of establishing commercial dairying in rural areas and a market demand for fluid milk which will persist and attract other farmers to this enterprise.

7.   The Dairy Tenant Scheme was started in 1971 and is being carried out in two locations on State Land. In each location, 20 farmers have 20 cows each. The tenants are charged a subsidized rent which was calculated on the basis of expected production return. The results of this scheme have been poor, principally because expected production was not achieved and even if it had been, the overall cost of all types of inputs could not be justified in the returns.

8.   The State Dairy Farms were started in 1971/72. They are essentially government-financed and Government-managed dairy farms. Five of them are financed by RDC through a WBG loan, and have 200 cows each. Six others are financed by the Government and have 90-250 cows each. Production performance has been poor, but they are economically justified for their demonstration and supply of breeding stock aspects.

OUTLINE OF TRAINING PROGRAM OF LIVESTOCK ENTERPRISE MANAGERS

1.   The overall objective of the training program is to provide live-
stock managers for Zambia's state and commercial ranches. The training would
be carried out under conditions of on-the-ranch participation, in cooperation
with organized training institutions.

2.   During the ranch training period, the trainee should participate
actively in the daily work of the ranch and should also be included in short-
and long-range decision making. He should learn from this and be able to
demonstrate an understanding of such manipulative skills as calving assistance,
vaccination and treatment procedures, dehorning and castrating, fence building,
and milking. He should be able to demonstrate an understanding of reproduction
management, seasonal pasture grazing, culling decisions, replacement selection,
major disease problems and emergency health care, and basic machinery maintenance.

3.   The trainee should be able to present an acceptable plan for herd
growth and demonstrate an understanding of the effect of technical coefficients.
In the business management area, he should know how to predict cash flow and
labor and capital requirements. He should also demonstrate his ability to
plan for future changes in size of enterprise as affected by resource cost and
availability and market projections.

4.   As much as possible, the above training should take place on the
ranch using problem solving techniques. The trainee should have access to
written materials on the subjects of cattle and land management. The institu-
tional training should be aimed at providing the trainee with an understanding
of agricultural scientific knowledge on animal feeding, breeding and disease.
This training should use animal science experiments to demonstrate certain
principles. The trainee should demonstrate his understanding of the use of
published material by preparing a review of information on a topic of practical
significance. This total program of ranch and institutional training would
require three to four years, depending greatly on the agriculture background
of the trainee.

ZAMBIA

AGRICULTURAL AND RURAL SECTOR SURVEY

FISHERIES IN ZAMBIA

ZAMBIA

AGRICULTURAL AND RURAL SECTOR SURVEY

FISHERIES IN ZAMBIA[1]/

Introduction

1.   The Zambian Fishing Industry is of considerable importance to
the rural economy, but expansion of production has been slow. Demand for
fish, both fresh and processed, has been increasing rapidly, and a grow-
ing proportion of consumption has had to be imported. At present,
production amounts only to about 40% of the estimated potential. In an
effort to increase production, Government created a new Department of
Fisheries within the Ministry of Lands and Natural Resources, and established
a Fisheries and Fish-Marketing Corporation.

2.   Additional measures will be required, however, to improve the
performance of the industry: new equipment is needed for Zambian fishermen
who now operate with outdated and unsuitable gear, especially boats and
nets; access to largely untapped high-potential areas need to be estab-
lished; and the distribution system--now serving only the large urban
centers, in the Copperbelt and Lusaka regions--should be improved and
expanded to serve the country as a whole.

Fishing Operations

3.   The fisheries of Zambia are remarkable for their variety.
Fishing is carried out by self-employed fishermen on the lakes, swamps,
flood plains, rivers and on about 2,000 fish ponds. More than half of
the total catch comes from the **northern region. There are eight major**
fisheries, most of which are located on or near the periphery of the
country,[2]/ thus complicating the problems of distribution and marketing.

4.   One half of the 50,000 producers are full-time commercial
fishermen; the remaining 25,000 are evenly divided between part-time
commercial fishermen and those who fish for subsistence purposes. Most
fishing is done by gill nets, seines, and a variety of traps used in
rivers and flood plains. Fishermen are scattered in small villages (10
to 50 families or more), and usually have small gardens to supplement
their incomes.

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[1]/ Fisheries were excluded from the terms of reference of the mission.
      However, because of the importance of the sub-sector and its potential
      role in Rural Growth Areas, this largely descriptive Annex, based on
      reports prepared in Zambia, has been included to indicate the scope
      for fisheries project development.

[2]/ See Map IBRD 11541.

5.   In all, there are about 17,000 fishing craft. Crude dugout
canoes predominate in all the fisheries, although increasing use is being
made of fiberglass boats and planked craft, a few (about 8% of the 1350
boats) with outboard motors.

6.   Industrial-size fishing craft and professional gear are used
only on Lake Tanganyika. These boats, which measure up to 65 feet overall,
have steel hulls and closed decks. They are manned by a crew of thirteen,
plus a skipper and an engineer. They fish year-round without loss of time
because of foul weather, and their annual catches average between 3,000-
4,000 tons.

Fish Resources

7.   Zambia has approximately 152,000 hectares of open lakes and
perennial rivers, as well as substantial swamps and river flood plains.
The main fishing areas are as follows:

Lakes	Rivers	Swamps	Flood Plains
Tanganyika	Chambeshi	Mweri-Wantipa	Chambeshi
Mweru	Luapula	Bangweulu	Luapula
Mweru-Wantipa	Luangwa	Lukanga	Kafue
Bangweulu	Kafue		Zambezi
Kariba	Zambezi		

Lakes

8.   Of the lakes, Tanganyika has the highest fishing potential with
an estimated 20,000 metric tons per year in the Zambian part of the lake
alone. **This may be an understatement. In order to assess the full potential
of the lake, UNDP/FAO is organizing a stock assessment research program with
the four countries that surround the lake: Burundi, Tanzania, Zaire and Zambia.
Preliminary findings indicate that most of the fish remain in the deep
waters where, because their boats are unsuitable for the rough water condi-
tions, fishermen normally do not operate.**

9.   Lake Mweru, which has the greatest potential of the lakes
located entirely within the country, has a declining fish production.
This is mainly due to poor enforcement of the fishing regulations which
has led to overcropping and to the use of small, closely-woven nets that
catch young stock before it has reached the breeding age. This lake also
has a serious crocodile problem (an estimated 4,000 crocodiles consume
approximately 20,000 kg of fish daily). Experts maintain that if the
biological balance of the lake is to be maintained, and if the high fish
potential is to be safe-guarded, a crocodile cropping program is essential.
Inaccessibility to parts of the lake, particularly the areas surrounded
by extensive swamp lands, and inadequate marketing and processing
facilities also hamper the development of fishing operations and prevent
the full utilization of the lake's potential.

10.   Because of bad management and overcropping, Lake Bangweulu currently has a low fishing potential, which could, however, be improved for the future by strict enforcement of fishing regulations.

11.   During 1967-68 the Zambian Department of Wildlife and Fisheries successfully transplanted Kapenta (a small, sardine-like fish) from its native habitat in Lake Tanganyika to Lake Kariba, and limited cropping--mainly at the southern end--has begun. Since the closure of the Kariba Dam, moreover, the fishing potential of the lake has been increasing yearly. Two problems hamper full exploitation of the resources of the man-made lake, however: first, a large area now flooded by the lake covers a hardwood forest which was not removed before the lake was filled. This creates a problem for fishermen whose nets become tangled in the trees. Since decomposition is slow, this problem is likely to continue to plague fishermen for some time to come. Second, the fact that the lake borders on a hostile country (Rhodesia) prevents a joint development effort.

Rivers, River Flood Plains, and Swamps

12.   The cropping potentials of the rivers are rather limited upstream, but improve significantly after passing into their respective flood plains. A study of the Kafue Flood Plains indicated a sustainable yield of 21,000 tons annually--only about one-fourth of which is currently utilized.

13.   Like the river flood plains, all Zambian swamps are rich in fish. And, like the flood plains, the high potential areas of the swamps are still largely unexplored. Exploitation of the fishing potential of the Bangweulu Swamp (probably the largest swamp in the world) is hampered by inadequate fishing technology and the inaccessibility of the market. While Bangweulu's problems are perhaps more pronounced, they are not atypical of Zambian swamps in general.

Fish Farming

14.   To date, little use has been made of fish farming in Zambia. Under tropical conditions and proper management, fish ponds can produce large quantities of fish. The northeast-northwest high rainfall belt, where waters are easily available, is the most suitable fish-farming area. An expansion of commercial fish farming could help to increase fish production.

Production and Potential

Production

15.   The annual production of fish in Zambia ranges from between 30,000 and 40,000 tons, with the following breakdown by area:

Estimated Fish Production in Zambia (1972)*
(in metric tons)

Lake Tanganyika	5750
Lake Mweru-Wantipa	6630
Lake Mweru	7265
Lake Bangweulu	7090
Lukanga Swamp	3000
Kafue River	5380
Lake Kariba	1300
Zambezi River	3000
Total	39,415

* Data on minor waters and fish ponds are not available

Potential

16.   The potential of annual fish production in Zambia is unknown.
Some estimates range as high as 100,000 metric tons per year, while other
sources, although recognizing that the potential is much greater than
current annual production, are skeptical of this high figure. The view
of an FAO stock assessment expert, F. Henderson, is that while it is very
likely that the yield from the present fishery can be substantially
increased, it is quite unrealistic to assume that the combined yield
could be more than doubled without intensive research and management
and, in order to meet the long-range goals of fish production in Zambia,
a large expansion of aqua culture appears to be necessary.

Policy and Institutions

Policy Objectives

17.   The principal objectives for fisheries development during the
SNDP are:
(a) to achieve a harvest of 55,000 tons of fish by 1976;
(b) to establish an effective marketing organization to enable
fish to be made available in some form to consumers
throughout the country;
(c) to improve fishing equipment and techniques; and
(d) to produce better quality fish--fresh, frozen and dried--
as a valuable protein source.

18.   To reach these objectives, Government introduced the Fisheries
Act, 1974, governing the fishing industry. It provides for the establish-
ment of Development Committees in fishing villages and increased training
facilities to stimulate development of all aspects of the industry.

Institutions

19.   The Department of Fisheries within the Ministry of Lands and
Natural Resources was formed in early 1974. Previously, fishery aspects
were looked after by the Department of Wildlife and Fisheries. The

Department is in charge of the extension service. Approximately 40
fish extension officers, operating from established fishing camps, are
posted to the main fishing areas all over the country.

20.   To provide training opportunities, a new Fish Training Insti-
tute was established with UNDP/FAO assistance at the Kafue River.
Construction of buildings started in 1974 and it is expected to start
operations during 1975.

21.   In 1969, with the assistance of UNDP/FAO, a Central Fisheries
Research Station was established at Chilanga. Staffed by FAO, the
station conducted extensive biological and technical research from 1969
to 1973. In 1973 UNDP/FAO turned the research facilities over to the
Government.

Research and Training

22.   Extensive biological and technological research has been carried
out in all major waters, and there is enough information available to
provide a sound basis for a rapid expansion of the fishing industry.

23.   A UNDP/FAO Review Mission visited Zambia in November-December
1972. Its main recommendations on training included:
   (i)   a survey of existing training facilities and the extension
         service;
   (ii) assistance in the establishment of a pilot demonstration
         and training center at Kafue, responsible for the training
         of fishery extension officers and fishermen;
   (iii) the establishment of fishermen's development units at the
         village level, drawing on the facilities of the Kafue
         pilot demonstration and training center.

Market and Prices

The Market

24.   Eighty percent of the fish produced in Zambia is sold as a dried
or smoke-dried product; the remaining 20% is sold fresh or frozen. To a
large extent, this pattern is determined by consumer preference, but
limited refrigeration facilities for fresh and frozen fish at distri-
butive points and in homes also restricts the sale of these products.

25.   There is an uneven distribution of fish throughout the
country. An estimated 4,000 traders, most of whom are part-time, visit
the scattered fishing communities, to purchase fish for sale in the richest
markets along the line-of-rail (the Copperbelt towns) or Lusaka. The
visits of the traders are irregular, and this, combined with the fact
that they often carry no or an insufficient amount of ice, contributes
to the spoilage of the catch.

26.   The recent food consumption survey indicates that consumption of fish in some rural areas is very low. Many people in these areas would welcome the opportunity to buy fish more often, and wider distribution of smoked and dried fish would undoubtedly improve diets in many areas.

Imports

27.   Imports of fish for human consumption in 1970 amounted to 23,000 tons valued at K 2.7 million (US$ 4.2 million). In the next five years, population growth, steadily rising incomes and standards of living, and improved distribution facilities may increase the annual per capita consumption of fish in Zambia from the present 12.5 kilos to 15 kilos or more. In 1980, Zambia will require about 80,000 tons of fish. Unless the development of fisheries is drastically improved, this could mean a shortfall of 35,000 metric tons (worth K 4.1 million /US$ 6.4 million/ in constant terms) over estimated production.

Prices

28.   Maximum consumer prices are fixed by Government with variation between the different species. Since marketing costs vary considerably due to the distance and accessibility of the producing areas, it is unrealistic to enforce a uniform consumer price throughout the country, and with the market in the hands of a large number of full- or part-time fish traders and fishermen/traders, it is nearly impossible to enforce one.

Market Organization

29.   The fish market in Zambia is dominated by a large number of small-scale private fish marketeers who deal almost exclusively in dried or smoke dried fish. There are only two companies operating on a larger scale--a private fishing and marketing company operating from Lake Tanganyika and the state-owned Lake Fisheries of Zambia. The two commercial companies, which specialize in marketing fresh and frozen fish, have their own fishing fleets operating on Lakes Tanganyika and Mweru. They also own the only cold storage rooms in the country.

30.   Lake Fisheries of Zambia, a former subsidiary of INDECO was formed to take over the operations of a private company, Groving Johnson, in 1969. It was charged with increasing fish production through its own operations, assisting private fishermen by providing marketing services, and importing frozen food products. Lake Fisheries of Zambia failed to fulfill these obligations and incurred heavy financial losses.

31.   In order to implement Government objectives and policy in regard to the fishing industry, a Fisheries and Fish Marketing Corporation was formed in 1974 as a subsidiary of ZIMCO. The new corporation

has taken control of Lake Fisheries of Zambia and is in the process of expanding its field of operations.

Constraints on Development

32.   Although their individual effects and importance need quantification, a number of problems facing the further development of the fishing industry in Zambia can be identified.

33.   Fishing Techniques. The majority of fishermen, working alone or in a small group sharing a boat, operate with outdated unsuitable equipment and in most cases their fishing and processing techniques are obsolete.

34.   Access and Transport. Fishing areas are typically remote--the big lakes are 500-1000 km from major markets--and access roads to landing sites in the fishing areas are few and poor. In general, fishermen must either market their own fish locally, or rely on fish traders who visit their villages at irregular intervals to buy fish and transport it to urban centers for sale. The traders use small trucks and bicycle trailers, and service their regions in a haphazard, sporadic fashion.

35.   Storage. With the exception of Lake Tanganyika, Kitwe, Kashikishi and Lusaka (Map IBRD 11541) there are no fish storage facilities, and the storage at Kitwe and Lusaka needs replacing. The combination of poor processing, difficult access and lack of storage has been estimated to be responsible for spoilage of 20% of the fish catch.

36.   Extension Services. The Fisheries Extension Service is very weakly staffed. There are about 200 men in the field who, in addition to their other responsibilities, are also obliged to collect statistical data. The men are not well trained and, in general, extension services consist merely of demonstrating new types of nets. A wider view of extension activities, e.g., improvement of marketing, storage and processing facilities, is lacking. Also, often there are no funds for travel from village to village, and thus staff are unable to reach a high proportion of fishermen in remote areas.

37.   Credit. There is a need for credit for equipment but past performance with loan recovery has been very poor--in 1971 when the then Credit Organization of Zambia loaned fishermen K 338,000, the recovery rate was under 15%. Recently Government has proposed a new loan scheme to be handled by the Marketing Corporation under which fish produced will be the security against loans.

38.   Price Policy. There is an inherent conflict in Government's price policy objectives of increasing production of fish, providing a reasonable income to fishermen by providing market outlets, and distri-

buting fish to consumers at a low price. Moreover, although different prices are set for different types of fish there is no differentiation by grade and thus no incentive to producers to improve quality. In the situation of many small producer/traders engaged in the marketing of a non-standard perishable food there seems little advantage, and many problems, in attempting to set and enforce fixed prices.

Conclusion

39.   Major problems are poor communication links with many high potential fishing areas, poor equipment and processing techniques employed by the fishermen, an insufficient marketing system and a rigid price system. It should be possible to ease these constraints rather rapidly, and a project to provide the needed physical infrastructure is under consideration in Zambia. It draws upon an FAO study[1] and could cost over K 4 million (US$ 6.2 million). Cost figures and markets need further study, the project should be broadened in scope to meet all the constraints noted, and a detailed economic appraisal made.

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[1] Fish Marketing and Processing: Republic of Zambia. Food and Agriculture Organization of the United Nations, Rome 1972 (FI:DP/ZAM/68/511/2, 15 October, 1972).

ZAMBIA

AGRICULTURAL AND RURAL SECTOR SURVEY

SUMMARY OF INVESTMENT PROPOSALS

The mission's report concentrates on a strategy and policy issues
for the agricultural and rural sector. Improvements in both will be pre-
requisites for successful investment in the sector, both because they are
fundamental to the economic viability of projects and also because of the
need to improve the capacity of the sector to absorb investments. On the
implicit assumption that policy improvements will be made, a number of
potential areas for investment for government, private, bi-lateral or
international financing have been identified. The following summarizes
projects and studies which are elaborated upon in the report and its
Annexes. The costs are indicative only and are expressed in 1974 prices. 1/

Project 1:   Sugar Development
             (para. 5.17; Annex 14, paras. 50-51, 104; Annex 13, paras. 45-46)

  Location: Possibly Chambeshi Flats close to TAZARA.

  Description: Factory, estate and outgrowers development to meet
                 internal demand from 1982: final development to 100,000
                 tons.

  Costs and   (a) Feasibility study 1976-77 (see Project 14: K 130,000
                     (US$200,000)
                 (b) Factory and land development 1979-82, K 80 million
                     (US$120 million).

Project 2:   Cotton Production
             (para. 5.14; Annex 13, paras. 16-19)

  Location: Rural Growth Areas in Southern, Central and Eastern
                 Provinces.

  Description: To introduce farmers to growing cotton as a rotation
                 crop on smallholdings. Elements include package of
                 extension services, ULV sprays and improved varieties;
                 and storage and feeder roads. Annual additional production
                 of about 8,000 tons seed cotton worth K 2.5 million to
                 producers could result.

1/   Tentative correction coefficients for future prices are: 1975: 1.16;
     1976: 1.26; 1977: 1.40; 1978: 1.56; 1979: 1.79; 1980: 1.95; and
     1981: 2.14.

Costs and Phasing:	An initial 5-year project to reach some 20,000 farmers could cost K 10 million (US$15 million). Assuming production by present and former producers return to the 1971-72 level this would satisfy demand in 1981. Any further project would involve expansion of ginning capacity.

Project 3:   Tea Development
                (para. 5.18; Annex 13, paras. 43-44)

Location:	Kawambwa.
Description:	Partnership with tea company to expand tea estate, establish factory and plan subsequent outgrower development.
Cost and Phasing:	K 650,000 (US$1 million), 1976-78.

Project 4:   Other Crop, Livestock and Social Development in Rural Growth Areas

Description:	Investments in the rural areas over the next two decades should be directed to perhaps 75 selected Rural Growth Centers (RGCs) and villages in the surrounding Rural Growth Areas (paras. 5.02-5.04; Annex 2, para. 49). Crop development is particularly dependent on improved pricing. Those to be developed by smallholders within the RGA framework would include:

(a) maize - most areas, requiring improved input delivery (paras. 5.08-5.09; Annex 13, Paras. 4-6);

(b) burley tobacco - in all Provinces except Western and Luapula, to 2,300 ha by mid-1980s. Requires staff training (para. 5.15; Annex 13, para. 25);

(c) virginia tobacco - development in second phase of family farming tobacco scheme in Western, Southern and Eastern Provinces (para. 5.15; Annex 13, 22);

(d) groundnuts - confectionary nuts in Eastern Province, nuts for oil in all others (para. 5.23; Annex 13, paras. 32-33);

(e) sunflower - especially Central and Southern Provinces (Annex 13, para. 38);

(f) coffee - small arabica development, dry-land and irrigated to involve about 1,000 farmers in Northern Province in next decade (para. 5.18; Annex 13, para 42);

(g) rice - initially upland rice development in Luapula and Northern Provinces, to 3,500 ha in 5 years: later irrigated in Barotse Flood Plain, Kariba, Kafue, Chambeshi and Lake Bangweulu areas. About K 200,000 (US$312,000) would also be needed for processing units (para. 5.13; Annex 13, paras. 9-10; Annex 14);

(h) other components - fish, cattle, hides, fruit, poultry and pigs according to area (Annex 2, paras. 16-48).

Assistance to farmers would be based on package programs including intensified extension services, access roads, farmer training, improved marketing and input input supply systems, and processing facilities where needed. (Annex 2, para. 15).

Cost and Phasing;	An initial 5-year program to reach 1 million people in 75 areas might cost about K 45 million (US$70 million). This includes K 10 million in areas of cotton production (Project 2) and K 2 million for 4 peri-urban developments (Project 5) but excludes major irrigation investment (Project 7). A second phase program reaching 2-2.5 million people might cost K 150 million (US$235 million).

Project 5: Peri-urban Development
(para. 5.05; Annex 2, paras. 42-44)

Location:	Close to Copperbelt cities and Lusaka: replicatable near Provincial towns.
Description:	To develop smallholder production of fruit, vegetables, pigs and poultry, dairy and field crops for the urban markets. Components would include roads; surface and groundwater development for irrigation; market links; extension services and input supplies. An inventory of land and water resources of the area is needed, and two initial projects involving 1,000 families each, could be developed.
Costs and Phasing:	(a) detailed surveys, K 200,000 (US$320,000); (b) two projects, about K 2.0 million (US$3.2 million) over 5 years.

Project 6: Maize Storage Silos
            (paras. 5.19-5.20)

Location: Line-of-rail and Provincial centers.

Description: (a) evaluation of maize storage needs, location and type;

                (b) construction of storage.

Costs and   (a) evaluation (see Project 13: K 50,000 (US$70,000)
  Phasing:
                (b) construction - depending on study. If silos justified
                for whole crop and reserve, K 40-60 million (US$62-94
                million) in 5-7 year program.

Project 7: Irrigation Development
            (para. 5.32; Annex 14, paras. 104-108)

Location: See Map IBRD 11545. Nationwide on major rivers and lakes—
                Kafue and Chambeshi—on tributaries and groundwater
                reservoirs, according to scale and location.

Description: Large-scale (over 200 ha) irrigation for company devel-
                opment of sugar, wheat (possibly with soya beans) and
                vegetable crops; medium-scale (20-200 ha) mainly on
                commercial farms; and small-scale (under 20 ha) in RGAs
                would be for wheat, rice, oilseeds, coffee, fruits and
                vegetables.

Costs and   Targets proposed are:
  Phasing:

	1977-81		1982-86		1987-95		Total	
	Area ha	Cost K m/n	Area ha	Cost K m/n	Area ha	Cost K m/n	Area ha	Cost K m/n
Large-scale* (Annex 14, App XV)	5-8	8.5-13.6	10-12	17.0-20.4	10-15	17.0-25.5	25-35	42.5-59.6
Medium-scale	3	3.6	4	4.8	10	12.0	1.7	20.4
Small-scale	1	0.7	1	0.7	5	3.5	7	4.9
	9-12	12.8-17.9	15-17	22.5-25.9	25-30	41.0	49-59	67.9-84.9

                * excluding sugar areas - up to 15,000 ha by 1995.

Project 8:   Rural Water Supplies (RWS)
             (para. 5.33; Annex 14, paras. 70-75, 109-111; Appendix XXII)

Location: Countrywide in RGAs.

Description: Technical inventory of existing RWS; construction of about
                700 hand-dug wells and 300 boreholes a year; and improve-
                ment and restoration of existing facilities.

Costs and   K 17.5 million (US$27.3 million) over 10 years (phase
Phasing: I 1977-81, K 7.5 million: phase II 1982-86, K 10 million).

Project 9:   Cattle Watering Points
             (para. 5.33; Annex 14, paras. 112-113; Appendix XXII)

Location: RGAs in Western Province (Mulanga and Siloana Plains).

Description: Drilling 120-150 boreholes for cattle water supplies.

Cost and   K 0.5 million (US$0.8 million), 1977-81.
Phasing:

Project 10: Rural Industry Development
             (para. 5.06; Annex 10, paras. 36-38

Location: Rural Growth Centers.

Description: (a) Technical assistance to define role of small-scale
                industry, review policy and institutions affecting its
                development, and identify products;

                (b) A lending program for capital investment, and
                working capital; and technical assistance in a range
                of small industries.

Costs and   Dependent on (a). A national K 3 million (US$4.5 million),
Phasing: over 10 years is suggested.

Project 11: Tsetse Fly Control
             (para. 5.27; Annex 15, para. 30)

Location: See Map IBRD 11541.

Description: Support to animal disease and tsetse control programs,
                maintaining present lines.

Costs and   Five-year program: K 2.2 million (US$3.5 million).
Phasing:

Project 12:   Application of LANDSAT Imagery
              (para. 5.35; Annex 14, paras 121-2, Annex XXII)

    Location: Countrywide

    Description: Purchase of complete LANDSAT mosaics (initially 2
                for February and September), technical assistance and
                counterpart training in Zambia for groundtruthing, and
                overseas for interpretation, preparation of overlays, and
                application to water resource and land planning, agri-
                cultural data improvement and crop forecasting.

    Costs and   1 year: K 350,000 (US$535,000).
      Phasing:

Project 13:   Fish Marketing Infrastructure
              (para. 5.39; Annex 16, paras. 32-39)

    Location: Fishing areas, associated with RGAs, and in major markets.

    Description: Access roads, storage, market infrastructure and enhanced
                extension services for fishing and fish processing.
                Details require investigation which would be included in
                initial phase.

    Cost and   In excess of K 5 million (US$7.8 million).
      Phasing:

Project 14:   Studies and Planning Activities

    Description, Costs and Phasing:
        Apart from technical research requirements the mission identified
        a number of studies and related planning activities which are needed
        to further policy formulation or project identification and imple-
        mentation. In many cases funding for these could become a component
        of a project. In total identified studies could cost nearly
        K 900,000 (US$1.4 million).

        (a) Study of the Irrigation Potential of the Chambeshi Valley, close
        to TAZARA. Includes soil-survey, surface and groundwater investi-
        gation, and project identification. One and one-half years,
        K 100,000 (US$150,000) (Annex 14, para. 120; Appendix XXII);

        (b) Preparation of a Kafue Basin Water Plan as a basis for policy
        for managing the river's water resource. One year, K 160,000
        (US$250,000). To be followed by a Study for the Development of the
        Kafue Flats. Three years, K 775,000 (US$1.2 million) (Annex 14,
        para. 120; Appendix XXII);

(c) <u>Water Resource Data Collection.</u> To include establishment of a central archive and mapping of Zambia's groundwater potential. K 150,000 (US$240,000) (Annex 14, para. 121; Appendix XXII);

(d) <u>Sugar Expansion.</u> Study of the location of a further 100,000 ton factory and estate for development from 1979. One and one-half years, K 130,000 (US$200,000) to start in 1976 (para. 5.17; Annex 13, para. 46). Linked to study (a);

(e) <u>Siting of Expansion to Textile Plant.</u> Study advantages and disadvantages of siting a textile plant in Eastern Province rather than expanding Kafue textiles. Six months, K 40,000 (US$60,000) (para. 5.14; Annex 13, para. 19);

(f) <u>Maize Storage Needs.</u> An evaluation of the type, location and quantity of Zambia's maize storage needs. The study should be linked to the Bank's Regional Maize Price Policy study. Maize meal stock holding policy also needs appraisal. Nine months, K 50,000 (US$70,000) (para. 5.20); Annex 13, para. 4; Annex 8, para. 131);

(g) <u>Cassava for Starch or Stock Feed.</u> Study of technical, production and market feasibility of commercial cassava production close to TAZARA. Six months, K 40,000 (US$60,000) (Annex 13, para. 51);

(h) <u>Review of Road and Rail Tariffs.</u> To provide basis for revision of tariff structure to encourage agricultural production and reduce transport costs. Should include traffic study embracing all parastatal operations (para. 4.42; Annex 12, para. 39). Six months, K 30,000 (US$45,000);

(i) <u>Agricultural Credit.</u> Farm economics research into the smallholders' need for credit. This should be linked to an internal review of Agricultural Finance Corporation (AFC) and other parastatal and private credit operations for smallholders. One and one-half years, K 65,000 (US$100,000) (para. 5.04; Annex 7, paras. 28-39);

(j) <u>Commercial Dairy Production.</u> A detailed study of the economics of dairy production by commercial and emergent farmers to identify ways of encouraging investment in dairy herds and dairying facilities to secure long-run production goals, as a guide to policy formulation and project preparation. Nine months, K 50,000 (US$70,000) (Para. 5.29, Annex 15, 39).

ZAMBIA

AGRICULTURAL AND RURAL SECTOR SURVEY

DEVELOPMENT AND INCOME DISTRIBUTION IN A DUAL ECONOMY:
A DYNAMIC SIMULATION MODEL FOR ZAMBIA

Tables:[*]

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* Each Table comprises subtables showing:

(a) Labor Force Distribution
(b) Pre-Tax per Worker Income Levels
(c) Migration Rates
(d) Distribution of Population
(e) National Output and Its Composition
(f) Disposition of National Product

ZAMBIA

AGRICULTURAL AND RURAL SECTOR SURVEY

DEVELOPMENT AND INCOME DISTRIBUTION IN A DUAL ECONOMY:
A DYNAMIC SIMULATION MODEL FOR ZAMBIA*

I. Introduction

1.   Development theorists have long made use of the simplifying
paradigm of the dual economy. With this theory, the key structural
characteristic of developing countries is the dualism in the economy
between a traditional, relatively poor, mostly agricultural sector and
a modern, relatively rich, mostly industrial sector. Seen in this light,
policy discussions should focus most strongly on the implications of
the linkages and characteristics of the two sectors. This approach to
economic development has its roots in Ricardo and Marx and has been
repopularized in recent decades by the work of Lewis, Fei and Ranis,
Marglin, Sen and many others.

2.   Although rich in general policy conclusions, specific policy
applications are rare. Numerical economy-wide forecasting and program-
ming models have emphasized other important constraints (e.g., savings
and foreign exchange limitation, intermediate industrial demands, human
capital, etc.) in comparison to dual economy factors.[1] This tendency
is due both to data rarely being collected with dual economy models in
mind, and to the development of the numerical models out of Keynsian
and neo-classical growth models.

3.   Dual economy models have, however, found a real use in the
literature on project evaluation in developing countries. Both the
Little-Mirrlees and UNIDO methods are based on use of shadow prices
implicitly derived from optimization of a dynamic dual economy model.
Unfortunately, in practice partial equilibrium estimates of the para-
meters (principally, the shadow prices of labor, capital, and foreign
exchange) are utilized, putting the whole project evaluation procedure
in question.

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[1] A notable exception is the study of Japan by A.C. Kelly, J.C. Williamson
    and R.J. Cheetham, Dualistic Economic Development: Theory and History.
    U. of Chicago Press, Chicago, 1972.

4.   Here, we broaden the use of dual economy models by attempting
to construct a numerical application designed explicitly for simultaneous
derivation of long-term macroeconomic forecasts and shadow prices.
Particular attention is paid to the policy implications of alternative
income distribution objectives. It is important to note that the model
is not explicitly maximizing. Rather it simulates the development process
under a number of different assumptions regarding government policy and
exogenous factors.

5.   Zambia is the country for which this dual economy model has
been developped. Through exploitation of its mining resources (mainly
copper), Zambia maintains one of the highest levels of national income
per capita in Africa. Especially since Independence, its industrial
and urban sectors have grown dramatically. On the other hand, the Zambian
economy remains highly dualized, with the majority of the population
living in rural areas where income per capita averages less than one
quarter the level in the modern sectors. Indeed, most of the rural
population is engaged in subsistence farming. Not only is income low
in agriculture, but growth in food production has been sluggish and
irregular.

6.   Reduction of income gaps between rural and urban areas and
increased agricultural output are key policy objectives of the Zambian
government. The dynamic model of Zambia (DYZAM) is designed as a tool
planners could use in studying the impact of alternative policy packages.
Although DYZAM is an economy-wide model, the major emphasis throughout
is on income and production in the rural sectors. The other major focus
is on the medium- and long-term effects of various public policies.
Hence, short-run adjustment problems are largely neglected.

7.   The model itself is reviewed in general terms in Section II.
In Section III, a number of alternative macroeconomic policies are
compared; these deal largely with taxation, pricing, and investment
policy. More microeconomic experiments, simulating more specific agri-
cultural strategies, are discussed in Section IV.[1]

II.   Assumptions and the Model Formulation

General Assumptions

8.   The typical theoretical dual economy model postulates a two-
sector (traditional and modern) economy producing two goods (rural and

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[1]   A more complete algebraic formulation and development of the model, along with
      the shadow price and welfare implications of DYZAM are available from
      the Development Research Center of the Bank.

urban) having two consuming classes (rural and urban workers) and one savings class (profit earners or government). This structure clearly is too narrow for any real country application. A broader disaggregation has been adopted for DYZAM to more accurately reflect Zambian reality, while remaining sufficiently aggregative to be estimatable and computable.

9.   In the model, it is assumed that the Zambian economy produces three goods: a rural good (highly aggregative and largely agricultural), an urban good (even more highly aggregative), and a mining good (mostly copper). In order to focus more heavily on production, income levels, and dualism within agriculture itself, the rural economy is subdivided into three producing sectors. The first, referred to as "traditional agriculture", incorporates subsistence farming and small farmers marketing only a small share of their production. Roughly half the population is supported by the income generated in traditional agriculture. The second, referred to as "emergent agriculture", includes small-scale Zambian farmers who earn most of their income through marketing their produce. Finally, there is the large-scale commercial agriculture sector. Although relatively small in terms of employment, this sector produces about 40% of all marketed agricultural produce. In total then, there are five producing sectors in the model: traditional agriculture, emergent agriculture, commercial agriculture, urban, and mining.

10.   To further emphasize income distribution (and to improve the savings and demand projections), the economy is divided into seven income classes. The first five correspond to the workers in each sector (i.e., traditional farmers, emergent farmers, commercial farm workers, urban workers, mining workers). The other two refer to the high income elite of the economy who receive portions of the returns to capital, viz., the Zambian bourgeoisie and foreigners.

11.   The next set of assumptions deals with commodity prices. Throughout, we assume that all three goods are tradeable and that Zambia, by itself, cannot change the relative world terms of trade. Thus, the economy faces fixed international prices in each year, although these may change exogenously year-to-year.[1] Although it is not entirely accurate to do away with non-traded goods, the computational and data collection benefits of this simplification make it a useful first approximation.[2] With given international prices, domestic producers'

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[1]   While this may be a reasonable assumption for agricultural and urban goods, it is quite possible that Zambia could affect the world price of copper by adjusting its own inventories. Since DYZAM is ill-suited for use in choosing optimal inventory levels, we assume that the country will continue to act as a price taker and sell its output at going prices. Alternative policies could be easily simulated as well.

[2]   Most of the data for DYZAM were collected as part of the Agricultural and Rural Sector Survey Mission. Time limitations precluded any significant development of new data sources.

prices are set by tariff levels and domestic consumers' prices by
tariffs and excise taxes. Therefore, government indirect taxation
policy, together with world markets, determine all domestic commodity
prices.

12.   On the basis of consumer and producer behavior, as well as on
government policy, the model calculates sectoral resource allocations
(of capital and labor), production and income levels, consumption and
investment demands, government revenue and expenditure, and inter-
sectoral demographic movements for each year. The solution for any
given year determines certain initial conditions for the next and
consequently the model can simulate Zambian development forward in time
until its underlying assumptions are no longer sufficiently valid to
produce realistic projections.1/ In the following subsections, we consi-
der each step more explicitly.

Yearly Output Levels and Resource Allocations

13.   Consider the agricultural sectors first. It is postulated
that all three sectors operate along on the same Cobb-Douglas production
function, relating output to labor and capital inputs.2/ This amounts
to assuming the productivity differentials are largely due to different
choices of technique, which in turn are caused by various market
imperfections and rigidities. Most importantly, the capital stock in
each agricultural sector is fixed during any one year.

14.   Wages paid to hired labor in commercial farming is also set
exogenously on the basis of minimum wage regulations. We assume that
commercial farmers maximize their profits, given fixed producers'
prices and capital stock. This process determines the employment level
and output level for the sector. It is postulated that emergent farmers
neither hire labor from outside their subsector nor seek outside employ-
ment.3/ Thus, both labor and capital usage are set and output determined.
The labor force in traditional agriculture is the residual between the
total agricultural labor force and employment in commercial and emergent
agriculture.

15.   Employment and output in the urban sector are calculated in the
same way as with commercial agriculture. The producers' price and the
nominal wage are pre-determined; output is a function of labor and
capital inputs. Given that the capital stock is fixed by past investment
decisions, labor is hired until profits are maximized.

1/ Here we report on simulations for a twenty-year period, 1972-1992.

2/ With this formulation, land is treated implicitly as a surplus
   resource. This is supported by Ljung's finding that farm size is an
   almost linear function of other factors. Per Ljung: Migration and
   Rural Development, draft report, July 1974. In commercial agricul-
   ture, acreage is usually limited.

3/ Rural services are treated as part of agricultural production and are
   thus included.

16.   Mining is handled in a somewhat different fashion. First,
we assume that there is little scope for capital-labor substitution in
production; capital, labor, and intermediate input requirements are
proportional to output levels.1/ Output levels cannot now be determined
by explicit profit maximization; rather, we suppose that the sector will
follow a long-term growth strategy formulated by government planners.
This strategy can then be one of the policies tested by the model.

17.   While full employment is postulated for agriculture as a whole
(although mostly at low productivity), DYZAM allows for open unemploy-
ment in urban areas. Unemployment is computed residually as the
difference between the total urban work force and employment in the
mining and urban sectors.2/ Thus, the urban "informal" sector is
included neither in national income nor in employment calculations.

Personal Income Distribution

18.   It is a comparatively easy task to compute the total gross
income which accrues to each of the five "worker" classes, once output
(and employment) levels are known. Traditional and emergent farmers earn
the full value of their production (i.e., as if they "owned" the capital
used in their production activities). Total income earned by commercial
farm, urban, and mining workers is simply employment times the respective
fixed wage.

19.   Calculation of the distribution of the rest of the producers'
value of all production is more complicated. Consider the share going
to the Zambian bourgeoisie. They are treated as partial owners of the
commercial farming and urban sectors, and their total gross income is
determined by their share of profits (returns to capital) in each sector.
Foreigners have a 49% interest in mining, as well as considerable
investments in commercial agriculture and the urban sector. Remaining
ownership shares in these three sector belong to the government directly
and indirectly.3/

20.   Net personal income can then be derived by applying the average
corporate tax rates to profits and the relevant income tax rates to all
gross personal incomes. The net incomes of each group can then be

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1/   Although these ratios are fixed for any one year, they change over
     time, reflecting technical progress and long-term choice of technique.
     Similarly, technical progress terms are included in the Cobb-Douglas
     production functions used for determining output in the other sectors.

2/   The total urban labor force is fixed during each year, but changes over
     time in response to population growth and rural-urban migration.
     This process is reviewed below.

3/   Indirect governmental profits are those accruing to parastatals.
     Here, we aggregate net parastatal income together with direct
     government revenues.

invested (in the form of purchases of capital goods), spent for consumption (in the form of agricultural or urban goods), or (in the case of foreigners) repatriated abroad.

Private Expenditure Patterns

21.   The parameters of an extended linear expenditure system have been estimated for each of the seven income classes.[1] The system is "extended" in that savings levels are determined as a function of consumers' prices, as well as income levels. These relationships determine per capita consumption of agricultural and urban goods within each income class; these can then be summed over the population to provide projections of total consumption demand. Similarly, total private savings are the aggregation of individual savings levels.[2] Foreign remittances by non-Zambians are computed as part of their expenditure system.

22.   Since producers' and consumers' prices can differ, total private demand can be used to calculate excise tax and net import duty revenue. Together they comprise the government's net indirect tax proceeds. It is important to note that the implicit excise taxes or duties can be negative, as they currently are for agricultural goods taken as a whole.

Government Revenue and Expenditure

23.   Net government revenue is composed of its direct and indirect share of profits, direct taxes (on corporate and personal incomes), and indirect taxes (on imports and consumption goods).[3] In the experiments reported on here, we assume that the consolidated public budget, current and capital accounts, is balanced in each year. Thus, official foreign loans are assumed negligeable in net terms. Since government revenue in Zambia is highly dependent on the world price of copper (which fluctuates widely), this implies that expenditures also fluctuate.

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[1] These parameters are the marginal budget shares and propensity to save, and "subsistance" levels of consumption. Those all differ among the groups. See C. Lluch and R. Williams, Cross-country Demand and Savings Patterns: an Application of ELAS. Review of Economics and Statistics (forthcoming).

[2] Note that traditional and emergent farmers and high income groups are the only savers; workers do not save.

[3] We refer to "net" revenue since any taxation of parastatals would cancel out and is therefore ignored.

Future refinements of the model could easily allow for more constant
public expenditures, making use of foreign borrowing and changes in
foreign exchange reserve holdings.

24.   In DYZAM, all net government revenue is spent on urban goods,
for both current public consumption and savings. In the basic case,
discussed in Section III, public consumption grows at a fixed annual
rate of 7%. The remainder is allocated to savings. Alternative policies
are possible and several experiments have been attempted using fixed
marginal savings propensities and alternative consumption growth rates.
Note that with steady growth in public consumption, the government's
investment budget must bear the entire burden of fluctuating revenues.
Given the steady demands on current expenditures, this is, perhaps, the
most realistic view.

Capital Accumulation

25.   So far we have concentrated on the statics of the model--
income determination and resource allocation in any given year. To
obtain the solution, we had to postulate given capital availability in
each sector at the start of the year. Investment allocations, in turn,
determine capital stocks in future years. Therefore, in order to form the
dynamic linkages between any two consecutive years, the model has to
allocate public and private savings into each of the five sectors.

26.   Consider first the allocation of private savings. We assume
that the savings generated in the commercial farming and urban sectors
are re-invested in proportion to the proportions generated in each
sector. For example, if 15% of the savings of the Zambian bourgeoisie
is earned in commercial agriculture, 15% of new investment is made in
that sector. Similarly, the savings of traditional and emergent farmers
is invested entirely in those sectors.1/

27.   Investment in the mining sector is handled exogenously in
accordance with the production plan discussed above. Since capital
requirements are projected exogenously, and the ownership pattern is
fixed, both foreign and public investment in mining can be predetermined.
Any foreign profits above this amount are then repatriated.

28.   The final, and most interesting, issue is the allocation of
the rest of public savings between the urban and agricultural sectors,
and within agriculture itself. Public policy here is of crucial

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1/ We discuss below how demographic movements affect the allocation of
    capital between traditional and emergent farming.

importance in determining the sectoral pattern of development and future demographic shifts and income distribution. In the following sections, considerable attention is paid to alternative investment strategies, particularly within agriculture itself.

29.   Once public investment policy is decided, next year's sectoral capital stocks are known, as are their ownership patterns. These in turn are used in computing income levels and resource allocations in the future.

Migration and Demographic Shifts

30.   As we have seen, the sectoral distribution of the population plays a key role in determining the level and composition of output and demand, urban unemployment, etc. In particular, to solve DYZAM during any year, total urban and total rural labor forces and the number of emergent farmers must be known. For the initial year (1972) these are taken as data; for all later years, they are determined endogenously on the basis of demographic and economic behavior.

31.   The two most important population movements which the model simulates are growth in the ranks of emergent farmers and the steady migration of labor from agriculture to the urban areas. Both phenomena are explained and projected on economic rather than social or political grounds. The rural-urban migration rate, in any year, is taken as an increasing function of the ratio of expected urban to expected rural income, and of the urban employment rate for that year.1/ Together with the natural urban population growth rate, this determines total urban and total rural populations for the following year.

32.   At the same time that some traditional farmers are moving to cities, others are becoming emergent farmers through adoption of more modern techniques, planting a higher proportion of marketable crops, and gradual accumulation of capital and land. The yearly rate of this rural-rural migration (or more properly transformation) is dependent on the average income level of emergent farmers (at higher expected income, commercial farming becomes more attractive) and traditional farmers (at higher income, capital is accumulated more rapidly). Together with the overall growth rate of the agricultural labor force (computed using the rural-urban migration relations), the rate of rural-rural migration is used in DYZAM to calculate the number of emergent farmers in any year.

1/   This formulation is similar to that of M.T. Todaro, A Model of Labor Migration and Urban Unemployment in Less Developed Countries. American Economic Review. 1969.

Solution Procedure

33.   Given the behavioral and technical parameters of the model
and initial labor and capital configurations, DYZAM can be solved yearly
once government taxation and expenditure policies are specified. In
each year, the economy is represented by a set of simultaneous equations;
being small, the set is relatively easy to solve. The solution for any
one year provides the dynamic linkages (such as capital accumulation and
migration flows) which provide the next year's initial conditions. In
this sense, the model is recursive, solving each period separately and
moving from one year to the next sequentially.

34.   DYZAM has been programmed for use with a time-shared computer
system. This allows the user to quickly attempt a large number of
experiments in a very short time span at low cost.1/

III. The Basic Case and General Policy Experiments

35.   The Government influences the development process through its
taxation, pricing, and expenditure policies. Domestic relative prices
play a key role since they directly affect profit and investment rates
in the agricultural and urban sectors, the income levels of Zambian
farmers (and thereby rural-urban income distribution), sectoral output
levels, and the demand patterns (and hence the foreign trade pattern).
Since Zambia faces fixed international prices for all three goods,
producers' and consumers' prices are set in each year by the government's
indirect tax choices (tariffs and excise duties). World relative prices
are projected independently and specified before each DYZAM simulation.2/
In all experiments the world prices for agricultural and mining goods
are taken from historical data. Prices for later years must be assumed.

36.   For the basic case, we suppose that relative (in comparison
with urban goods) price of food will rise until 1980, and fall slowly
thereafter. It is of course difficult, if not impossible, to forecast
future mineral prices. Rather than attempt to guess at future fluctua-
tion patterns, a constant long-run price is specified for the basic
case; this price was chosen at a level equal to that in 1972.

37.   The major impact of Zambia's indirect taxation structure
(including implied subsidy rates) comes through the allocative effects
of changing domestic prices, rather than through changes in government
revenue levels. Thus, we suppose that indirect tax rates are chosen
with pricing, rather than revenue, objectives in mind. In the basic

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1/ Indeed, the cost of a 30-year simulation is less than US$ 0.75.

2/ Since we are ignoring the impact of general international infla-
    tion, only relative prices matter and one good must be chosen as a
    numeraire. In this model, the world price of the urban good is held
    constant while those for mining and agricultural goods vary.

case, it is supposed that the government attempts to hold domestic relative prices (for producers and consumers) of urban and agricultural goods constant. Since world prices are moving over time, this policy implies a constantly changing tariff and excise tax structure.1/ This policy seems to correlate rather well with recent practice in Zambia; the government has tried hard to insulate both farmers and consumers from the rise in the world relative price of food.

38.   On the expenditure side, the government must select current and capital budgets, as well as allocate investable resources among the five sectors.2/ For the basic case, we suppose that the government succeeds in holding growth in public consumption to 7% per year.3/ Within the investment budget, 5% of public savings (net of mining investment) is allocated to traditional and emergent agriculture, 4.5% to large-scale government farming, and the remainder to the urban sector. While the government earns returns from the latter two sectors (through para-statals), we assume that the small-scale Zambian farmers receive the imputed returns of government investment in their sectors.

39.   Direct taxation of profits and personal income is a key policy tool for affecting income distribution, both between individual classes and the private and public sector. In the basic case, the rate structure is held constant at 1974 levels. Zambian income taxes are already quite progressive and high. Unless the government opts for a major reorganization of ownership and income pattern in the modern sectors of the economy, it is not likely that they will be increased substantially. For this reason, the policy experiments discussed in this section do not focus on changes in rates of direct taxation.4/ In this section, we examine the numerical projections for the basic case and six alternate formulations. The experiments focus on general government policies (such as indirect tax rates and the division of government expenditure between consumption and investment) and several key exogenous parameters (such as world price projections and productivity changes). All runs of the model cover the years 1972 through 1992; value indexes are in 1972 prices.

1/ In the model, there are no tariffs or excise taxes on mining goods. Rather, profits are taxed directly for revenue purposes.

2/ Since we assume a predetermined plan for mining, the allocation problem is reduced to the urban and agricultural sectors.

3/ Government consumption is entirely in the form of urban goods. Public purchases of agricultural goods are treated as income and price subsidies to individual consumers.

4/ In practice, it would be simple to use DYZAM to simulate the impact of rate changes.

The Basic Case

40.　　　Results for the basic case are summarized in Table 18.1.　At the top of the table, public price and expenditure policies are specified. Part 1(a) contains projections of sector employment and the rate of urban employment.　In terms of employment, the most rapidly growing sector is emergent agriculture.　The labor force in traditional agriculture actually declines slowly due to rural-rural and rural-urban migration.　Although employment is growing at 4% a year in the urban sector, rural-urban migration leads to even more rapid growth in the total labor force, implying increasing urban unemployment.

41.　　　This process of demographic transformation is seen more clearly in 1(c) which presents the yearly migration rates.　Rural-urban migration declines even though the gap between urban and traditional farming income continues to grow (see 1(b)) because employment rates are falling in the urban sector.　After the employment rate peaks around 1984, migration rates begin to rise again.

42.　　　The transformation process of traditional becoming emergent farmers accelerates steadily since income levels for Zambian farmers are growing and the spread between traditional and emergent is widening. At first glance the rates of growth of income per worker in small-scale Zambian farming may look somewhat high, especially for traditional farming.　The major factors underlying these results, is an optimistic projection for efficiency improvements, 2.5% per year, and the small steady allocation (5%) of government investment.　If these projections are not attained, it is likely that the reduced income growth of sub-sistance farmers would lead to accelerated rural-urban migration, higher unemployment, and increased reliance on imported food.

43.　　　The implied demographic shifts are summarized in 1(d).　Here we project that the proportion of the population supported by traditional agriculture will fall from one-half to one-quarter by 1992, and the percentage supported by emergent farming will increase from one-eigth to one-quarter.

44.　　　The major national income accounts projections are summarized in Tables 1(e) and 1(f).　Both in terms of producers' and world prices, national income grows rapidly.　These projections are also optimistic regarding the required investment effort.　The average savings rate increases very slowly, allowing for a rise in consumption almost as rapid as for GNP.　Although growth in the urban sector is forecast 50% higher than in agriculture, the disparity is small in comparison to most countries.　This result, derived from behavioral and policy assumptions, seems to support the notion that Zambia has some comparative advantage in agriculture.

Table 18.1: THE BASIC CASE

GOVERNMENT INVESTMENT POLICY
(i) SHARES OF GOVERNMENT INVESTMENT
INVESTMENT IN URBAN SECTOR = .905
INVESTMENT IN COMMERCIAL AGRICULTURE = .045
INVESTMENT IN ZAMBIAN AGRICULTURE = .050

(ii) CONSTANT DOMESTIC RELATIVE PRICES

1(a) LABOR FORCE DISTRIBUTION
(IN THOUSANDS)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	630.000	599.381	586.321	576.525	557.890	525.353	-.90
2.	157.000	204.743	264.346	336.300	422.485	524.808	6.22
3.	20.000	26.145	30.585	35.558	41.588	49.205	4.60
4.	285.000	353.102	396.662	453.175	529.308	631.187	4.06
5.	316.667	413.287	494.168	573.384	662.079	763.277	4.50
6.	10.000	14.562	19.731	21.047	20.054	17.306	

ROW 1 REPRESENTS WORK FORCE IN TRADITIONAL AGRI
ROW 2 REPRESENTS WORK FORCE IN EMERGENT AGRI
ROW 3 REPRESENTS EMPLOYMENT IN COMMERCIAL AGRI
ROW 4 REPRESENTS URBAN SECTOR EMPLOYMENT
ROW 5 REPRESENTS TOTAL URBAN LABOR FORCE
ROW 6 REPRESENTS PERCENTAGE OF URBAN UNEMPLOYMENT

1(b) PRE-TAX PER WORKER INCOME LEVELS
(IN THOUSANDS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	.186	.205	.223	.241	.265	.296	2.52
2.	.300	.341	.382	.433	.499	.590	3.35
3.	.280	.321	.369	.423	.486	.557	3.50
4.	.900	1.033	1.135	1.360	1.561	1.791	3.50

ROW 1 REPRESENTS INCOME IN TRADITIONAL AGRI
ROW 2 REPRESENTS INCOME IN EMERGENT AGRI
ROW 3 REPRESENTS WAGES IN COMMERCIAL AGRI
ROW 4 REPRESENTS WAGES IN URBAN SECTOR

1(c) MIGRATION RATES
(PERCENTAGE OF LABOR FORCE IN TRADITIONAL AGRICULTURE)

	1972	1976	1980	1984	1988	1992	TYPE OF MIGRATION
1.	1.101	1.452	1.730	2.034	2.408	2.829	TO EMERG FARMS
2.	2.055	1.734	1.075	1.013	1.153	1.520	TO URBAN SECT

Alternative Indirect Tax Policies

45.   In the basic case, indirect taxes are continually adjusted, year-by-year, to maintain constant domestic relative prices for consumers as well as producers. Since agricultural prices have risen rapidly in recent years, this policy has implied higher explicit and implicit subsidies in order to maintain low food prices.   As long as the world relative price of agricultural products continues to rise (until 1980 in our examples), more and more potential government revenue will be diverted for subsidies, at the expense of investments in agriculture and the urban sectors and farmers' incomes. On the positive side, the constant price policy does tend to hold down nominal wages, which in the short-run, at least, is a stimulus to the urban sector. In addition, there may well be non-quantifiable benefits from maintaining relative price stability.

46.   To examine more closely the importance of indirect tax policy, two alternatives are reviewed here. Both consider policies which allow domestic prices to move together with world prices.

47.   Constant tariff and excise duties. First, consider the case of maintaining constant tariff and excise duties; here domestic relative prices change in proportion to changes in world relative prices. The results of this policy experiment are presented in Table 18.2. In comparing these projections with those for the basic case (Table 18.1), it is immediately obvious that the entire development pattern is much improved. There is more rapid growth in both agricultural and urban sectors; incomes of Zambian farmers improve most dramatically. The root of these improvements is not hard to trace.

Table 18.2: CONSTANT TARIFFS, TAXES AND SUBSIDY RATES

(1) GOVERNMENT INVESTMENT POLICY
SHARES OF GOVERNMENT INVESTMENT
INVESTMENT IN URBAN SECTOR = .905
INVESTMENT IN COMMERCIAL AGRICULTURE = .045
INVESTMENT IN ZAMBIAN AGRICULTURE = .050

2(a) LABOR FORCE DISTRIBUTION
(IN THOUSANDS)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	630.000	592.884	562.835	529.454	479.058	399.869	-2.25
2.	157.000	207.950	280.287	364.950	460.265	566.781	6.63
3.	20.000	30.908	39.336	44.397	50.247	57.459	5.42
4.	285.000	357.061	419.763	505.331	621.013	777.678	5.15
5.	316.667	411.316	492.560	593.576	694.446	833.535	4.99
6.	10.000	13.296	14.952	13.408	10.574	7.257	

ROW 1 REPRESENTS WORK FORCE IN TRADITIONAL AGRI
ROW 2 REPRESENTS WORK FORCE IN EMERGENT AGRI
ROW 3 REPRESENTS EMPLOYMENT IN COMMERCIAL AGRI
ROW 4 REPRESENTS URBAN SECTOR EMPLOYMENT
ROW 5 REPRESENTS TOTAL URBAN LABOR FORCE
ROW 6 REPRESENTS PERCENTAGE OF URBAN UNEMPLOYMENT

2(b) PRE-TAX PER WORKER INCOME LEVELS
(IN THOUSANDS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	.180	.232	.265	.279	.307	.346	3.22
2.	.300	.397	.462	.509	.565	.633	2.81
3.	.290	.321	.369	.427	.486	.557	2.50
4.	.900	1.032	1.185	1.360	1.561	1.791	3.50

ROW 1 REPRESENTS INCOME IN TRADITIONAL AGRI
ROW 2 REPRESENTS INCOME IN EMERGENT AGRI
ROW 3 REPRESENTS WAGES IN COMMERCIAL AGRI
ROW 4 REPRESENTS WAGES IN URBAN SECTOR

2(c) MIGRATION RATES
(PERCENTAGE OF LABOR FORCE IN TRADITIONAL AGRICULTURE)

	1972	1976	1980	1984	1988	1992	TYPE OF MIGRATION
1.	1.101	1.344	2.347	2.582	2.927	3.546	TO EMERG FARMS
2.	2.055	1.725	1.406	1.870	2.936	5.305	TO URBAN SECT

Table 18.2 (cont'd.)

2(d) DISTRIBUTION OF POPULATION
(IN THOUSANDS AND AS PERCENT OF TOTAL)

1.	2250.000	2117.442	2010.126	1890.906	1711.028	1423.102	-2.25
2.	560.714	742.677	1001.024	1302.392	1642.805	2024.217	6.63
3.	1288.462	1573.124	1822.083	2159.289	2612.639	3222.942	4.69
4.	.503	.433	.372	.317	.260	.197	-4.63
5.	.126	.152	.185	.219	.250	.279	4.03
6.	.291	.321	.337	.362	.397	.444	2.14

ROWS 1 AND 4 REPRESENT POP IN TRAD AGRI
ROWS 2 AND 5 REPRESENT POP IN EMERG AGR
ROWS 3 AND 6 REPRESENT POP IN URBAN SECTORS

2(e) NATIONAL OUTPUT AND ITS COMPOSITION
(IN MILLIONS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	184.500	231.478	293.375	378.974	495.007	654.541	6.54
2.	755.501	1036.161	1465.269	2024.184	2854.543	4102.012	5.63
3.	425.000	516.530	627.919	763.233	927.722	1127.652	5.00
4.	1216.251	1682.475	2214.129	2934.133	3966.263	5469.491	7.31
5.	1365.460	1836.670	2376.802	3083.166	4070.296	5471.481	7.19

ROW 1 REPRESENTS AGRICULTURAL GOODS
ROW 2 REPRESENTS URBAN GOODS
ROW 3 REPRESENTS MINING GOODS
ROW 4 REPRESENTS GNP AT DOMESTIC PRODUCERS PRICES
ROW 5 REPRESENTS GNP AT WORLD MARKET PRICES

2(f) DISPOSITION OF NATIONAL PRODUCT
(AT MARKET PRICES. IN MILLIONS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	564.406	749.363	935.857	1218.237	1593.076	2135.236	6.88
2.	271.666	356.098	466.778	611.543	802.902	1051.261	7.00
3.	271.457	415.873	577.714	813.476	1164.521	1697.006	9.60
4.	25.907	30.267	35.516	41.733	49.401	58.624	4.17
5.	188.602	226.040	263.292	306.963	363.949	438.670	4.31

ROW 1 REPRESENTS PRIVATE CONSUMPTION
ROW 2 REPRESENTS PUBLIC CONSUMPTION
ROW 3 REPRESENTS GROSS CAPITAL FORMATION
ROW 4 REPRESENTS FOREIGN REMITTANCES
ROW 5 REPRESENTS TOTAL PER CAPITA CONSUMPTION

Since taxes and subsidies are held constant, required food subsidies are substantially reduced; since public consumption is growing at an exogenous rate, all the additional government revenue is available for investment. This in turn is translated into more rapid growth across the economy. Since under this policy, agricultural prices are allowed to rise in step with the world market, Zambian farmers can earn higher income, helping to reduce rural-urban income inequality and providing even more investable resources for growth in agricultural production.

48. Tariff reduction. In the second experiment, a policy of gradual tariff reduction (at 5% per year) is followed. All of the previous results and reasoning continues to hold, but in an even more accentuated form. Unemployment rates drop steadily during the twenty year period, since there is sufficient investment funds to build industrial capacity at a rapid rate. Indeed, the projections summarized in Table 18.3 indicate that growth in urban employment outstrips rural-urban migration, and under this policy it might be necessary to redirect more of total savings to agriculture to reduce demand for urban labor or to raise urban wages to increase migration to the urban sector (and to further reduce labor demands).

Alternative Government Expenditure Policies

49. We have already noticed that the development pattern is greatly affected by indirect tax policy, partly through induced changes in government revenue and investment expenditures. So far, we have been treating public consumption as fixed, growing at 7% per annum. This is a rather optimistic assumption, which implies considerable political will in reducing the average growth rate of current expenditures by the government, as well as a public marginal savings propensity of unity (during any given year). To test the sensitivity of the results to these assumptions regarding the division of public expenditure between savings and consumption, we have experimented with two types of alternative policies. In the first, the growth rate of public consumption is set at 21% above the basic case level, at 8.5% per year. In the second, increases in net government revenue (above the base year level) are divided equally between public savings and consumption.

50. Increased public consumption. The implications of higher rates of growth for public consumption are presented in Table 18.4. It is not surprising that the economy grows at a significantly slower rate. Note, however, that output in the urban sector changes much more than in the agricultural sectors. This is because public savings represent a much higher share of total investment in that sector than in agriculture.

Table 18.3: GRADUAL REDUCTION IN TARIFFS

GOVERNMENT INVESTMENT POLICY
SHARES OF GOVERNMENT INVESTMENT
INVESTMENT IN URBAN SECTOR = .905
INVESTMENT IN COMMERCIAL AGRICULTURE = .045
INVESTMENT IN ZAMBIAN AGRICULTURE = .050

3(a) LABOR FORCE DISTRIBUTION
(IN THOUSANDS)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	630.000	589.891	550.326	498.571	405.042	240.872	-4.69
2.	157.000	208.889	285.282	377.249	482.531	599.305	6.93
3.	20.000	33.945	47.420	58.701	73.046	92.325	7.95
4.	285.000	358.819	429.726	533.981	686.151	909.648	5.98
5.	316.667	410.833	492.492	587.846	723.420	930.141	5.54
6.	10.000	12.661	12.745	9.163	5.152	2.182	

ROW 1 REPRESENTS WORK FORCE IN TRADITIONAL AGRI
ROW 2 REPRESENTS WORK FORCE IN EMERGENT AGRI
ROW 3 REPRESENTS EMPLOYMENT IN COMMERCIAL AGRI
ROW 4 REPRESENTS URBAN SECTOR EMPLOYMENT
ROW 5 REPRESENTS TOTAL URBAN LABOR FORCE
ROW 6 REPRESENTS PERCENTAGE OF URBAN UNEMPLOYMENT

3(b) PRE-TAX PER WORKER INCOME LEVELS
(IN THOUSANDS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	.180	.240	.286	.318	.379	.552	5.76
2.	.309	.401	.501	.582	.686	.825	5.19
3.	.280	.310	.345	.396	.437	.488	2.81
4.	.900	.996	1.109	1.239	1.391	1.568	2.81

ROW 1 REPRESENTS INCOME IN TRADITIONAL AGRI
ROW 2 REPRESENTS INCOME IN EMERGENT AGRI
ROW 3 REPRESENTS WAGES IN COMMERCIAL AGRI
ROW 4 REPRESENTS WAGES IN URBAN SECTOR

3(c) MIGRATION RATES
(PERCENTAGE OF LABOR FORCE IN TRADITIONAL AGRICULTURE)

	1972	1976	1980	1984	1988	1992	TYPE OF MIGRATION
1.	1.101	1.966	2.654	3.133	4.004	6.340	TO EMERG FARMS
2.	2.055	1.706	1.534	2.668	6.184	17.430	TO URBAN SECT

Table 18.4: PUBLIC CONSUMPTION GROWING AT 8.5%
(21% ABOVE THE BASIC CASE)

GOVERNMENT INVESTMENT POLICY
(i) SHARES OF GOVERNMENT INVESTMENT
INVESTMENT IN URBAN SECTOR = .905
INVESTMENT IN COMMERCIAL AGRICULTURE = .045
INVESTMENT IN ZAMBIAN AGRICULTURE = .050

(ii) CONSTANT DOMESTIC RELATIVE PRICES

4(a) LABOR FORCE DISTRIBUTION
(IN THOUSANDS)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	630.000	600.689	593.967	596.732	604.099	618.225	-.09
2.	157.000	204.717	263.988	334.114	415.755	508.343	6.05
3.	20.000	25.923	29.223	31.338	31.410	27.637	1.63
4.	285.000	349.430	374.740	386.281	369.857	296.386	.20
5.	316.667	412.230	438.343	560.183	632.779	708.437	4.11
6.	10.000	15.234	23.357	31.044	41.550	58.163	

ROW 1 REPRESENTS WORK FORCE IN TRADITIONAL AGRI
ROW 2 REPRESENTS WORK FORCE IN EMERGENT AGRI
ROW 3 REPRESENTS EMPLOYMENT IN COMMERCIAL AGRI
ROW 4 REPRESENTS URBAN SECTOR EMPLOYMENT
ROW 5 REPRESENTS TOTAL URBAN LABOR FORCE
ROW 6 REPRESENTS PERCENTAGE OF URBAN UNEMPLOYMENT

4(b) PRE-TAX PER WORKER INCOME LEVELS
(IN THOUSANDS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	.180	.204	.218	.227	.231	.224	1.11
2.	.300	.340	.377	.415	.452	.477	2.35
3.	.280	.321	.369	.423	.486	.557	3.50
4.	.900	1.033	1.185	1.360	1.561	1.791	3.50

ROW 1 REPRESENTS INCOME IN TRADITIONAL AGRI
ROW 2 REPRESENTS INCOME IN EMERGENT AGRI
ROW 3 REPRESENTS WAGES IN COMMERCIAL AGRI
ROW 4 REPRESENTS WAGES IN URBAN SECTOR

4(c) MIGRATION RATES
(PERCENTAGE OF LABOR FORCE IN TRADITIONAL AGRICULTURE)

	1972	1976	1980	1984	1988	1992	TYPE OF MIGRATION
1.	1.101	1.441	1.667	1.941	1.949	1.934	TO EMERG FARMS
2.	2.055	1.612	.308	.514	.308	.145	TO URBAN SECT

Table 18.4(cont'd.)

4(d) DISTRIBUTION OF POPULATION
      (IN THOUSANDS AND AS PERCENT OF TOTAL)

1.	2250.000	2145.316	2121.309	2131.187	2157.493	2207.947	-.09
2.	560.714	731.131	942.456	1193.264	1484.940	1815.528	6.05
3.	1288.462	1543.771	1648.916	1701.405	1646.654	1372.818	.02
4.	.508	.438	.393	.357	.328	.304	-2.53
5.	.126	.149	.174	.200	.226	.250	3.46
6.	.291	.315	.305	.285	.250	.189	-2.13

ROWS 1 AND 4 REPRESENT POP IN TRAD AGRI
ROWS 2 AND 5 REPRESENT POP IN EMERG AGR
ROWS 3 AND 6 REPRESENT POP IN URBAN SECTORS

4(e) NATIONAL OUTPUT AND ITS COMPOSITION
      (IN MILLIONS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	184.500	227.684	274.898	330.934	392.442	447.707	4.53
2.	755.501	1062.945	1308.106	1547.313	1700.081	1563.345	3.70
3.	425.000	516.590	627.919	763.239	927.722	1127.652	5.00
4.	1216.251	1626.413	1991.141	2374.350	2695.542	2743.626	4.15
5.	1365.460	1813.074	2225.045	2639.952	3022.577	3204.206	4.36

ROW 1 REPRESENTS AGRICULTURAL GOODS
ROW 2 REPRESENTS URBAN GOODS
ROW 3 REPRESENTS MINING GOODS
ROW 4 REPRESENTS GNP AT DOMESTIC PRODUCERS PRICES
ROW 5 REPRESENTS GNP AT WORLD MARKET PRICES

4(f) DISPOSITION OF NATIONAL PRODUCT
      (AT MARKET PRICES, IN MILLIONS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	564.406	714.296	850.744	996.881	1124.684	1159.405	3.67
2.	271.666	376.490	521.766	723.089	1012.099	1338.742	5.50
3.	271.457	359.428	401.982	431.677	239.149	17.306	-12.73
4.	25.907	30.178	35.362	41.655	49.295	58.573	4.16
5.	188.602	222.919	254.112	288.494	323.179	350.795	3.15

ROW 1 REPRESENTS PRIVATE CONSUMPTION
ROW 2 REPRESENTS PUBLIC CONSUMPTION
ROW 3 REPRESENTS GROSS CAPITAL FORMATION
ROW 4 REPRESENTS FOREIGN REMITTANCES
ROW 5 REPRESENTS TOTAL PER CAPITA CONSUMPTION

51.   The effects on income distribution and employment are striking. Since public investment funds are shrinking, while depreciation expenses are rising, net investment in the urban sector steadily falls, perhaps turning negative by 1980. Since wages and productivity are rising (at identical rates) in the urban sector, employment here peaks around 1984. Thereafter, urban employment rises very rapidly, since rural-urban migration rates react rather slowly. They do fall, however, slowing the transformation of the rural sector from traditional to emergent farming. This, in turn, works to reduce farm income levels (as compared with the basic case), making the income distribution that much worse.

52.   Finally, the whole process is accelerative. Reduced income of Zambian farmers reduces investment and hence future income, and so on. Similar phenomena hold for revenue and expenditures of the government. While more public consumption now implies higher aggregate consumption for the medium-run, this policy means less total consumption per capita after 1984; growth in private consumption per capita even turns negative.

53.   Increased public savings. In Table 18.5 we show projections for a more flexible policy, viz., a fixed 50% public marginal savings propensity.1/ In the near term, this policy would lead to lower consumption and higher public savings. Since more investment is taking place, the economy grows more rapidly (in a pattern opposite that described above), leading to higher future government revenue and, hence, consumption also. Note also that the entire development pattern is somewhat smoother than in the basic case, since investment levels do not absorb the entire impact of fluctuations in government revenue trends (brought on largely through changes in world relative prices).

Experiments with Exogenous Parameters

54.   The above experiments have dealt with the impact of changes in government economic policies. But these are not the only important parameter determining the development pattern. A model such as DYZAM has hundreds of exogenous parameters ranging from world relative prices to coefficients of the expenditure equations, to ownership patterns of physical capital, to technical parameters of the production function. These too can be very important, as seen in the results of the two experiments discussed below.

1/ The reader is again reminded that government revenue and expenditure is defined net of all implicit and explicit transfers associated with indirect taxation.

Table 18.5: PUBLIC MARGINAL PROPENSITY TO SAVE AT 50%

GOVERNMENT INVESTMENT POLICY

SHARES OF GOVERNMENT INVESTMENT
INVESTMENT IN URBAN SECTOR = .905
INVESTMENT IN COMMERCIAL AGRICULTURE = .045
INVESTMENT IN ZAMBIAN AGRICULTURE = .050

CONSTANT DOMESTIC RELATIVE PRICES
MPS = .5

5(a) LABOR FORCE DISTRIBUTION
(IN THOUSANDS)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	630.000	603.780	584.175	561.717	528.637	482.056	-1.33
2.	157.000	204.625	264.474	337.537	425.597	529.879	6.27
3.	20.000	26.050	31.632	37.793	44.820	52.957	4.99
4.	285.000	351.688	413.799	488.341	578.487	686.152	4.49
5.	316.667	409.102	495.779	585.320	684.989	797.750	4.73
6.	10.000	14.034	16.536	16.568	15.548	13.999	

ROW 1 REPRESENTS WORK FORCE IN TRADITIONAL AGRI
ROW 2 REPRESENTS WORK FORCE IN EMERGENT AGRI
ROW 3 REPRESENTS EMPLOYMENT IN COMMERCIAL AGRI
ROW 4 REPRESENTS URBAN SECTOR EMPLOYMENT
ROW 5 REPRESENTS TOTAL URBAN LABOR FORCE
ROW 6 REPRESENTS PERCENTAGE OF URBAN UNEMPLOYMENT

5(b) PRE-TAX PER WORKER INCOME LEVELS
(IN THOUSANDS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	.180	.202	.226	.251	.282	.321	2.93
2.	.300	.340	.386	.442	.512	.600	3.53
3.	.280	.321	.369	.423	.486	.557	3.50
4.	.900	1.033	1.185	1.360	1.561	1.791	3.50

ROW 1 REPRESENTS INCOME IN TRADITIONAL AGRI
ROW 2 REPRESENTS INCOME IN EMERGENT AGRI
ROW 3 REPRESENTS WAGES IN COMMERCIAL AGRI
ROW 4 REPRESENTS WAGES IN URBAN SECTOR

5(c) MIGRATION RATES
(PERCENTAGE OF LABOR FORCE IN TRADITIONAL AGRICULTURE)

	1972	1976	1980	1984	1988	1992	TYPE OF MIGRATION
1.	1.101	1.437	1.772	2.157	2.625	3.202	TO EMERG FARMS
2.	2.055	1.863	1.449	1.483	1.675	1.992	TO URBAN SECT

55.   Reduced Copper Prices. Since the agricultural and urban
goods are so highly aggregated, perhaps it is not unreasonable to have
some confidence in projections of movements of their relative prices
in the world market. Unfortunately, world metal markets are notoriously
unstable and it is impossible to forecast with any accuracy prices
(even in relative terms) for a twenty-year period. This is a serious
limitation of the long-term simulation model, since Zambia is so
heavily dependent on revenues from exporting copper. However, no matter
how unstable the world price of copper, any long-term planning (even
if no formal model is used) requires that some projections be made.
To avoid serious problems of bad "guestimating", simulations with
DYZAM should be made using a number of different price forecasts.

56.   The results of one such experiment are shown in Table 18.6.
In this case the long-term relative price of copper is projected to be
15% below that which prevailed in 1972. All other policies and para-
meters are the same as in the basic case.1/ Since output plans for the
sector are not revised, copper earnings are reduced. This erodes both
government revenue and the profits accruing to foreigners. Once again,
the major impact falls on investment in the urban sector. Output and
employment rise more slowly, and the rate of unemployment rises
rapidly. These effects then feed back into agriculture, reducing output
and average income and slowing the internal transformation process.2/

57.   Reduced Urban Profits. As a second example of the importance
of exogenous parameters, consider our projections for technology. In
deriving the production functions for the urban sector, the profit
rate, gross of depreciation and direct taxation, was estimated to remain
stable at 22% per year.3/ This may be too optimistic for Zambia.
Urban investment in recent years has not achieved this profit level;
in the future, the government (or private sector) may not be sufficiently
judicious in its choice of projects in the urban sector to maintain
the average profit rate.

1/ In the basic case, the long-run copper price was taken to be the
   same, relative to urban goods, as in 1972.

2/ These projections closely resemble those in Table 18.3 which
   represent the case of increased public consumption. However, here
   there is no compensating increase in total per capita consumption.
   Rather, there is a transfer of real income from Zambia to the rest
   of the world.

3/ Using a Cobb-Douglas production function, the profit rate will be
   constant if labor productivity and the real wage grow at identical
   rates.

Table 18.6(cont'd.)

6(d) DISTRIBUTION OF POPULATION
(IN THOUSANDS AND AS PERCENT OF TOTAL)

1.	2250.000	2140.648	2123.863	2148.490	2182.878	2226.349	-.05
2.	560.714	731.225	942.226	1190.380	1472.460	1803.347	5.03
3.	1288.462	1557.897	1604.618	1626.751	1603.574	1483.592	.71
4.	.508	.437	.393	.360	.332	.306	-2.49
5.	.126	.149	.174	.200	.225	.249	3.44
6.	.291	.318	.297	.273	.244	.204	-1.75

ROWS 1 AND 4 REPRESENT POP IN TRAD AGRI
ROWS 2 AND 5 REPRESENT POP IN EMERG AGR
ROWS 3 AND 6 REPRESENT POP IN URBAN SECTORS

6(e) NATIONAL OUTPUT AND ITS COMPOSITION
(IN MILLIONS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	184.500	228.378	272.188	325.348	387.815	456.153	4.65
2.	755.501	1074.117	1267.301	1463.560	1648.594	1715.263	4.18
3.	425.000	516.590	627.919	763.239	927.722	1127.652	5.00
4.	1216.251	1560.790	1854.049	2178.527	2500.272	2735.248	4.14
5.	1365.460	1745.442	2095.012	2456.089	2836.630	3166.661	4.30

ROW 1 REPRESENTS AGRICULTURAL GOODS
ROW 2 REPRESENTS URBAN GOODS
ROW 3 REPRESENTS MINING GOODS
ROW 4 REPRESENTS GNP AT DOMESTIC PRODUCERS PRICES
ROW 5 REPRESENTS GNP AT WORLD MARKET PRICES

6(f) DISPOSITION OF NATIONAL PRODUCT
(AT MARKET PRICES IN MILLIONS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	564.406	718.500	835.413	967.032	1104.265	1216.265	3.91
2.	271.666	356.038	466.772	611.843	802.002	1051.261	7.00
3.	271.457	326.907	365.752	406.629	406.768	308.795	.61
4.	25.907	11.193	12.296	13.606	15.202	17.172	-2.05
5.	189.602	219.210	241.094	264.828	288.670	312.160	2.55

ROW 1 REPRESENTS PRIVATE CONSUMPTION
ROW 2 REPRESENTS PUBLIC CONSUMPTION
ROW 3 REPRESENTS GROSS CAPITAL FORMATION
ROW 4 REPRESENTS FOREIGN REMITTANCES
ROW 5 REPRESENTS TOTAL PER CAPITA CONSUMPTION

58.   In order to test these notions, we have re-run the basic case
under the assumption that the average gross profit rate will be only
18% in the urban sector. The projections for this experiment are given
in Table 18.7. Not surprisingly, growth in the urban sector falls
drastically. Since profits are lower, government revenues is reduced,
leading to less investment in the agricultural sectors as well. In
this case, urban employment grows so gradually (given modest rates of
technical progress), that even though rural-urban migration rates
are very low, unemployment rates increase rapidly. As with the other
"pessimistic" case, slower migration retards growth in farmers' income
and agricultural output.

IV. Alternative Policies for Agriculture

59.   So far, we have reported on experiments of a general nature
which illustrate how DYZAM can be used as a tool for investigating
economy-wide and macroeconomic issues. However, the model was also
designed to pay special attention to development in the agriculture
sectors. In this section, the focus is shifted to more microeconomic
policies aimed specifically at agriculture.

60.   In designing the policies, two main objectives are considered--
rapid growth in total food production, as well as in income levels
among the two classes of Zambian farmers (traditional and emergent).
As will be seen, the two goals are not always complementary. In
addition, in order to evaluate any policy for the rural sector, it is
essential to have some notion of the costs involved elsewhere in the
economy. Since partial equilibrium (or informal) methods may be
acceptable for estimating the current impact of policy changes, the
real value of a model such as DYZAM lies in its abilities to reasonably
simulate medium-and long-term interrelationships.

61.   To illustrate how the model works for these purposes, four
alternatives to the basic case economic policies are presented. In
summary form, these are:
    (a)   increased public investment in small-scale Zambian
          farming;
    (b)   increased public investment in commercial farming;
    (c)   direct price subsidies to small-scale Zambian farmers; and
    (d)   concentrated investment in small-scale farming.

62.   Increased Investment in Small-scale Farming. This policy
has both income distribution and production objectives. The poorest
people in the economy are small-scale Zambian farmers, traditional
farmers in particular. The notion behind this policy is that if these
farmers are allocated an increased share of public investment, there

Table 18.7: URBAN PROFIT RATE REDUCED FROM 22% TO 18%

GOVERNMENT INVESTMENT POLICY
        SHARES OF GOVERNMENT INVESTMENT
                INVESTMENT IN URBAN SECTOR = .905
                INVESTMENT IN COMMERCIAL AGRICULTURE = .045
                INVESTMENT IN ZAMBIAN AGRICULTURE = .050

        CONSTANT DOMESTIC RELATIVE PRICES

6(a) LABOR FORCE DISTRIBUTION
(IN THOUSANDS)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	630.000	608.013	605.162	608.023	609.468	605.453	-.17
2.	157.000	204.704	263.892	334.657	412.360	516.283	6.13
3.	20.000	25.938	29.550	32.866	35.931	38.521	3.33
4.	285.000	337.023	359.593	383.539	409.276	428.721	2.06
5.	316.667	404.903	477.227	546.825	620.283	699.379	4.04
6.	10.000	16.765	24.662	29.861	34.179	38.700	

                ROW 1 REPRESENTS WORK FORCE IN TRADITIONAL AGRI
                ROW 2 REPRESENTS WORK FORCE IN EMERGENT AGRI
                ROW 3 REPRESENTS EMPLOYMENT IN COMMERCIAL AGRI
                ROW 4 REPRESENTS URBAN SECTOR EMPLOYMENT
                ROW 5 REPRESENTS TOTAL URBAN LABOR FORCE
                ROW 6 REPRESENTS PERCENTAGE OF URBAN UNEMPLOYMENT

6(b) PRE-TAX PER WORKER INCOME LEVELS
(IN THOUSANDS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	.180	.202	.216	.228	.239	.250	1.66
2.	.300	.340	.377	.420	.470	.526	2.94
3.	.280	.321	.369	.423	.486	.557	3.50
4.	.900	1.033	1.185	1.360	1.561	1.791	3.50

                ROW 1 REPRESENTS INCOME IN TRADITIONAL AGRI
                ROW 2 REPRESENTS INCOME IN EMERGENT AGRI
                ROW 3 REPRESENTS WAGES IN COMMERCIAL AGRI
                ROW 4 REPRESENTS WAGES IN URBAN SECTOR

6(c) MIGRATION RATES
(PERCENTAGE OF LABOR FORCE IN TRADITIONAL AGRICULTURE)

	1972	1976	1980	1984	1988	1992	TYPE OF MIGRATION
1.	1.101	1.422	1.645	1.857	2.075	2.299	TO EMERG FARMS
2.	2.055	1.379	.737	.554	.460	.385	TO URBAN SECT

Table 18.7(cont'd.)

6(d) DISTRIBUTION OF POPULATION
(IN THOUSANDS AND AS PERCENT OF TOTAL)

1.	2250.000	2171.475	2162.007	2171.512	2176.670	2173.047	-.17
2.	560.714	731.085	942.437	1195.190	1494.141	1843.890	6.13
3.	1288.461	1496.052	1590.427	1680.359	1774.417	1881.796	1.91
4.	.508	.444	.400	.364	.331	.293	-2.61
5.	.126	.149	.174	.200	.227	.254	3.54
6.	.291	.306	.294	.284	.277	.259	-.57

ROWS 1 AND 4 REPRESENT POP IN TRAD AGRI
ROWS 2 AND 5 REPRESENT POP IN EMERG AGR
ROWS 3 AND 6 REPRESENT POP IN URBAN SECTORS

6(e) NATIONAL OUTPUT AND ITS COMPOSITION
IN MILLIONS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	184.500	228.083	276.751	338.543	417.012	515.291	5.27
2.	755.500	1025.204	1255.022	1526.327	1876.675	2261.368	5.63
3.	425.000	516.596	627.919	763.239	927.722	1127.652	5.00
4.	1216.250	1589.071	1939.300	2370.975	2896.706	3509.732	5.44
5.	1365.453	1783.410	2185.118	2640.940	3193.543	3840.270	5.31

ROW 1 REPRESENTS AGRICULTURAL GOODS
ROW 2 REPRESENTS URBAN GOODS
ROW 3 REPRESENTS MINING GOODS
ROW 4 REPRESENTS GNP AT DOMESTIC PRODUCERS PRICES
ROW 5 REPRESENTS GNP AT WORLD MARKET PRICES

6(f) DISPOSITION OF NATIONAL PRODUCT
(AT MARKET PRICES, IN MILLIONS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	564.405	701.422	833.304	997.031	1198.973	1437.928	4.79
2.	271.666	356.099	466.772	611.543	802.001	1051.260	7.00
3.	271.457	362.965	434.307	572.002	638.735	734.544	5.10
4.	25.907	30.090	35.185	41.390	49.942	58.132	4.12
5.	193.602	216.120	240.702	269.268	304.063	342.675	3.40

ROW 1 REPRESENTS PRIVATE CONSUMPTION
ROW 2 REPRESENTS PUBLIC CONSUMPTION
ROW 3 REPRESENTS GROSS CAPITAL FORMATION
ROW 4 REPRESENTS FOREIGN REMITTANCES
ROW 5 REPRESENTS TOTAL PER CAPITA CONSUMPTION

will be gains in food production (through increases in the capital intensity of their technology) as well as significant increases in income per farmer (partially through an increased rate of transformation of traditional into emergent farmers). The direct impact of the policy change is absorbed by reductions in the share of public investment going to the urban sector.

63.   The effects of such a policy are seen in Table 18.8. Here Zambian agriculture's share, 9.5%, is contrasted with 5% in the basic case. This policy does indeed stimulate total agricultural production, its average growth rate going to 6.82% from 5.8%, representing an increase of 16%. Since investment is directly diverted from the urban sector, it is not surprising that the growth rate there falls 9%. On balance, the growth rate of GNP (at world market prices) drops. It is useful to remember that more investment in small-scale farming means less government profit revenue and less future investment; this indirect dynamic effect reinforces the impact of the near-term reallocation of investment.

64.   The policy also has a significant effect on the dynamics of income distribution. There is much more rapid growth in income per farmer in small-scale agriculture; for traditional farming, the rate increases by one-third to over 3% per year. The rate of rural transformation is more rapid, implying further improvements in income distribution. On the other hand, there is less migration projected to urban areas since unemployment rates are higher and farmers are relatively better off in this experiment. Most of the poor gain in comparison with the basic case, but other poor, the urban unemployed in particular, lose.[1]/

65.   Increased Investment in Commercial Farming. In this simulation the share of public investment going to commercial farming is increased by 4.5%. The rationale for this policy is two-fold. In the first place, it may be economically or politically more efficient to concentrate public expenditures in large-scale farms.[2]/ Increased investment there would not only promote output in the short-run, but also would provide more public revenue in the future, since the government would retain a profit interest in State owned farms, and exacts a high marginal tax on private farms; this is opposite to the policy of investing in small farmers (policy (a)). Second, commercial farm workers are relatively well paid and this policy would provide more employment.

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[1]/ We cannot evaluate this policy immediately, since there are large groups of losers and gainers, including important intergenerational transfers.

[2]/ To take account of the very diffuse nature of accross-the-board public investment in small-scale agriculture, on arbitrary efficiency differential of 50% is imposed between it and investment in commercial farming.

Table 18.8 (cont'd.)

8(d) DISTRIBUTION OF POPULATION
(IN THOUSANDS AND AS PERCENT OF TOTAL)

1.	2250.000	2154.314	2103.962	2060.131	1979.431	1857.983	-.85
2.	560.714	738.228	975.579	1272.252	1634.253	2066.073	6.74
3.	1288.462	1528.353	1671.962	1851.742	2080.915	2364.785	3.08
4.	.509	.440	.390	.346	.301	.256	-3.37
5.	.126	.151	.191	.213	.248	.284	4.13
6.	.291	.312	.310	.311	.316	.326	.57

```
ROWS 1 AND 4 REPRESENT POP IN TRAD AGRI
ROWS 2 AND 5 REPRESENT POP IN EMERG AGR
ROWS 3 AND 6 REPRESENT POP IN URBAN SECTORS
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8(e) NATIONAL OUTPUT AND ITS COMPOSITION
(IN MILLIONS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	184.500	243.113	310.130	400.071	522.511	680.018	6.32
2.	755.501	1050.751	1329.022	1703.882	2219.072	2923.748	7.00
3.	425.000	516.530	627.919	763.239	927.722	1127.652	5.00
4.	1216.251	1629.646	2047.299	2600.058	3344.608	4346.739	6.58
5.	1365.460	1823.747	2289.632	2854.030	3595.211	4569.329	6.20

```
ROW 1 REPRESENTS AGRICULTURAL GOODS
ROW 2 REPRESENTS URBAN GOODS
ROW 3 REPRESENTS MINING GOODS
ROW 4 REPRESENTS GNP AT DOMESTIC PRODUCERS PRICES
ROW 5 REPRESENTS GNP AT WORLD MARKET PRICES
```

8(f) DISPOSITION OF NATIONAL PRODUCT
(AT MARKET PRICES, IN MILLIONS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	564.406	723.392	988.200	1107.161	1403.857	1804.933	5.98
2.	271.666	356.093	466.772	611.843	802.002	1051.261	7.00
3.	271.457	379.951	481.438	635.745	843.704	1124.632	7.37
4.	25.907	30.173	35.322	41.655	49.295	58.573	4.16
5.	188.602	220.712	250.966	288.332	325.165	392.199	3.74

```
ROW 1 REPRESENTS PRIVATE CONSUMPTION
ROW 2 REPRESENTS PUBLIC CONSUMPTION
ROW 3 REPRESENTS GROSS CAPITAL FORMATION
ROW 4 REPRESENTS FOREIGN REMITTANCES
ROW 5 REPRESENTS TOTAL PER CAPITA CONSUMPTION
```

66.   In terms of total food production, this policy (b) is nearly
as successful as policy (a) (the projections are summarized in Table
18.9). However, it is much more favorable in its implications for the
urban sector. Indeed, even though the share of public savings devoted
to urban investment declines, the average long-term growth rate remains
practically identical to the basic case. This means that more total
government revenue is generated by the shift of savings to commercial
farming, implying that at the margin agriculture is more profitable
(in its capital returns) than the urban sector. Since no sectors lose
(in output terms), clearly GNP grows more rapidly than with policy (a)
or the basic case.

67.   Income distribution gains are less obvious. Income levels
for Zambian farmers are projected at about the same level as in the
basic case and much below those implied by policy (a). However, employ-
ment is almost doubled in commercial agriculture, reducing the number
of low income subsistance farmers. In terms of demographic transform-
ations, policy (b) is very similar in its implications to the basic
case. Since income distribution is about the same, while GNP grows
more rapidly, policy (b) is definitely better than the basic case, no
matter what criteria are used to evaluate development patterns.

68.   Price Subsidies to Small-scale Farmers. As we saw in Section
III, pricing policies have important sectoral effects. The government
may be unwilling to raise agricultural producers' prices since much of
the gains would accrue to commercial farmers, many of whom are non-
Zambian. There also may be strong reasons to maintain low consumer
prices. In these situations, policy (c) emerges as a possibility.
With this policy the government provides a subsidy to the producers'
price received by small-scale Zambian farmers on their marketed sales.1/
The objectives of the subsidy are to improve income distribution and
stimulate food production.

69.   As it turns out, total agricultural production is unchanged
from the basic case, and somewhat lower than with policies (a) and (b).
Table 18.10 presents the results for policy (c). While not shown in
the table, this policy does imply a major shift in the composition of
agriculture in the long-term, with commercial farming declining and
emergent farming increasing in importance. In terms of production in
the urban sector, policy (c) has a greater impact than the other
policies; the implied growth rate of the sector falls by more than 1%
per year. Consequently, GNP growth is reduced.

1/ Specifically, a subsidy rate of 20% is introduced after 1974. Since
    they commercially sell different shares of their produce, this
    represents an income boost of about 5% and 12% for traditional
    and emergent farmers.

Table 18.9: INCREASED INVESTMENT IN COMMERCIAL FARMING

```
GOVERNMENT INVESTMENT POLICY
    SHARES OF GOVERNMENT INVESTMENT
        INVESTMENT IN URBAN SECTOR = .860
        INVESTMENT IN COMMERCIAL AGRICULTURE = .050
        INVESTMENT IN ZAMBIAN AGRICULTURE = .050

    CONSTANT DOMESTIC RELATIVE PRICES
```

9(a) LABOR FORCE DISTRIBUTION
(IN THOUSANDS)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	630.000	595.719	579.851	564.563	539.348	497.420	-1.17
2.	157.000	204.768	264.445	326.598	423.137	525.921	6.23
3.	20.000	34.326	45.498	57.905	72.745	91.235	7.38
4.	285.000	346.847	398.192	444.925	523.368	632.122	4.06
5.	316.667	408.686	486.226	563.301	648.802	748.067	4.39
6.	10.000	15.131	20.163	21.015	13.256	15.499	

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ROW 1 REPRESENTS WORK FORCE IN TRADITIONAL AGRI
ROW 2 REPRESENTS WORK FORCE IN EMERGENT AGRI
ROW 3 REPRESENTS EMPLOYMENT IN COMMERCIAL AGRI
ROW 4 REPRESENTS URBAN SECTOR EMPLOYMENT
ROW 5 REPRESENTS TOTAL URBAN LABOR FORCE
ROW 6 REPRESENTS PERCENTAGE OF URBAN UNEMPLOYMENT
```

9(b) PRE-TAX PER WORKER INCOME LEVELS
(IN THOUSANDS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	.180	.206	.225	.246	.273	.310	2.76
2.	.300	.341	.393	.436	.504	.592	3.46
3.	.280	.321	.369	.423	.486	.557	3.50
4.	.900	1.033	1.185	1.360	1.561	1.791	3.50

```
ROW 1 REPRESENTS INCOME IN TRADITIONAL AGRI
ROW 2 REPRESENTS INCOME IN EMERGENT AGRI
ROW 3 REPRESENTS WAGES IN COMMERCIAL AGRI
ROW 4 REPRESENTS WAGES IN URBAN SECTOR
```

9(c) MIGRATION RATES
(PERCENTAGE OF LABOR FORCE IN TRADITIONAL AGRICULTURE)

	1972	1976	1980	1984	1988	1992	TYPE OF MIGRATION
1.	1.101	1.463	1.757	2.093	2.509	3.067	TO EMERG FARM
2.	2.055	1.599	1.002	.963	1.144	1.643	TO URBAN SECT

Table 18.10: PRICE SUBSIDIES TO SMALL FARMERS

GOVERNMENT INVESTMENT POLICY
    SHARES OF GOVERNMENT INVESTMENT
        INVESTMENT IN URBAN SECTOR = .905
        INVESTMENT IN COMMERCIAL AGRICULTURE = .045
        INVESTMENT IN ZAMBIAN AGRICULTURE = .050

CONSTANT DOMESTIC RELATIVE PRICES

10(a) LABOR FORCE DISTRIBUTION
(IN THOUSANDS)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	630.000	599.202	586.287	577.061	563.415	543.098	-.74
2.	157.000	206.025	271.126	348.987	440.683	547.331	6.45
3.	20.000	26.033	29.822	33.741	38.067	42.910	3.89
4.	285.000	351.213	384.388	424.617	474.817	534.801	3.20
5.	316.667	412.298	488.785	562.679	641.877	728.804	4.26
6.	10.000	14.816	21.359	24.536	26.027	26.219	

ROW 1 REPRESENTS WORK FORCE IN TRADITIONAL AGRI
ROW 2 REPRESENTS WORK FORCE IN EMERGENT AGRI
ROW 3 REPRESENTS EMPLOYMENT IN COMMERCIAL AGRI
ROW 4 REPRESENTS URBAN SECTOR EMPLOYMENT
ROW 5 REPRESENTS TOTAL URBAN LABOR FORCE
ROW 6 REPRESENTS PERCENTAGE OF URBAN UNEMPLOYMENT

10(b) PRE-TAX PER WORKER INCOME LEVELS
(IN THOUSANDS OF 1972 KWACHA)

	1972	1976	1980	1984	1988	1992	AVE GROWTH RATE
1.	.180	.217	.233	.248	.265	.283	2.29
2.	.300	.384	.438	.502	.579	.671	4.11
3.	.280	.321	.368	.423	.486	.557	3.50
4.	.900	1.033	1.185	1.360	1.561	1.791	3.50

ROW 1 REPRESENTS INCOME IN TRADITIONAL AGRI
ROW 2 REPRESENTS INCOME IN EMERGENT AGRI
ROW 3 REPRESENTS WAGES IN COMMERCIAL AGRI
ROW 4 REPRESENTS WAGES IN URBAN SECTOR

10(c) MIGRATION RATES
(PERCENTAGE OF LABOR FORCE IN TRADITIONAL AGRICULTURE)

	1972	1976	1980	1984	1988	1992	TYPE OF MIGRATION
1.	1.101	1.268	1.949	2.228	2.535	2.876	TO EMERG FARMS
2.	2.055	1.569	.879	.736	.710	.729	TO URBAN SECT

70.   While policy (c) seems successful in raising the income levels
of emergent farmers, it is curious that income levels of traditional
farmers are lower compared to the other policies and the basic case.
The explanation rests on what is going on in the urban sector. Unemploy-
ment rises rapidly as urban sector growth falls (due to diversion of
current and future public savings to income subsidies), which discourages
rural-urban migration. Since this is not quite off-set by more rapid
transformation of traditional into emergent farmers, the total size
of the traditional agriculture sector is higher. The increased popula-
tion which must be supported more than absorbs the subsidy income to
the sector as a whole. This seems to indicate that a policy aimed
at improving a target group's relative position may have opposite effects
in the long and short runs.

71.   Concentrated Investment in Small-scale Farming in Rural Growth
Areas. As noted before, an important problem with direct public
investment in small-scale agriculture is its low relative productivity,
caused by the very diffuse and heterogeneous nature of the rural
sector in Zambia. This issue has of course been raised many times.
Intensive Development Zone (IDZ) Projects were conceived as a practical
response to this idea, as is the concept of the Sector Mission of Rural
Growth Areas (RGA). With policy (d), we attempt to simulate some of
the dynamic, economy-wide implications of this type of strategy for
agriculture.

72.   The key notion is that by concentrating relatively large
amounts of capital on productive areas and a smaller number of farmers,
the productivity of the public funds (in terms of food output) will be
increased. Hopefully, such a policy would also stimulate the rural
transformation process by developing pockets of high income which
become growth poles in the rural sector.

73.   In this experiment an additional 2% of public investment is
diverted from the urban sector to development of rural growth areas
in agriculture. This creates opportunities for traditional farmers to
become emergent farmers at higher income levels. Thus, the principle
impact is on the growth of emergent farming, as seen in the results
shown in Table 18.11.

74.   This policy is reasonably successful in stimulating agricul-
tural production in comparison with the basic case, the average growth
rate rising from less than 6% to more than 7%. Interestingly, although
investment is diverted from the urban sector, its growth rate is
practically unchanged. This is because stimulating agriculture helps
improve the balance of trade, thereby increasing the government's tax
revenues. This increase in revenue means that public investment in
the urban sector hardly changes. In terms of total GNP the production

gains in agriculture more than compensate for the output losses in the urban sector.

75.   The changes in income distribution as a result of this policy are rather dramatic. Although the number of Zambian farmers remains unchanged, the composition shifts, and more than 75% are engaged in emergent farming by 1992. This contrasts with 50% in the basic case. In terms of income growth the remaining traditional farmers benefit the most. This is a natural consequence of the release of near-surplus labor at rapid rate. Finally, while urban employment is down somewhat, unemployment rates do not significantly rise since remaining in agriculture has become more attractive.

Y. Summary: Welfare and Policy Implications

76.   As variations from the basic model (Table 18.1 and paras 40-44) four alternative tax and expenditure policies are simulated (Tables 18.2-18.5 and paras 45-53) and four approaches to agricultural policy are tested (Tables 18.8-18.11 and paras 59-75). Also simulated are the effects of reduced copper prices and falling productivity in the urban sector (Tables 18.6-18.7 and paras 55-58). The growth paths for each of these variations are shown.

77.   The gains and losses associated with any public policy change tend to accrue to different groups at different time periods. Therefore, it has been necessary to use a social utility metric to make overall comparisons of growth paths. This approach rests on a basic assumption that social welfare can be measured as an aggregate, based on the sum of discounted utility of consumption of each individual in the economy.

78.   Specifically, an identical isoelastic per capita welfare function was postulated for each of the seven income classes at each point in time. Let v denote the elasticity of the marginal utility of consumption; let d denote the one-year subjective discount rate; and let t denote the number of years in the planning horizon. Then the intertemporal interpersonal social welfare function is defined as follows:

$$W = \sum_{t=1}^{T} \frac{1}{(1+)^t} \sum_{s=1}^{F} n_{s,t} \frac{y_{s,t}^{1-v}}{1-v}$$

where $s = 1...s = 7$ are consumer classes, and $n_{s,t}$ is the number of persons having consumption level $y_{s,t}$ in year t.[1] For $v = 0$ the only objective is that of maximizing discounted aggregate consumption, regardless of income distribution. The higher the value of v, the more weight is placed on reducing the number of those in low income groups. The higher the value of d, the more weight is placed upon short, rather than long, term objective of the economy.

79.   Once v and d are specified, it becomes possible to rank the policy alternatives discussed in Sections III and IV. Such a comparison is shown in Table 18.12. Two general comments should be made. In the first place, even though the percentage differences may seem small, their importance should not be minimized. Indeed given the high subjective role of discounting and strong preference for income equality (through the choice of v and d), these differences are actually quite significant. Second, the policies were also compared for a number of other parameter values.[2] Surprisingly, the overall rankings were quite stable, although the percentage differences widened (lowered) when v or d was reduced (raised).

80.   These results seem to confirm insights to be gained by examination of the growth paths themselves, and to lend support to the sector mission's recommendations. In particular, they suggest how important it is for both overall growth and income distribution to reduce divergences between domestic and world prices, whilst a policy of concentrating rural investment is the most effective of the 4 simulated agricultural policies in achieving rural transformation and stimulating overall agricultural production. Moreover, this is achieved without serious cost to the urban sector because the improved balance of trade allows urban investment to be maintained. The vulnerability of the economy to falling copper prices and rising costs, affecting both the urban sector and the possibilities for rural transformation, is also indicated.

1/ With the exception of the unemployed urban workers, the model itself computes the levels of private consumption for each group. To these must be added the relevant share of public consumption. For this purpose, we make the simple assumption that all Government consumption is allocated to each "family" in proportion to their relative incomes. Thus, $y_{s,t}$ includes both the value of private and public consumption. While in terms of the simulation model, the income level of the unemployed is zero, they do manage to survive on the basis of transfers and income earned in an "informal" sector which is not directly modelled. Somewhat arbitrarily, we have set their level of private consumption to be identical with the 1972 level for traditional farmers.

2/ In all, tests were made for $v = 1,2,3$ and $p = 4\%,8\%$.

Table 18.12:   RANKING OF POLICIES FOR v = 2, d = 8%

Policy	Table	As % of value in basic case	Rank
Basic case	18.1	100	8
Constant indirect tax rates	18.2	108	2
Tariff reduction	18.3	117	1
Public consumption growth rate = 8.5%	18.4	98	9
Public marginal savings rate = .5	18.5	102	7
Increased public investment in small-scale farming	18.8	107	3
Increased public investment in commercial farming	18.9	103	6
Direct subsidy to small-scale farmers	18.10	104	5
RGA investment	18.11	106	4

ZAMBIA

AGRICULTURAL AND RURAL SECTOR SURVEY

STATISTICAL ANNEX

- 3 -

Table 1.1: POPULATION AND POPULATION DENSITY

Province	Population 1963 Census (1,000)	Population 1969 Census (1,000)	1973 Estimates (1,000)	Area (1,000 Km^2)	1973 Density (Person Km^2)
Central	505	713	876	116.29	7.5
Copperbelt	544	816	1,019	31.33	32.5
Eastern	480	510	549	69.10	7.9
Luapula	357	336	352	50.56	7.0
Northern	564	545	572	147.81	3.9
North-Western	211	232	253	125.83	2.0
Southern	466	496	535	85.28	6.3
Western	363	410	459	126.40	3.6
TOTAL	3,490	4,057	4,618	752.60	6.1

Note: The African-population in Zambia is estimated to be increasing at a rateof 2.9% per annum while non-African population stays more or less constant.

Source: Ministry of Planning and Finance, Economic Report, 1973.

Table 1.2: ESTIMATED POPULATION OF TOWNS, 1973
(in 1000)

Town	Population	Town	Population
Lusaka	381	Chipata	18
Kitwe	270	Kafue	16
Ndola	216	Choma	14
Chingola	140	Mongu	12
Mufulira	130	Kasama	11
Luanshya	116	Mansa	10
Kabwe	89	Mazabuka	7
Livingstone	54	Mbala	6
Chililabombwe	54	Solwezi	5
Kalulushi		TOTAL:	1,590

Source: Ministry of Planning & Finance, Economic Report, 1973

Table 1.3: LAND AREA BY TENURE CATEGORY, 1970

Category	31. December, 1970 000 hectares
STATE LAND	4,859
Includes: Freehold	1,140
Leasehold	1,169
Townships	878
Forest Reserves and Protected Areas	945
Tribal Occupation	570
Inundated by Water	152
Unalientated	5
RESERVES	27,073
Includes: Protected Forest Areas	3,883
TRUST LAND	43,361
Includes: Forest Reserves and Protected Areas	4,401
TOTAL LAND AREA	75,293

Source: Annual Report of the Lands Department.

Table 1.4: LAND UTILIZATION - COMMERCIAL SECTOR 1970/71
(1,000 ha)

	Central	Southern	Copperbelt & Other	Total
Total Farm Area	465.4	507.7	174.0	1,147.1
Total Cleared Arable Land	73.2	57.4	2.3	132.9
Gross Cropped Land	37.6	24.6	0.6	62.8
Fallows	35.6	32.7	1.7	70.0
Pasture & Meadows	·96.6	115.7	114.3	356.6
Other Arable Land	96.0	24.1	6.8	126.9
Land not suitable for Cultivation	127.7	174.8	18.6	321.1
Use not Specified	72.0	135.7	1.9	209.6

Source: CSO, Census of Agriculture, 1970-71 (First Report), Lusaka, May, 1974.

Table 1.5: FARM SIZE DISTRIBUTION OF EXPATRIATE AND AFRICAN FARMS
ON STATE LAND

	Expatriate Farms (size in ha)					African Farms (size in ha)				
	Less than 10	10-100	100-1,000	Over 1,000	Total	Less than 10	10-100	100-1,000	Over 1,000	Total
Central										
Chisamba	-	2	52	52	106	-	-	19	15	34
Kabwe	-	3	29	12	44	-	3	12	3	18
Lusaka	19	106	161	69	355	21	70	54	11	156
Mkushi	-	-	82	27	109	-	-	8	1	9
Copperbelt										
Chingola	-	2	6	6	14	-	1	1	1	3
Mufurila	1	4	7	-	12	-	11	2	-	13
Ndola	-	19	20	3	42	2	9	7	1	19
Eastern										
Chipata	-	14	36	-	50	3	17	34	6	60
Northern										
Mbala	-	6	6	2	14	2	5	20	1	28
Southern										
Choma	-	1	20	39	60	-	2	14	13	29
Kalomo	-	-	16	51	67	-	-	5	9	14
Livingstone	6	14	23	14	57	2	6	3	3	14
Mazabuka	1	1	68	39	109	1	1	24	10	36
Monze	-	5	1	8	14	-	6	12	13	31
TOTAL:	27	177	527	322	1.053	31	131	215	87	464

Table 1 6· NUMBERS OF FARMS, FARMERS AND FARM AREA ON STATE LAND[1/]
(Areas are in hectares)

	Expatriate			African			Private Co.[2/]		Prastatals[3/]		Settlements		Cooperatives		Mining	Forest	Other Land[4/]	Vacant Land	Total
	Farms	Farmers	Area	Farms	Farmers	Area	Farms	Area	Farms	Area	Farms	Area	Farms	Area	Area	Area	Area	Area	Area
Central																			
Chisamba	106	62	107,209	34	26	28,433	23	24,083	21	20,721	1	1,641	1	1,886		-	5,203	21,593	210,769
Kabwe	44	27	33,177	18	16	6,242	-	-	4	4,441	-	-	1	256		-	15,899	1,833	61,848
Lusaka	355	214	208,518	156	116	39,643	14	18,196	25	11,525	-	-	2	2,067		-	66,800	-	346,749
Mkushi	109	80	102,871	9	8	5,546	-	-	30	35,478	2	1,832	-	-		-	-	1,496	147,223
Copperbelt																			
Chingola	14	10	9,816	3	3	1,728	8	5,392	-	-	2	244	1	134	15,514	-	6,546	-	39,374
Mufurila	12	11	1,623	13	13	1,328	-	-	-	-	-	-	-	-	-	-	258	-	3,209
Ndola[5/]	42	38	10,152	19	19	3,691	-	-	1	2,835	-	-	1	160	15,402	259	5,853	20	38,372
Eastern																			
Chipata	50	27	16,755	60	56	20,838	-	-	123	94,206	4	4,250	1	1,145	-	4 424	120,847	13	262,478
Northern																			
Mbala	14	12	6,277	28	26	9,072	-	-	13	13,895	-	-	-	-	-	-	29 899	1.212	60,355
Southern																			
Choma	60	38	81,310	29	24	26,534	18	28,033	30	50,896	-	-	1	1,222	-	-	19,794	668	208,457
Kalomo	67	34	106,847	14	14	17,147	11	18,901	34	46,623	-	-	2	1,995	-	-	3,549	422	195,484
Livingstone	57	44	32,452	14	12	4,953	-	-	-	-	-	-	-	-	-	-	6,948	13,911	58,264
Mazabuka	109	40	102,128	36	30	29,422	29	38,977	20	25,095	29	31,180	3	5,688	-	-	4,693	1,296	238,479
Monze	14	12	12,886	31	25	26,235	-	-	12	15,171	8	9,328	-	-	-	-	8,682	1,539	73,843
TOTAL·	1,053	649	832,021	464	388	220,812	103	133,582	313	320,888	46	48,475	13	14,553	30,916	4,683	294,971	44,003	1,944,904

1/ Survey was initially carried out in 1970-71 period, and some revisions were made during 1972. In mid-1974, new questionaires were sent out for which returns were satisfactory, except the Mbala and Copperbelt area. Thus the information should be considered as updated as of mid-1974 except for these two areas
2/ The private companies include Anglo American, Zambesi Ranching, Farm Holding and Zambia Sugar Companies.
3/ The parastatals include Agricultural Finance Corporation, Tobacco Board of Zambia, Cold Storage Board, other subsidiaries of Rural Development Corporation and settlement projects.
4/ Other land includes townships, colleges, urban lands, railway lands, residents and unspecified Government lands.
5/ Including Kitwe farming area.

Table 1 7· GROSS DOMESTIC PRODUCT (PRODUCERS' VALUES, CURRENT PRICES)
(in 1,000,000 kwacha)

	1970	1971	1972	1973	1974 [7/]
Total Gross Domestic Product	1,257.7	1,178.2	1,311.9	1,628 0	1,820.0
Agriculture, Forestry and Fishing:	132.0	150.3	158.4	157 0	171 5
Commercial Sector 1/ [1/]	37.4	49 0	55.4	51 0	56.5
Subsistence Sector	94.6	101.5	103.0	106.0	115.0
Mining and Quarrying [2/]	462.4	300.3	324.0	568.0	622.0
Metal Mining	457.1	293.2	317.7	562.0	616.0
Other Mining Quarrying	5.3	7.1	6.3	6.0	6 0
Manufacturing	127.4	142.0	182.0	210.0	242.0
Food Manufacturing	17.5	20.4	96.7	114.1	126.7
Beverages and Tobacco	51.6	56.4			
Textiles and Wearing Apparel	10.7	10.0	13.5	15.4	15.5
Wood & Wood Products, including Furniture	5.0	3.3	4.7	5.0	8.0
Paper, Paper Products, Printing and Publishing	4.5	5.4	6.5	6.6	10 0
Rubber Products	3.2	4.9	20.5	27.9	33 4
Chemicals, Chemical, Petroleum & Plastic Products	6.3	6.5			
Non-metallic Mineral Products	10.6	9.5	10.1	10.2	10.2
Basic-metal Products	2.5	2.2	3.1	3.3	5.3
Fabricated Metal Products, Machinery & Equipment	15.2	23.0	26.7	27.2	32.6
Other Manufacturing Industries	0.3	0.4	0.2	0 3	0 3
Electricity, Gas and Water	15.5	18.2	25.7	30.5	32 0
Construction	82.3	89.4	93.3	97 5	106.0
Wholesale and Retail Trade	119.3	113.7	140.7	155.0	186.0
Hotels and Restaurants	10.8	12.3	13.8	15.0	16.5
Transport, Communication and Storage	52.0	66.1	74.9	82.5	95.5
Rail Transport3/ [3/]	8.1	11.3	12.2	7 2	7.5
Road Transport	27.2	35.9	36.6	48.0	60 0
Other Transport and Storage	7.8	10.7	16.6	17.0	17 0
Post and Telecommunication	8.9	8.2	9.5	10 2	11.0
Financial Institutions and Insurance	41.8	40.7	44.1	48 0	60.0
Real Estate [4/]	37.3	39.2	38.4	40 5	41.5
Business Services	16.7	15.4	13.7	15.0	16.5
Community, Social and Personal Services	144.7	174.3	183.4	194.0	208.5
Public Administration and defence	62.6	81.9	89 4	92.0	102 0
Sanitary and Related Services	4.6				
Education 5/ [5/]	40.4	46 1	46.1	52.6	52 0
Health 5/ [5/] 6/ [6/]	13.3	20.2	21.9	21.7	24 6
Recreational and Cultural Services	4.9	6.9	6.5	6.7	7.4
Personal and Household Services	18.9	19.2	19.5	21.0	22 5
Import Duties	32.1	36.7	41.8	38 0	50 0
Less Imputed Bank Service Charges	16.1	20.4	22 3	23.0	28 0

1/ Sales from the subsistence farmers are transferred ·o gross output of the commercial sector.
2/ Royalties paid to the Government are treated as indirect taxes. Smelting and refining are included in this sector.
3/ Road Transport includes oil pipeline and water transport.
4/ Real Estate includes ownership of dwellings by private households, and administrative office buildings are not included; depreciation has been imputed for
    production account of Government
5/ Education and Health services of mine schools and mine hospitals are estimated at cost.
6/ Including religious organizations
7/ Provisional

Source. Central Statistical Office, Lusaka.

Table 1.8· GROSS DOMESTIC PRODUCT (PRODUCERS' VALUES, 1965 PRICES)
(in 1,000,000 Kwacha)

	1970	1971	1972	1973	1974 [1]
TOTAL GROSS DOMESTIC PRODUCT, Adjusted for terms of trade	964.1	827.8	871.1	1.025.6	1,049.4
Adjustment for changes in terms of trade	-34.2	-178.2	-229.7	-78.0	-66.2
TOTAL GROSS DOMESTIC PRODUCT	998.3	1,006 0	1,100.8	1,103.6	1,115.6
Agriculture, Forestry and Fishing	109.5	112.0	118.2	114.5	117.0
Commercial Sector	27.5	29.6	35.0	30.5	32.0
Subsistence Sector	82.0	82.4	83.2	84 0	85 0
Mining and Quarrying	420.2	410.1	454.1	439.2	456.2
Metal mining	416.0	407.0	451.8	437.0	454.0
Other mining	4.2	3.1	2.3	2.2	2.2
Manufacturing	93.1	98.5	119.6	132.5	147.0
Food manufacturing	14.0	15.4	54.0	59.5	65.5
Beverages and tobacco	31.5	31.3			
Textiles and wearing apparel	8.8	8.2	10.7	12.0	11.8
Wood and wood products including Furniture	4.5	2.9	4.1	4.3	6.9
Paper, paper products, publishing and printing	3.7	4.4	4.8	4.8	5 5
Rubber products	2.9	4.4	18.1	24.2	25.4
Chemicals, Chemical, petroleum and plastic products	5.8	5.9			
Non-metallic mineral products	7.7	6.9	7.3	7.3	7.3
Basic metal products	1.8	1.6	2 0	2.1	3.4
Fabricated metal products machinery and equipment	12.2	17.2	18.5	18.3	21.1
Other manufacturing	0.2	0.3	0.1	0.2	0.2
Electricity, gas and water	16.2	19.5	27.5	28.6	28.7
Construction	64.3	66.5	65.3	66 0	57 0
Wholesale and retail trade	93.0	87.3	99.2	100 8	110 3
Hotels and restaurants	8.5	9.5	9.7	9.8	9.8
Transport, Communication and Storage	41.0	49.9	52.4	57.5	63.4
Rail transport	6.4	8.5	8.2	4 9	4.9
Road transport	21.6	27.1	25.5	34.3	40.1
Other transport	6.2	8.1	11.6	11.6	11.6
Posts and telecommunication	6.8	6.2	7.1	6.7	6.8
Financial institutions and insurance	21.9	26.2	25.0	21.0	25.5
Real Estate	33.1	32.5	31.4	32.0	32 5
	13.0	13.5	9.6	9 8	9.8
Business service	13.0	13.5	9.6	9.8	9.8
Community, social and personal services	116.9	127.5	132.4	123.4	126.2
Public administration and defence	51.2	59.9	64.8	58.1	61.1
Sanitary and related services	3.8				
Education	33.0	33.8	33 4	33 2	31 1
Health	10.9	14.8	15.8	13.7	14.8
Recreational and cultural services	4.0	5 0	4.7	4.2	4 4
Personal and household services	14.0	14.0	13.7	14.2	14 8
Import duties	27.0	29.2	31.5	25.5	28.5
Less imputed bank service charges	8.7	10.4	10.0	8 4	10.1
Errors and Omissions	-50.7	-65.8	-65.1	-48.6	-86.2

1/ Provisional

Source· Central Statistical Office, Lusaka.

Table 1.9: GROSS DOMESTIC PRODUCT (BY TYPE OF EXPENDITURE, CURRENT PRICES)
(in 1,000,000 kwacha)

	1970	1971	1972	1973	1974 [1]
Government final consumption expenditure	198.5	272.6	283.0	307	340
Private final consumption expenditure	504.2	514.0	570.4	618	710
Increase in stocks	-13.3	+47.4	+12.2	-	+60
Gross fixed capital formation	353.4	369.3	416.2	435	520
Final consumption and gross capital formation	1,042.8	1,203.3	1,281.8	1,360	1,630
Export of goods and services	685.4	500.6	584.0	795	914
Less imports of goods and services	470.5	525.7	553.9	527	724
Gross domestic product at current purchasers' values	1,257.7	1,178.2	1,311.9	1,628	1,820

1/ Provisional

Source: Central Statistical Office, Lusaka.

Table 1.10:   EXPENDITURE ON THE GROSS DOMESTIC PRODUCT IN PURCHASERS' VALUES AT 1965 CONSTANT
(in 1,000,000 Kwacha)

	1970	1971	1972	1973	1974 [1]
Government final consumption expenditure	170.5	204.2	206.4	203.7	210.5
Private final consumption expenditure	384.2	375.1	390.1	396.6	418.0
Increase in stocks	-9.4	37.0	9.2	-	42.0
Gross fixed capital formation	238.5	231.3	242.8	246.4	271.0
Final consumption and gross capital formation	783.8	847.6	848.5	846.7	941.5
Exports	609.2	576.7	669.7	608.7	585.5
Less Imports	394.7	418.3	417.4	351.8	411.4
Gross Domestic Product at 1965 prices	998.3	1,006.0	1,100.8	1,103.6	1,115.6
Adjustment for changes in terms of trade	-34.2	-178.2	-229.7	-78.0	-66.2
Gross domestic product at 1965 prices adjusted for terms of trade	964.1	827.8	871.1	1,025.6	1,049.4

1/ Provisional

Source: Central Statistical Office, Lusaka.

Table 1.11:   WAGE EMPLOYMENT BY INDUSTRY[1]/
(in 1,000 persons)

	1968	1969	1970	1971	1972	1972 % of Total
			African Employees			
Agriculture, Forestry, Fishing	32.7	36.4	34.1	38.7	33.1	9.9
Mining, Quarrying	48.7	50.3	52.1	52.8	52.1	15.6
Manufacturing	30.5	32.0	35.2	39.0	39.8	11.9
Utility	3.2	3.3	2.8	3.6	4.4	1.3
Construction	61.4	59.7	66.2	63.1	66.2	19.8
Commerce	27.4	27.9	28.1	33.4	32.4	9.7
Transport, Communication	20.7	19.6	19.7	21.0	24.4	7.3
Financial Service	5.2	6.4	7.2	8.6	9.4	2.8
Social, Personal Services	59.7	65.0	70.1	78.7	72.3	21.6
TOTAL:	289.4	300.5	315.6	339.0	334.2	100.0
			Non-African Employees			
Agriculture, Forestry, Fishing	0.5	0.5	0.5	0.5	0.5	2.0
Mining, Quarrying	6.1	5.6	5.5	5.4	5.4	20.9
Manufacturing	2.6	2.6	2.9	3.0	2.7	10.5
Utility	0.4	0.4	0.4	0.5	0.4	1.7
Construction	2.6	2.4	2.5	2.7	2.7	10.5
Commerce	5.2	5.0	4.6	4.6	4.3	16.5
Transport, Communication	2.8	2.9	2.6	1.6	2.2	8.5
Financial Service	2.3	2.1	2.2	2.0	2.0	7.6
Social, Personal Services	6.6	6.3	6.1	6.3	5.7	21.9
TOTAL:	29.2	27.8	27.4	26.6	26.0	100.0

1/ Excluding domestic and other services.

Source: Ministry of Planning and Finance, Economic Report, 1973.

Table 1.12: AVERAGE ANNUAL EARNINGS OF EMPLOYEES[1]
(Kwacha)

	African			non-African		
	1970	1971	1972	1970	1971	1972
All Industry	878	977	960	4,962	5,635	5,500
Agriculture, Forestry & Fisheries	322	354	376	4,326	4,249	4,515
Mining & Quarrying	1,480	1,569	1,491	6,982	7,336	6,971
Manufacturing	755	946	853	5,125	6,795	6,128
Electricity & Water	763	775	769	6,184	6,398	6,346
Construction	571	663	674	6,590	6,373	6,479
Distribution, Restaurants and Hotels	725	762	864	4,309	4,531	5,140
Transport & Communication	1,185	1,393	1,311	4,560	5,902	5,553
Finance, Insurance & Real Estate	1,052	1,142	1,031	5,007	5,899	5,327
Community & Social Services	722	844	831	2,661	2,971	2,968

1/ Based on 4th Quarter; and cash earnings, excluding earnings in kind
and employer's contribution to pension funds, etc.

Source: Employment Enquiry, quoted in Economic Report, 1973, Ministry of Planning
and Finance.

Table 1.13: NUMBER OF FAMILIES WHO ARE ENGAGED IN FARMING
ACTIVITIES, 1970/71

	Urban	Peri-Urban	Rural	Total
Central	23,700	3,800	72,600	100,000
Copperbelt	77,200	-	17,300	94,500
Eastern	-	3,100	121,300	124,400
Luapula	-	3,900	81,000	84,800
Northern	-	3,400	120,100	123,500
North-Western	-	4,200	53,000	57,200
Southern	7,800	4,800	78,500	91,000
Western	-	2,700	88,800	91,500
TOTAL:	108,600	25,800	632,400	766,900

Urban: 10 large cities.

Peri-Urban: Towns, which have the population of 30,000 or more

Source: CSO, Census of Agriculture, 1970-71 (First Report), Lusaka, May, 1974

Table 1.14: NUMBER OF FARM HOUSEHOLDS BY TYPES OF AGRICULTURAL ACTIVITIES,
1970/71

| | Total No. of Household | Non-Farming Household | Subsistence Household | No. of Marketing Household | | | |
				Crops	Livestock	Other 1/	Total
Central	126,100	26,100	54,100	13,800	1,000	31,100	45,900
Copperbelt	132,000	37,500	60,400	20,100	300	13,700	34,100
Eastern	125,800	1,400	72,500	23,400	2,800	25,700	51,900
Luapula	85,800	1,000	40,700	16,400	600	27,100	44,100
Northern	124,800	1,300	66,600	18,800	500	37,600	56,900
North-Western	58,400	1,300	33,100	9,500	700	13,900	24,100
Southern	93,800	2,800	46,800	6,400	2,000	35,800	44,200
Western	95,000	3,500	61,600	12,700	1,900	15,300	29,900
TOTAL:	841,700	74,900	435,800	121,100	9,700	200,300	331,100

1/ Mixed farm or poultry producing farms.

Source: CSO, Census of Agriculture, 1970-71 (First Report), Lusaka, May 1974.

Table 1 15· DISTRIBUTION OF HOUSEHOLDS ACCORDING TO AGRICULTURAL ACTIVITIES, 1970/71
(in 1,000 Households)

	Central	Copperbelt	Eastern	Luapula	Northern	North-Western	Southern	Western	TOTAL
Number of Households									
Urban									
Total	48.4	114.7	-	-	-	·-	9.2	-	172.3
Non-Farming	24.7	37.5	-	-	-	-	1.4	-	63.7
Non-Surplus Farming	18.7	54.1	-	-	-	-	5.8	-	78.6
Peri-Urban									
Total	5.2	-	4.5	4.8	4 7	5.4	6.1	6.2	37 0
Non-Farming	1.4	-	1 4	1.0	1.3	1.3	1.3	3.5	11 2
Non-Surplus Farming	2.8	-	2.6	2.4	2.6	2.1	4.0	2.1	18.6
Rural									
Total	7.6	17.3	121.3	81.0	120.1	53.0	78.5	88 8	632.4
Non-Farming	-	-	-	-	-	-	-	-	·-
Non-Surplus Farming	32.6	6.3	69.9	38.3	64.0	31.0	37.0	59 5	338.6
Total of Urban, Peri-Urban & Rural									
Total	126.1	132.0	125.8	85.8	124.8	58.4	93.8	95 0	841 7
Non-Farming	26.1	37.5	1.4	1.0	1.3	1.3	2 8	3.5	74.9
Non-Surplus Farming	54.1	60.4	72.5	40.7	66.6	33 1	46.8	61 6	435.8
Percentage of Provincial-wise as of Total Households									
Urban									
Total	28	67	-	-	-	-	5	-	100
Non-Farming	39	59	-	-	-	-	2	-	100
Non-Surplus Farming	24	69	-	-	-	-	7	-	100
Per-Urban									
Total	14	-	12	13	13	15	16	17	100
Non-Farming	13	-	13	9	12	12	12	31	100
Non-Surplus Farming	15	-	14	13	14	11	22	11	100
Rural									
Total	11	3	19	13	19	8	12	14	100
Non-Farming	-	-	-	-	-	-	-	-	100
Non-Surplus Farming	10	2	21	11	19	9	11	8	100
Total of Urban, Peri-Urban & Rural									
Total	15	16	15	10	15	7	11	11	100
Non-Farming	35	50	2	1	2	2	4	5	100
Non-Surplus Farming	12	14	17	9	15	8	11	14	100

Note: 1. "Urban" refers to 10 principal cities: Lusaka, Kitwe, Ndola, Mufulira, Chingola, Luanshya, Livingston, Chililabombwe, and Kalulushi.
2. "Peri-Urban" refers to population centers which had more than 30,000.
3. "Non-Surplus" means subsistence.

Source CSO, Census of Agriculture, 1970/71 (First Report), Lusaka, May 1974

Commodity	Unit	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974*
MAIZE	Tons	204,270	263,000	348,720	383,080	233,830	273,990	135,200	399,950	616,554	460,480	450,000
TOBACCO:												
FLUE CURED	Tons	10,960	6,600	6,566	4,950	6,280	5,020	4,790	5,910	5,530	6,230	7,160
BURLEY	Tons	1,703	1,993	855	275	285	240	255	388	385	471	523
ORIENTAL	Tons	297	526	213	131	114	75	8	4	-	-	-
SUGAR CANE	Tons	-	-	-	-	183,000	257,000	322,000	331,000	397,400	446,350	500,000
GROUNDNUTS	Tons	3,630	6,740	11,530	4,810	5,390	7,820	3,270	5,970	6,480	2,960	5,000
SUNFLOWER SEED	Tons	-	-	-	-	-	-	-	16	163	1,050	3,500
SOYA BEANS	Tons	-	-	-	-	-	-	-	-	-	173	400
SEED COTTON:	Tons	1,649	2,273	2,778	831	4,252	6,915	5,606	11,919	8,453	5,225	5,600
SORGUM	Tons	-	-	24	727	3,545	1,181	545	90	212	34	350
FRUIT	Tons	2,600	2,400	2,500	2,600	2,200	3,100	4,800	5,600	5,900	5,500	6,000
VEGETABLES	Tons	13,500	13,000	14,100	15,200	15,500	17,200	21,000	24,100	27,700	20,000	25,000
CATTLE	Head	71,000	69,000	63,000	55,000	47,000	49,000	68,000	68,000	72,443	90,000	n.a
PIGS	Head	16,000	17,000	20,000	22,000	25,000	27,000	35,000	34,000	32,000	36,000	n.a
CHICKENS	1000 Head	650	905	1,410	2,100	3,200	3,800	4,000	4,425	5,500	6,100	n.a.
TURKEY & DUCKS	1000 Head	-	-	27	35	40	46	50	25	40	30	n.a.
EGGS	Millions	17	22	27	36	54	93	99	108	115	123	n.a.
MILK	Tons	20,500	19,770	19,020	18,330	18,430	16,260	15,610	16,000	16,586	16,700	n.a.
DAY OLD CHICKS	1000 Head	-	-	-	-	280	440	665	910	1,100	1,250	n.a.

* Estimates.

Source: Planning Unit, Ministry of Rural Development.

Table 2.2:ESTIMATED GROSS VALUE OF MARKETED AGRICULTURAL PRODUCTION [1]
(in 1000 Kwacha)

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
MAIZE	7,633	9,899	13,981	12,992	8,329	9,639	5,204	17,833	29,311	19,952	19,350
TOBACCO:											
FLUE CURED	5,619	3,973	4,431	4,791	4,228	3,902	3,841	4,782	4,934	5,347	6,118
BURLEY	669	639	267	75	126	122	143	218	221	224	-
OTHER	201	296	112	55	52	32	4	2	-	-	-
SUGAR CANE	-	-	-	-	1,210	1,698	2,127	2,186	2,607	2,950	3,000
GROUNDNUT	332	605	1,152	1,437	532	792	348	720	780	456	425
SUNFLOWER	-	-	-	-	-	-	-	1	15	157	686
SOYA BEANS	-	-	-	-	-	-	-	-	-	16	59
SEED COTTON	226	304	452	244	608	1,040	912	2,094	1,485	920	1,400
SORGUM	-	-	-	89	183	61	28	5	9	2	19
FRUIT	150	137	143	166	158	220	353	477	500	470	500
VEGETABLES	1,150	1,105	1,325	1,550	2,161	2,361	2,613	3,064	3,355	3,050	3,300
CATTLE	3,200	3,800	3,970	3,740	3,950	4,170	5,510	5,710	6,261	7,780	n.a.
PIGS	320	410	530	580	690	700	940	1,040	1,178	1,210	n.a.
CHICKENS	444	667	1,176	1,800	3,520	4,180	4,400	4,868	6,050	6,820	n.a
TURKEY & DUCKS	-	-	60	76	85	98	101	47	80	60	n.a.
EGGS	530	675	940	1,200	1,710	2,950	3,300	3,600	4,370	4,940	n.a.
MILK	1,350	1,320	1,220	1,350	1,410	1,320	1,310	1,390	1,645	1,677	n a.
DAY OLD CHICKS	-	-	-	-	60	100	150	190	275	300	n a.
TOTAL:	21,824	23,830	29,759	30,145	29,012	33,385	31,284	48,227	63,066	56,331	n a

1/ At current market prices.

Source: Planning Unit, Ministry of Rural Development.

Table 2 3   PRODUCTION, AREA AND YIELD OF MAJOR AGRICULTURAL PRODUCTS, 1969/70 1/

Region	Maize Traditional	Maize Commercial	Maize Total	Millet Traditional	Millet Total	Sorghum Traditional	Sorghum Commercial	Sorghum Total	Groundnut Traditional	Groundnut Commercial	Groundnut Total	Cassava Traditional	Sweet Potatoes Traditional	Legumes Traditional	Cotton Commercial	Virginia Tobacco Commercial
Production (in 1,000 tons)																
Central	174.0	115.4	289.4	4.0	4.0	6.4	0.2	6.6	3.6	0.2	3.8	1.3	3.1	2.0	0.4	529.4
Copperbelt	37.0	0.4	37.4	0.3	0.3	13.7		13.7	14.5		14.5	4.7	5.2	5.0		
Southern	223.8	95.6	319.4	2.2	2.2	8.3	0.3	8.6	11.3	0.2	11.5	0.2	4.0	2.3	1.6	370.4
Sub-total	434.9	211.4	646.3	6.5	6.5	28.4	0.5	28.9	29.5	0.3	29.8	6.1	12.3	9.2		899.8
Eastern	133.5		133.5	5.9	5.9	2.2		2.2	15.5		15.5	3.2	4.7	2.7		
Luapula	30.4		30.4	7.5	7.5	0.1		0.1	8.7		8.8	44.9	5.9	2.2		
Northern	61.3		61.3	38.3	38.3	4.5		4.5	11.2		11.2	47.2	2.8	8.9		
North-Western	29.4		29.4	6.4	6.4	5.9		5.9	1.9		1.9	35.3	2.0	2.6		
Western	44.1		44.1	19.4	19.4	11.1		11.1	3.4		3.4	18.3	2.2	2.1		
Sub-total	298.6	0.2	298.8	77.5	77.5	23.7	—	23.7	40.7	0.2	41.0	149.0	17.7	18.5	—	42.1
TOTAL	733.6	211.5	945.1	84.0	84.0	52.1	0.5	52.6	70.2	0.6	70.8	155.1	29.9	27.7	2.0	941.9
Area (1,000 ha)																
Central	139.0	39.8	178.8	7.4	7.4	13.1	0.2	13.3	7.3	0.3	7.6	1.6	2.2	4.0	0.3	3.2
Copperbelt	44.9	0.2	45.1	0.9	0.9	8.8		8.8	27.6		27.6	8.5	5.7	13.3		
Southern	379.1	26.3	405.4	7.1	7.1	15.0	0.3	15.3	26.5	0.4	27.0	0.2	3.8	5.0	1.2	2.1
Sub-total	562.9	66.3	629.2	15.3	15.3	36.9	0.5	37.4	61.4	0.7	62.1	10.4	11.7	22.3	1.5	5.3
Eastern	156.0		156.0	11.9	11.9	5.4		5.4	45.0		45.0	2.2	6.0	12.8		
Luapula	48.1		48.1	9.6	9.6	0.3		0.3	20.1		20.1	41.2	5.0	4.9		
Northern	84.0		84.0	43.6	43.6	4.0		4.0	22.8		22.8	40.3	3.2	25.6		
North-Western	28.8		28.8	9.4	9.4	11.7		11.7	4.5		4.5	34.0	2.1	4.6		
Western	86.4		86.4	40.7	40.7	19.3		19.3	6.9		6.9	33.6	2.3	4.9		
Sub-total	403.2	—	403.2	115.2	115.2	40.6	—	40.6	99.3	—	99.3	151.3	18.6	52.8	—	0.2
TOTAL	966.2	66.4	1,032.6	130.5	130.5	77.5	0.5	78.0	160.6	0.7	161.4	161.7	30.3	75.1	1.5	5.5
Yield (ton/ha)																
Central	1.3	2.9	1.6	0.5	0.5	0.5	1.0	0.5	0.5	0.7	0.5	0.8	1.4	0.5	1.3	165.4
Copperbelt	0.8	2.0	0.8	0.3	0.3	1.6		1.6	0.5		0.5	0.6	0.9	0.4		
Southern	0.6	3.6	0.8	0.3	0.3	0.6	1.0	0.6	0.4	0.5	0.4	1.0	1.1	0.5	1.3	176.4
Average	0.8	3.2	1.0	0.4	0.4	0.8	1.0	0.8	0.5	0.4	0.5	0.6	1.1	0.4		169.8
Eastern	0.9		0.9	0.5	0.5	0.4		0.4	0.3		0.3	1.5	0.8	0.2		
Luapula	0.6		0.6	0.8	0.8	0.3		0.3	0.4		0.4	1.1	1.2	0.4		
Northern	0.7		0.7	0.9	0.9	1.1		1.1	0.5		0.5	1.2	0.9	0.3		
North-Western	1.0		1.0	0.7	0.7	0.5		0.5	0.4		0.4	1.0	1.0	0.6		
Western	0.5		0.5	0.5	0.5	0.6		0.6	0.5		0.5	0.5	1.0	0.4		
Average	0.7	—	0.7	0.7	0.7	0.6		0.6	0.4		0.4	1.0	1.0	0.4		
AVERAGE	0.8	3.2	0.9	0.6	0.6	0.7	1.0	0.7	0.4	0.9	0.4	1.0	1.0	0.4	1.3	171.3

1/ Totals may not add up due to rounding

Conversions used			
Maize	1 bag = 90 kg	Cassava	1 bag = 80 kg
Millet	1 bag = 90 kg	Sweet Potatoes	1 bag = 56 kg
Groundnut	1 bag = 80 kg	Legume	1 bag = 90 kg
Cotton	1 kg = 2.2 lbs	Tobacco	1 bag = 90 kg
1 ha = 2 47 acres			

Source   CSO, Census of Agriculture, 1970-71 (First Report). May 1974
CSO Agricultural and Pastoral Production 1970, February 1973

Table 2.4: CROP YIELDS
(SUMMARY OF CROP CUTTING SURVEY, 1970/71 1/)
(in kg/ha)

	Maize	Millet	Sorghum	Beans	Cassava	Shelled Groundnut
Central	1,574	3,057	938	1,452	2,511	777
Copperbelt	1 816	-	1,665	2,541	2,480	2,063
Eastern	1,332	1,483	787	696	927	956
Luapula	665	2,694	1,363	1,212	1,913	1,225
Northern	1,514	2,572	1,483	1,272	2,093	1,284
North-Western	1,634	3,601	1,392	1,514	2,272	1,045
Southern	1,089	-	756	938	-	1,016
Western	1,300	-	576	302	1,166	628
Average	1,363	2,541	1,120	1,212	1,883	1,136

1/ 1 bag = 80 kg for cassava or groundnuts
    1 bag = 90 kg for other crops
    1 ha = 2.47 acres

Source: CSO, Census of Agriculture, 1970-71 (First Report), Lusaka, May 1974.

Table 2.5: MARKETED MAIZE PRODUCTION
(in 1000 90kg Bags)

Harvest Year	Central	Copperbelt	Eastern	Luapala	Northern	North-Western	Southern	Western	Total
1964	1,323.9	3.0	95.0	2.0	15.7	-	811.1	1.0	2,251 7
1965	1,889.2	3.9	80.3	4.1	19.6	1.2	899.8	1.0	2,899.1
1966	2,330.3	10.6	150.8	11.6	28.3	1.5	1,705.6	2.1	4,240 8
1967	2,326.3	20.1	89.5	14.9	69.0	17.3	1,680.5	5.4	4,222.7
1968	1,590.0	15.7	117.3	23.3	93.2	13.2	1,031.7	23.0	2,908.2
1969	1,322.2	27-6	26.1	36.7	113.8	28.3	1,443.6	21.9	3,020.2
1970	903.2	6.7	15.6	19.6	56.8	15.2	461.4	11.8	1,490.3
1971	2,604.4	33.1	152.0	25.4	63.8	33 1	1,504.2	27.8	4,443.8
1972	4,196.7	28.7	334.8	28.8	72.2	38.6	2,115.0	35.8	6,850.6
1973 [1]	2,510.1	132.5	505.9	15.6	59.0	25.7	1,170.6	14.7	4,434.0
1974 [1]	3,490.3	60.8	608.5	14.7	62 0	29.7	1,911.0	30.1	6,207.1

[1]/ MRD, Planning Unit.

Source: Ministry of Planning and Finance, Economic Report, 1973.

Table 2.6:   MARKETED PRODUCTION OF PADDY
(in 80 kg bags)

P R O V I N C E S

Harvest Year	Eastern	Luapula	Northern	North-Western	Western	Total
1967	-	180	-	50	500	730
1968	10	680	80	30	390	1,190
1969	170	1,010	460	100	250	1,990
1970	10	670	1,140	90	170	2,080
1971	820	250	1,400	70	360	2,900
1972	800	810	1,370	50	150	3,180
1973 1/	810	3,850	1,740	-	270	6,670

1/ Estimated.

Source: Ministry of Rural Development.

Table 2.7:   VIRGINIA FLUE-CURED TOBACCO PRODUCTION

Harvest Year	No. of Reg. Growers	Area (hectares)	Hectares per Grower	Crop Marketed (ton)	Average Yield (kg/ha)	Total Value (1000 k)	Average Price (N/kg)
1964	332	10,441	31.4	10,962	1,050	5,619	51 3
1965	265	6,639	25.1	6,600	994	3,973	60 2
1966	246	6,868	27.9	6,566	956	4,431	67.5
1967	210	4,605	21.9	4,947	1,074	4,791	96.8
1968	242	5,924	24.5	6,279	1,060	4,228	67.4
1969	237	5,829	24.6	5,023	862	3,902	77.7
1970	221	5,467	24.7	4,792	877	3,841*	80.2*
1971	212	5,634	26.6	5,908	1,049	4,782*	80.9*
1972	225	4,920	21.9	5,532	1,124	4,924*	89.0*
1973	321	5,352	20.5	6,223	1,163	5,347*	85.9*
1974	n.a.	6,738	n.a.	6,201	920	6,118	98.7

* Including Subsidy.

Source: Tobacco Board of Zambia.

Table 2.8: BURLEY TOBACCO PRODUCTION

Harvest Year	Area (hectares)	Crop Marketed (ton)	Average Yield (kg/ha)	Total Value (1,000K)	Average Price (n/kg)
1964	3,520	1,703	484	669	39.3
1965	3,202	1,993	662	639	32.1
1966	1,266	855	676	267	31.2
1967	547	275	502	75	27.5
1968	446	285	640	126	44.1
1969	408	240	588	122	50.7
1970	436	255	584	143	56.2
1971	611	388	635	218	56.2
1972	569	385	676	221	57.3
1973	811	471	580	291	61.7
1974	749	430	574	379	88.2

Source: Tobacco Board of Zambia.

Table 2.9: MARKETED GROUNDNUT PRODUCTION (OIL PRODUCING VARIETIES)
(In 180 1b/80 kg Bags)

Harvest Year	Provinces			Total	Total in Tons
	Central	Southern	Others		
1964	5,160	4,460	6,580	16,200	1,296
1965	1,890	810	7,030	9,730	778
1966	1,000	880	3,230	5,110	409
1967	1,000	7,010	2,490	10,500	840
1968	1,050	4,770	1,250	7,070	566
1969	1,110	7,210	1,240	9,560	765
1970	2,690	4,740	340	7,770	622
1971	2,290	3,140	510	5,940	475
1972	3,340	1,570	130	5,040	403
1973 1/	1,000	1,730	70	2,800	224

1/ Estimates.

Source: Ministry of Rural Development.

Table 2.10: PRODUCTION OF GROUNDNUTS IN EASTERN PROVINCE

Harvest Year	No. of 80 kg bags/180 lb bags	In metric tons
1964	28,250	2,260
1965	72,830	5,826
1966	136,080	10,886
1967	170,840	13,667
1968	58,960	4,717
1969	86,180	6,894
1970	32,290	4,740
1971	68,720	5,498
1972	75,980	6,078
1973*	32,000	2,560

* Estimate: 1964-1970: 180 lb bag (shelled nuts)
             1971-1973: 80 kg bag (shelled nuts).

Source: Ministry of Rural Development.

Table 2.11: SUGARCANE AND SUGAR PRODUCTION

	Sugarcane Productions (ton)			Area (ha)			Yield (ton/ha)		Sugar Production	Sugar Yield
	Estate	Farmers	Total	Estate	Farmers	Total	Estate	Farmers	(ton)	(ton/ha)
1968	175,721	7,692	183,413	1,406	77	1,483	125.0	99.9	21,509	14.5
1969	241,705	15,053	256,758	2,289	163	2,452	105.6	92.3	30,417	12.4
1970	304,641	17,016	321,657	2,659	212	2,871	114.6	80.3	40,132	14.0
1971	309,258	21,479	330,737	3,315	260	3,575	93.3	82.6	41,546	11.6
1972	372,328	25,035	397,328	3,421	244	3,665	108.8	102 7	51,118	13.9
1973 1/	423,650	22,700	446,350	4,300	200	4,500	98.5	113.5	56.500	13.0

1/ Estimates.

Source: Zambia Sugar Company.

Table 2.12: NUMBER OF CATTLE - TRADITIONAL SECTOR [1]

	Central	Copper-Belt	Eastern	Lua-pula	Northern	North-western	Southern	Western	Total number of cattle of which:				
									Total	Cows & Heifers	Bulls	Calves	Oxen
1964	107,566	3,110	173,807	n.a.	51,877	10,945	450,574	271,163	1,069,042	528,185	29,344	201,607	309,906
1965	115,758	2,909	172,181	2,761	49,593	12,474	475,466	283,655	1,111,858	542,259	38,502	215,413	315,683
1966	128,891	3,130	180,589	2,625	48,888	14,363	488,760	300,912	1,168,158	572,133	33,995	229,027	333,003
1967	138,544	4,534	185,657	2,741	47,285	16,992	517,181	329,026	1,242,243	607,525	36,780	240,594	357,344
1968	146,469	5,291	194,459	3,257	56,041	18,308	498,880	328,346	1,251,051	607,985	38,061	240,120	364,885
1969	162,637	4,341	196,729	4,357	60,909	21,798	567,291	349,271	1,357,333	663,570	40,580	262,668	390,515
1970	165,643	4,624	177,179	6,337	67,258	23,508	615,043	353,731	1,413,323	692,791	44,959	273,592	401,981
1971	168,845	5,963	161,619	9,131	81,795	30,873	607,320	338,646	1,444,192	718,991	47,022	272,394	405,785
1972	186,574	6,910	179,297	9,272	88,199	30,260	616,232	372,588	1,489,332	738,921	46,290	285,356	418,765

1/ Number of cattle held by the commercial sector is estimated to be 210,000 heads in 1972.

Source· MRD, Quarterly Agricultural Statistical Bulletin, June 1974 (Advanced Copy).

Table 2.13: CATTLE POPULATION, BEEF PRODUCTION, IMPORTS AND CONSUMPTION
(in 1,000 head)

| Year | Cattle Population | | | Beef Consumption | | | |
	Total	Traditional	Commercial[1]	Domestic[2] Marketed Slaughterings	Imports[3]	Exports	Consumption
1964	1,207	1,069	190	71	25	6	90
1965	1,302	1,112	190	69	16	1	84
1966	1,324	1,168	156	63	33	-	96
1967	1,407	1,242	165	54	39	-	93
1968	1,433	1,251	182	47	52	-	99
1969	n.a.	1,357	n.a.	49	56	-	105
1970	n.a.	1,379	n.a.	68	43	-	111
1971	1,627	1,444[4]	183[5]	68	66	-	134
1972	n.a.	1,489[4]	n.a.	72	94	-	166
1973*	n.a.	n.a.	n.a.	94	47	-	151

*Estimate

1/ Includes both beef and dairy cattle
2/ Includes only recorded official domestic slaughterings
3/ Includes imports of live cattle for slaughter. The beef imports are converted to a head basis assuming 181 Kg per carcass.
4/ Includes commercial cattle in all areas except line of rail
5/ Line of rail only including state owned cattle.
6/ Un-recorded local consumption in 1973 is estimated to be 40,000 head.

Source: Ministry of Rural Development
Cold Storage Board

	Grading by Source [1/]			Grading by Type [2/]				
Year	Cold Storage Board	Private Butchers	TOTAL GRADINGS	Super Choice	Standard	Commercial	Vealers	Others [3/]
1964	51,576	12,222	65,978	n.a.	n.a.	n.a.	n.a.	n.a.
1965	49,467	13,277	62,744	n.a.	n.a.	n.a.	n.a.	n.a.
1966	39,556	15,293	54,849	14,580	12,453	24,097	2,588	1,131
1967	29,035	17,635	46,670	15,430	10,984	17,042	2,391	823
1968	20,604	13,495	34,099	7,831	12,722	12,141	1,078	327
1969	21,735	15,144	36,879	7,998	14,480	13,082	981	338
1970	37,205	17,165	54,370	9,468	20,307	21,580	1,264	1,751
1971	29,328	22,466	51,794	10,839	20,048	19,081	1,007	729
1972	29,382	21,401	50,783	14,080	17,352	17,657	700	984
1973	56,514	21,971	78,485	18,944	30,357	27,362	539	1,283

1/ C.S.B. slaughterings include slaughterings of live imported cattle.
2/ The grading structure was changed in March 1965, January 1968 and April 1972. The grading figures for 1964 and 1965 are not given since they are not comparable with the later figures.
3/ Others include cattle condemned or detained.

Source: Ministry of Planning and Finance, Economic Report, 1973.
    Cold Storage Board
    CSO, Quarterly Agricultural Statistical Bulledin, June 1974 (Advanced Copy)

Table 2.15: CATTLE SLAUGHTERED BY COLD STORAGE BOARD AND PRIVATE BUTCHERS
(in head)

Year	Western	Southern	Eastern	Northern	Copperbelt	Central	Luapula	North-Western	Total
Cold Storage Board [1]									
1964	-	25,261	-	-	7,307	12,755	-	-	45,323
1965	-	21,661	-	-	8,948	9,238	-	-	39,847
1966	-	20,836	-	-	2,331	6,019	-	-	29,186
1967	-	14,478	-	-	2,878	5,191	-	-	22,547
1968	-	7,194	-	-	561	12,829	-	-	20,584
1969	-	5,404	1,853	-	351	14,127	-	-	21,735
1970	-	15,889	3,527	-	131	16,358	-	-	35,905
1971	-	12,748	3,668	-	346	12,318	-	-	29,080
1972	-	12,197	2,712	-	706	13,520	-	-	29,135
Private Butchers - Graded									
1964	-	n.a.	n.a.	-	n.a.	n.a.	-	-	12,222
1965	-	27	-	-	913	12,227	-	-	13,277
1966	-	12	-	-	1,171	14,110	-	-	15,293
1967	-	29	-	-	3,370	14,236	-	-	17,835
1968	-	32	-	-	2,114	11,349	-	-	13,495
1969	-	80	-	-	1,702	13,362	-	-	15,144
1970	-	54	-	-	1,470	15,641	-	-	17,165
1971	-	36	164	-	5,983	16,283	-	-	22,466
1972	-	186	44	-	5,927	15,244	-	-	21,401
Private Butchers - Ungraded									
1964	3,280	3,790	3,310	1,200	1,690	140	-	-	13,410
1965	3,350	3,820	5,280	1,250	2,020	640	-	-	16,360
1966	4,430	4,210	5,810	1,670	1,500	530	140	-	18,290
1967	3,340	3,650	3,490	1,790	730	630	120	-	13,750
1968	3,200	3,660	3,310	2,040	570	400	210	-	13,390
1969	2,990	3,250	2,920	1,460	1,000	-	280	-	11,900
1970	2,560	3,180	2,220	2,080	2,880	-	220	2,060	15,200
1971	2,770	3,500	2,480	1,940	3,170	500	220	1,420	16,000
1972	3,690	4,610	3,200	3,470	5,000	530	-	1,160	21,660
Total Slaughtered									
1964	3,280	29,051[2/]	3,310[2/]	1,200	8,997[2/]	12,895[2/]	-	-	70,955
1965	3,350	25,508	5,280	1,250	11,881	22,215	-	-	69,484
1966	4,430	25,058	5,810	1,670	5,002	20,659	140	-	62,769
1967	3,340	18,157	3,490	1,790	6,978	20,057	120	-	53,932
1968	3,200	10,886	3,310	2,040	3,245	24,578	210	-	47,469
1969	2,990	8,734	4,773	1,460	3,053	27,489	280	-	48,779
1970	2,560	19,123	5,747	2,080	4,481	31,999	220	2,060	68,060
1971	2,770	16,284	6,312	1,940	9,499	29,101	220	1,420	67,546
1972	3,690	16,993	5,956	3,470	11,633	29,294	-	1,160	72,196

1/ Cold Storage Board figures exclude imported cattle from Botswana and slaughtered at Livingstone abattoir
2/ Excludes graded slaughted cattle by private butchers

Source: MRD, Quarterly Agricultural Statistical Bulletin, June 1974 (Advanced Copy).

Table 2.16: NUMBER OF PIGS AND SHEEP - TRADITIONAL SECTOR
(in head)

	Central		Copperbelt		Eastern		Luapula		Northern		North Western		Southern		Western		Total Zambia	
	Pigs	Sheep & Goats	Pigs	Sheep & Goats	Pigs	Sheep & Goats	Pigs	Sheep & Goats	Pigs	Sheep & Goats	Pigs	Sheep & Goats	Pigs	Sheep & Goats	Pigs	Sheep & Goats	Pigs	Sheep & Goats
1964	307	2,491	143	989	47,411	49,380	n.a.	—	322	23,049	2,296	7,995	10,989	89,745	340	1,121	61,808	174,770
1965	350	1,754	125	370	49,000	56,673	17	15,676	173	11,459	4,721	9,989	11,432	88,820	419	607	66,121	179,978
1966	146	2,961	268	736	63,438	61,337	23	9,301	250	9,077	4,088	2,907	10,810	100,119	605	779	79,219	196,200
1967	334	2,611	632	323	70,145	75,691	43	8,950	235	6,880	4,317	14,808	11,850	108,258	920	904	88,376	218,425
1968	386	1,657	225	949	60,913	71,479	207	13,165	1,381	9,690	4,346	14,476	12,051	100,528	735	644	80,244	212,588
1969	462	978	253	1,064	56,085	65,457	466	22,931	2,257	9,914	4,421	11,636	16,353	136,060	1,857	1,352	82,154	250,382
1970	1,149	6,301	558	803	52,942	71,712	454	26,331	2,650	17,093	4,547	13,956	16,368	150,331	1,344	1,660	80,012	288,187
1971	813	6,940	419	1,113	55,721	60,796	652	28,817	2,889	21,973	5,242	15,117	18,522	142,146	1,947	1,964	86,204	283,894
1972	1,184	7,770	1,219	1,685	53,118	64,227	354	21,205	1,822	25,656	7,736	15,735	13,724	137,550	1,655	1,444	80,812	279,876

Source: MRD, Quarterly Agricultural Statistical Bulletin, June 1974 (Advanced Copy).

Table 2.17: PIG POPULATION AND PORK PRODUCTION, IMPORTS AND CONSUMPTION

(in 1,000 head)

| Year | Total | Pig Population | | Recorded Pig Consumption | | |
		Traditional	Commercial	Domestic Marketed Slaughterings	Imports	Consumption
1965	74	66	8	17	10	27
1966	89	79	10	20	25	43
1967	97	88	9	22	18	40
1968	92	80	12	25	18	43
1969	n.a.	82	n.a.	27	26	53
1970	n.a.	80	n.a.	35	19	54
1971	106	86	20	34	15	49
1972	93	86	n.a.	33	17	50
1973*	n.a.	101	n.a.	35	11	46

* Estimates

1/ Estimates by the Veterinary Department
2/ Includes recorded official slaughterings only; figures of illegal and home consumption
slaughter are not available.
3/ Import figures were converted to head basis assuming 54 kg per carcass.
4/ Includes line of rail commercial farmers only.

Source: Ministry of Planning and Finance, Economic Report, 1973.

Table 2.18:   RECORDED PIG SLAUGHTERINGS IN LINE-OF-RAIL PROVINCES
(in head)

| | Slaughtering by Provinces | | | Slaughtering by: | |
	Southern & Central	Copperbelt [1]/	Total	ZAPP	Private
1965	13,501	3,323	16,824	10,141	6,683
1966	16,069	2,237	18,306	12,117	6,189
1967	17,068	2,924	19,992	12,841	7,151
1968	17,101	5,145	22,246	13,607	8,639
1969	19,160	5,644	24,804	14,430	10,334
1970	25,838	7,290	33,128	21,263	11,865
1971	22,565	9,820	32,385	17,267	15,118
1972	21,078	10,972	32,050	16,859	15,191
1973	26,176	9,112	35,288	21,388	13,900

N.B.   All figures refer to pig slaughtering carried out at officially recognized markets
or abattoirs; illegal, farm and village slaughterings are excluded.

Source: Ministry of Planning and Finance, Economic Report, 1973.

Table 2.19:   INTAKE AND SALES OF MILK BY DAIRY PRODUCE BOARD
(in 1,000 liters)

| Year | Fresh wholemilk sold to D.P.B. by producers | Milk Sales by D.P.B. to Consumers | | |
		Fresh Wholemilk	Fortified Wholemilk	Total
1964	16,020	8,492	-	8,492
1965	18,403	10,650	2,089	12,739
1966	17,602	10,075	7,727	17,802
1967	16,948	9,140	13,125	22,265
1968	17,061	9,963	12,399	22,362
1969	15,225	9,762	15,657	25,419
1970	14,563	11,424	16,374	27,798
1971	14,505	13,080	18,196	31,276
1972	14,638	12,766	20,079	32,845
1973	14,793	n.a.	n.a.	n.a.

Source: Dairy Produce Board.

Table 2.20· DAIRY PRODUCE BOARD MILK INTAKE: VOLUME, AND VALUE BY AREA

	Total Intake			Midlands			Copperbelt			Mazabuka Area		
Period	Volume 1,000 Liters	Volume 1,000 (Kwacha)	Av. Producer Price per liter (Ngwee)	Volume 1,000 Liters	Value 1,000 (Kwacha)	Av. Producer Price per liter (Ngwee)	Volume 1,000 Liters	Value 1,000 (Kwacha)	Av. Producer Price per liter (Ngwee)	Volume 1,000 Liters	Value 1,000 (Kwacha)	Av. Producer Price Per liter (Ngwee)
1967	17,125	1,188	6.9	6,726	450	6.7	2,828	231	8.2	7,570	507	6.7
1968	17,095	1,295	7.6	6,003	493	8.2	3,121	250	8.0	7,971	552	6.9
1969	15,406	1,235	8.0	6,181	456	7.4	2,467	222	9.0	6,758	556	8.2
1970	14,563	1,222	8.4	5,504	450	8.2	2,695	250	9.3	6,361	522	8.2
1971	14,505	1,271	8.8	6,003	517	8.6	3,122	297	9.5	5,381	457	8.5
1972	14,789	1,477	10.0	5,788	554	9.6	4,359	477	10.9	4,642	446	9.6
1973	14,828	1,536	10.4	5,783	628	10.9	4,595	507	11.0	4,450	399	9.0

Source: MRD, Quarterly Agricultural Statistical Bulletin, June 1974 (Advanced copy).

Table 2.21: MILK PRODUCTION AND SALES:
(DAIRIES RUN BY PROJECTS DIVISION ONLY)

(in 1,000 liters)

Dairy	1971		1972		1973	
	Production	Sales	Production	Sales	Production	Sales
Kasama	113	95	168	118	143	1,104
Mansa	195	150	216	144	157	104
Solwezi	107	91	212	135	215	130
Chipata	226	203	367	281	384	350
Mongu	63	57	113	90	84	59
Total Rural	703	597	1,076	768	990	755
Kafubu	495	433	979	866	1,004	880
TOTAL:	1,198	1,030	2,055	1,634	1,994	1,635

Source: Projects Division, Ministry of Rural Development.

Table 2.22: MARKETED POULTRY PRODUCTION

Year	Eggs Quantity 1,000 Eggs	Eggs Value K1,000	Dressed or Live Chicken Quantity 1,000 Birds	Dressed or Live Chicken Value K1,000	Day old Chicks For Export Quantity 1,000 Birds	Day old Chicks For Export Value K1,000	Turkey and Ducks Quantity 1,000 Birds	Turkey and Ducks Value K1,000	Total Value K1,000
1964	17,400	530	650	444	-	-	-	-	974
1965	21,600	675	905	667	-	-	-	-	1,342
1966	27,000	940	1,410	1,176	-	-	27	60	2,116
1967	36,000	1,200	2,100	1,800	-	-	35	76	3,076
1968	54,000	1,710	3,200	3,520	280	60	40	85	5,375
1969	93,000	2,950	3,800	4,180	440	100	46	98	7,328
1970	99,000	3,300	4,000	4,400	665	150	50	101	7,951
1971	108,000	3,600	4,425	4,868	910	190	25	47	8,705
1972	115,200	4,370	5,500	6,050	1,100	275	40	80	10,775
1973	123,500	4,940	6,200	6,820	1,250	300	30	60	12,120

Source: Senior Poultry Office, Ministry of Rural Development.

Table 2.23: POULTRY PRODUCTION BY POULTRY BREEDERS
(in 1,000 heads)

Year	Pullets	Broilers	Cockerels	Total
1967	363	1,515	277	2,155
1968	572	2,349	492	3,413
1969	595	3,041	522	4,058
1970	688	3,778	502	4,968
1971	638	4,395	570	5,603
1972	783	5,263	649	6,695
1973	915	5,822	771	7,508

source: MRD. Quarterly Agricultural Statistical Bulletin, June 1974
(Advanced Copy).

Table 3.1: ESTIMATES OF FISH CATCHES IN MAJOR FISHING AREAS
(in Tonnes, Fresh Weight Equivalent)

Period	Lake Bangweulu	Lake Mweru/ Luapula River	Lake Tanganyika	Kafue River	Lake Mweru Wantipa	Lukanga Swamp	Lake Kariba	Total
1966	7,814	7,230	4,040	6,592	1,672	1,097	1,158	29,085
1967	7,409	5,747	7,104	2,894	2,665	1,423	790	28,232
1968	7,043	5,804	6,331	3,953	3,704	2,068	1,137	30,040
1969	7,409	5,881	4,719	5,728	4,125	1,846	1,085	30,793
1970	7,788	5,596	6,857	5,558	4,216	2,183	2,082	34,280
1971	7,278	6,360	4,980	4,928	3,825	2,290	1,477	31,138
1972	8,307	6,915	4,718	4,752	5,812	2,681	1,577	34,762

source: MRD, Quarterly Agricultural Statistical Bulletin, June, 1974 (Advanced Copy).

Table 4.1: IMPORTS OF MAJOR GRAIN PRODUCTS

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
					Quantities (in tons)					
Wheat in the grain	18,940.1	25,921.7	34,776.8	30,276.4	58,588.9	45,855 3	106,905.6	71,167.8	110,142.2	69,823 7
Rice in the grain	1,540.3	2,228.5	3,213.5	3,317.5	3,536.8	4,225.0	4,617 7	6,885.5	5,577 3	2 719.5
Barley in the grain	-	0.4	0.2	0.3	1.1	-	-	0.7	-	4 4
Maize in the grain	20,851.4	383.6	4,670.1	46.8	21.6	70,985.2	31,161 7	261,728.8	63,224 5	-
Rye in the grain	-	-	-	-	-	-	-	0 9	-	4 8
Oats in the grain	300.5	269.0	219.9	300.0	218.2	135.4	320 1	317.8	0.2	-
Sorghum in the grain	-	11,707.5	10,732.8	5,668.2	3,625.2	2,271.8	187.8	2,050.1	1,929.1	459 1
Cereals, other in the grain	6,946.8	346.2	-	257.3	-	-	160.5	116 5	385.3	1 2
Flour of wheat or melsin	1,460.9	2,921.0	7,563.9	10,311.9	2,888.6	1,161.0	15.3	8,217.7	3,277.5	9,682.1
Groats & meal of wheat, other							0.4	1.5	0.1	0 5
Cornflour	-	49.7	57.1	86.4	87.0	106.2	45.0	39.4	68.6	84 3
Prepared cereal: cornflakes etc.,	378.5	328.7	-	354.1	188.9	24.3	282.7	213.2	351 2	-
Malted Barley	-	3,004.4	-	4,211.8	3,662.3	2,798.9	9,107 4	10,039.4	10,594 3	7,863 8
Malted cereals & malt other	2,600.6	47.5	-	2,551.8	2,655.6	1,852 7	2,105.8	878.7	1,297.0	-
Macaroni, Spaghetti & similar products	194.3	232.9	285.3	220.3	323.9	353.2	146.6	311.8	259.0	-
					Value (in 1,000 Kwacha)					
Wheat in the grain	1,015.6	1,216.6	1,774.6	1,651.0	2,939.2	3,006.9	4,238 2	3,515 4	4,515 4	3,121 0
Rice in the grain	180.0	208.2	395.0	484.2	522.9	674.8	725 2	1,069 9	801.7	501.3
Barley in the grain	-	0.0	0.0	0.0	0.2	-	-	0 0	-	0.5
Maize in the grain	893.6	17.8	192.6	2.6	3.2	3,090.8	1,361.7	18,276.5	3,201.1	-
Rye in the grain	-	-	-	-	-	-	-	0.2	-	0.8
Oats in the grain	13.4	15.4	11.2	16.5	12.2	7 0	16.1	11.7	0 1	-
Sorghum in the grain	-	474.4	455.6	242.4	228.7	136.3	12 4	92.9	111.8	31.3
Cereals, other in the grain	318.6	15.2	-	10.6	-	-	7.8	6 7	20.1	0.3
Flour of wheat or melsin	117.2	217.0	545.4	768.2	185.5	103.9	2 2	962.4	318.3	809 1
Groats & meal of wheat, other	-	-	-	-	-	-		0.5	0 0	0.2
Cornflour	-	9.6	11.2	9.7	11.8	12.8	11.4	5.2	11.9	11 5
Prepared cereal; cornflakes etc.,	124.0	131.0	-	155.4	80.8	6.8	115 6	89 8	150.8	-
Malted Barley	-	302.8	-	398.5	342.3	246.5	659.3	985 9	1,182 5	850 0
Malted cereals & malt other	226.2	6.2	-	269.8	245.2	172.6	263.8	70 0	152.2	-
Macaroni, Spaghetti & similar products	55.6	63.6	74.0	67.4	77.5	98 0	42 5	86 3	73.3	-
					Unit Value (K/ton)					
Wheat in the grain	54	46	52	55	50	66	40	49	42	45
Rice in the grain	116	126	122	146	148	160	157	155	144	184
Barley in the grain	-	166	160	155	192	-	-	77	-	123
Maize in the grain	42	46	-	56	146	44	44	70	51	-
Rye in the grain	-	-	-	-	-	-	-	172	-	171
Oats in the grain	44	58	52	55	56	52	50	37	509	-
Sorghum in the grain	-	40	42	43	63	60	66	45	58	68
Cereals, other in the grain	46	44	-	41	-	-	49	58	52	226
Flour of wheat or melsin	80	74	72	74	64	90	142	117	116	84
Groats & meal of wheat, other	-	-	-	-	-	-	229	298	474	369
Cornflour	-	194	196	112	135	120	253	131	173	136
Prepared cereal; cornflakes etc.,	328	398	-	439	428	282	409	421	429	
Malted Barley	-	100	-	95	93	88	72	98	11	108
Malted cereals & malt other	86	132	-	106	92	93	125	80	117	-
Macaroni, Spaghetti & similar products	286	272	260	306	239	218	290	277	283	-

Source: CSO, Annual Statement of External Trade, 1964-72 and 1973 Computer Printout.

Table 4.2: QUANTITY AND COST OF IMPORTED FERTILIZER

Commodity	Nutrient	Quantity (ton) 1972/73	Quantity (ton) 1973/74	Landed Cost in Lusaka (K/ton) 1972/73	Landed Cost in Lusaka (K/ton) 1973/74	Total Landed Cost (K) 1972/73	Total Landed Cost (K) 1973/74
Tobacco Mixtures:							
A	2-18-15	360	460	121.29	153.40	43,664	70,564
C	6-18-12	11,907	1,000	70.09	157.00	834,610	157,000
V	4-18-15	3,000	3,500	79.43	165.00	238,300	577,500
Maize Mixtures:							
R	20-20-0	15,000	12,500	97.28	149.80	1,459,200	1,872,500
X	20-10-5	33,312	27,000	92.80	164.19	3,091,400	4,433,130
D	10-20-10	30,000	22,600	122.34	156.00	3,670,200	3,525,600
Nitrogenous Fertilizer							
Sulphate of Ammonia	21-0-0	4,000	5,000	63.46	145.20	253,840	726,000
Sodium Nitrate	16-0-0	500	500	87.04	130.00	43,520	65,000
Urea	46-0-0	25,500	15,000	103.31	155.33	2,634,300	2,329.950
Phosphate Fertilizer							
Single Supers	0-19-0	1,500	-	66.27	-	99,400	-
Triple Supers	0-44-0	1,200	3,000	118.37	160.00	142,044	480,000
Potash Fertilizer							
Potassium Chloride	0-0-60	600	800	112.64	130.00	67,584	104,000
Potassium Sulphate	0-0-50	894	250	56.73	124.00	50,720	31,000
TOTAL:		127,773	91,610	98.84	156.89	12,628,782	14,372,244

Source: MRD, Planning Unit.

Table 4.3: EXPORTS OF HIDES AND SKINS
(in number)

SITC		1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
21111	Hides, Bovine, Equine, Suspension Dried	-	3,419	4,748	3,990	-	-	90	48	225	110
21112	Hides, Bovine, Equine, Ground Dried	-	6,534	5,049	8,605	7,637	1,306	-	111	254	5,017
21113	Hides, Bovine, Equine, Dry, Salted	-	11,243	16,610	26,306	13,941	53,645	6,055	17,204	22,450	192,599
21114	Hides, Bovine, Equine, Wet	54,435	52,421	38,636	31,919	57,691	86,440	38,349	42,500	52,975	20,940
21119	Hides, Bovine, Equine, Other	40,000	76,932	17	142,448	4,499	-	84	21	396	1
21121	Skins, Calf, Suspension Dried	5,992	631	-	-	-	-	-	-	-	-
21122	Skins, Ground Dried	-	1,000	-	-	-	-	-	51	-	-
21123	Skins Dry Salted	-	3,151	17	-	-	240	634	680	100	2,672
21124	Skins, Calf, Wet	-	124	80	-	-	346	723	-	-	-
21129	Skins, Calf, Other	-	188	20	-	-	477	27,239	400	610	-
	TOTAL:	100,427	155,643	65,177	213,268	83,768	142,454	73,174	61,015	77,010	221,339

Source: CSO, Annual Statement of External Trade, 1964-72 and 1973 Computer Prinout.

Table 4.4: EXPORT OF AGRICULTURAL COMMODITIES

| | Tobacco | | Maize | | Day-old[1] Chickens | | Timber |
	Ton	1,000 K	Ton	1,000 K	1,000 Head	1,000 K	1,000 K
1964	12,303	5,664	-	-	-	-	816
1965	9,716	4,862	47,270	1,894	-	-	918
1966	7,264	4,522	39,891	1,796	257	53	684
1967	4,449	3,698	198,097	8,749	193	42	599
1968	3,541	2,735	63,988	2,838	203	41	638
1969	3,768	3,163	8,411	374	472	86	666
1970	4,041	2,852	60	-	774	133	529
1971	5,212	3,512	8,598	177	912	156	423
1972	4,181	2,737	1,896	100	1,297	222	100
1973	5,048	4,758	50,086	2,643	1,192	211	5
1974[2]	11,773	3,023	48,956	6,515	568	116	n.a.

1/ CSO, Annual Statement of External Trade 1972 and 1973 Computer Printout.
2/ Only January through June of 1974.

Source: CSO, Monthly Digest of Statistics, July 1974.

SITC Division Number	Commodity	1965	1966	1967	1968	1969	1970	1971	1972	1973
00	Live Animals	476	568	198	119	139	364	439	451	221
01	Meat and Meat Preparations	1,470	2,745	10,537	1,580	6,681	4,486	4,699	9,193	5,244
02	Dairy Products and Eggs	1,119	1,484	2,134	1,674	2,123	3,618	3,807	3,528	3,555
03	Fish and Fish Preparations	882	989	1,580	1,703	3,048	2,860	2,655	2,896	1,536
04	Cereals and Cereal Preparations	2,832	4,141	4,796	5,294	8,770	8,770	26,157	11,784	6,011
05	Fruits and Vegetables	1,874	2,295	3,912	3,152	3,234	2,992	2,619	2,369	1,472
06	Sugar and Sugar Preparations	4,926	1,993	2,694	2,306	1,793	2,213	1,836	1,551	1,519
08	Feeding Stuff for Animal (Excluding Unmilled Cereals)	325	604	435	549	1,049	1,243	1,415	1,481	1,439
09	Miscellaneous Food Preparations	1,469	1,241	1,594	1,726	2,215	2,485	2,929	2,634	2,191
22	Oil-Seeds, Oil Nuts and Oil Kernels	226	15	12	35	38	28	56	54	17
41	Animal Oils and Fats	243	485	374	383	328	538	1,057	581	634
42	Fixed Vegetable Oil and Fats	953	1,734	1,944	1,519	2,486	3,480	3,373	3,095	3,503
	TOTAL:	16,688	18,293	30,209	20,039	31,906	33,077	51,044	39,618	31,238

Source: MRD, Planning Unit.

Table 4.6:   IMPORT VALUES OF FOOD AND OTHER COMMODITIES
(in 1,000 K)

	Food1/	Beverage & Tabacco	Other	Total
1964	14,264	2,890	139,284	156,438
1965	16,532	2,804	191,406	210,742
1966	19,788	3,026	223,302	246,116
1967	21,372	2,127	282,851	306,350
1968	24,129	2,171	298,884	325,184
1969	30,411	2,196	279,190	311,797
1970	30,451	1,175	309,085	340,711
1971	48,193	1,417	349,672	399,282
1972	37,138	1,250	364,083	402,471
1973	24,344	973	321,550	346,867
1974 Jan - June	20,183	554	205,968	226,705

1/ SITC classification 0.

Source: CSO, Monthly Digest of Statistics, July, 1974.

Table 4.7: GROSS VALUE OF IMPORTS AND EXPORTS
(in 1000 K)

| | Exports | | | Imports | Net Export |
	Domestic	Re-Export	Total	Total Imports	
1964	326,872	8,646	335,518	156,438	179,080
1965	375,096	5,198	380,294	210,742	169,552
1966	490,332	3,126	493,458	246,116	247,342
1967	467,016	2,993	470,009	306,350	163,659
1968	540,744	3,671	544,415	325,184	219,231
1969	754,449	12,040	766,489	311,797	454,692
1970	710,388	4,576	714,964	340.711	374.253
1971	480,011	5,166	485,177	399,282	85,895
1972	536,043	5,521	541,564	402,471	139,093
1973	738,004	3,952	741,955	346,867	395,089
1974 Est.	841,000	5,000	846,000	500,000	346,000

Source: CSO, Monthly Digest of Statistics, Sept. 1974.
CSO, Balance of Payments Estimates (Unpublished Tables).

Table 4.8 IMPORTS OF VEGETABLE PRODUCTS

Quality (in tons)

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Potatoes, fresh	2,169.9	2,227.9	-	3,571.4	4,895.4	3,727.9	2,612.5	1,172.5	993.4	103.5
Beans, dried or split	923.3	1,403.7	1,828.8	1,832.0	1,922.9	2,790.8	2,434.2	1,295.9	1,929.3	2,113.5
Cow peas	-	0.4	-	8.7	0.2	42.5	9.8	23.9	752.2	0.3
Gram & Dhal, dried	-	47.9	140.7	50.1	67.9	87.1	172.5	222.8	171.4	194.4
Legumes, dried	158.6	134.4	129.2	53.7	300.0	658.7	175.9	76.9	35.4	11.6
Tomatoes, fresh	-	341.0	49.2	201.6	205.3	95.4	126.5	3.7	-	-
Carrots, fresh	-	83.3	67.6	67.3	58.3	36.7	28.1	0.5	0.6	-
Cabbages, fresh	-	115.2	166.4	88.1	100.1	50.5	67.9	5	-	-
Onions, not preserved	1,548.9	1,494.7	1,578.5	1,341.6	1,652.3	1,798.0	985.8	1,341.5	189.3	97.6
Beans, fresh	-	9.7	-	-	-	-	21.3	81.1	36.4	4.5
Peas, frozen	-	0.9	25.2	24.6	8.5	9.4	7.6	44.6	82.1	13.1
Vegetables in temperature preservative	-	-	-	-	-	-	5.1	2.9	0.4	-
Vegetables, frozen	87.1	161.7	232.7	190.1	216.4	249.4	334.7	30.1	100.9	24.0
Vegetables, fresh	791.1	570.0	256.0	309.2	229.0	147.0	193.9	81.8	46.0	29.4
Locust beans, fresh or dried	-	-	-	-	-	-	0.6	4.4	0.3	-
Vegetables, dried, dehydrated	1.9	20.9	17.6	0.2	0.7	5.1	18.5	11.8	57.8	18.0
Pea & Gram flour	-	36.4	-	29.9	53.5	21.0	17.7	24.3	40.4	-
Beans, prepared or preserved	203.5	258.6	266.8	388.0	474.4	994.1	577.7	584.4	546.6	-
Peas, prepared or preserved	156.4	133.4	112.8	205.6	272.2	583.8	171.5	239.4	190.4	-
Vegetables, prepared or preserved	420.3	85.1	10.5	35.6	521.5	0.7	358.9	255.5	288.2	-
Raw sugar	-	-	1,	42,283.1	22,821.3	6,232.4	44.7	0.2	5.3	-
Sugar, refined, other	18,121.9	26,762.9	22,645.8	4,433.5	11,076.6	8,092.4	17,653.7	13,380.3	14,348.1	-

Value (in 1,000 Kwacha)

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Potatoes, fresh	117.6	149.8	-	213.2	321.7	307.9	255.7	109.7	86.1	8.3
Beans, dried or split	84.8	141.6	18.2	185.5	256.3	390.6	399.6	313.1	527.3	401.0
Cow peas	-	0.0	-	1.3	0.0	5.2	1.9	8.2	96.1	0.0
Gram & Dhal, dried	-	8.8	26.0	9.2	16.8	20.3	41.5	54.0	41.0	51.8
Legumes, dried	21.0	25.0	23.2	10.8	62.0	92.0	37.9	24.8	16.9	5.1
Tomatoes, fresh	-	41.4	7.8	31.8	29.3	15.5	24.4	0.7	-	-
Carrots, fresh	-	6.2	6.4	5.3	3.9	3.4	2.5	-	-	-
Cabbages, fresh	-	7.4	13.2	5.6	4.8	4.7	5.9	0.1	0.0	10.0
Onions, not preserved	46.6	127.4	91.2	175.2	111.7	121.4	147.4	121.7	23.4	0.5
Beans, fresh	-	1.6	-	-	-	-	3.6	30.6	1.7	0.5
Peas, frozen	-	0.4	8.4	7.2	2.4	3.2	1.3	20.7	39.8	6.5
Vegetables in temperature preservative	-	-	-	-	-	-	2.3	1.1	0.2	-
Vegetables, frozen	27.0	49.5	89.0	65.0	78.6	101.5	149.0	14.3	51.5	13.2
Vegetables, fresh	82.0	106.8	41.4	46.1	43.3	29.9	45.0	28.1	20.7	12.6
Locust beans, fresh or dried	-	-	-	-	-	-	0.2	5.5	0.6	-
Vegetables, dried, dehydrated	3.5	6.4	4.8	0.2	0.7	2.4	21.0	7.6	39.8	21.0
Pea & Gram flour	-	8.6	-	5.6	13.2	7.0	5.5	8.1	14.4	-
Beans, prepared or preserved	49.6	65.6	1.8	103.9	97.6	167.6	118.6	131.9	151.6	-
Peas, prepared or preserved	49.6	34.2	.4	59.3	64.1	128.7	43.3	66.5	53.2	-
Vegetables, prepared or preserved	136.4	30.2	.4	11.4	185.1	0.5	106.4	83.9	107.8	-
Raw sugar	-	-	.6	1,673.6	886.2	458.8	3.4	0.0	0.6	-
Sugar, refined, other	1,761.6	2,477.8	1,	321.1	797.2	689.0	1,529.4	1,194.5	1,092.4	-

Unit Value (in Kwacha/ton)

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Potatoes, fresh	54	68	-	60	66	83	98	94	87	80
Beans, dried or split	92	100	100	101	133	140	164	242	273	190
Cow peas	-	-	-	148	276	126	195	342	128	139
Gram & Dhal, dried	-	-	184	183	247	233	240	242	239	267
Legumes, dried	132	-	180	202	207	140	215	322	476	441
Tomatoes, fresh	-	-	158	158	142	163	193	197	-	-
Carrots, fresh	-	-	94	78	67	91	88	85	-	-
Cabbages, fresh	56	66	80	64	48	93	87	84	60	-
Onions, not preserved	-	174	58	131	68	68	150	91	124	103
Beans, fresh	-	186	-	-	-	-	167	377	46	104
Peas, frozen	-	-	330	293	276	339	174	463	485	496
Vegetables in temperature preservative	-	-	-	-	-	-	461	389	369	-
Vegetables, frozen	210	306	374	342	363	407	445	475	510	550
Vegetables, fresh	104	138	162	151	189	204	232	244	449	429
Locust beans, fresh or dried	-	-	-	-	-	-	270	1,262	-	-
Vegetables, dried, dehydrated	1,852	-	272	958	1,055	477	1,140	647	689	1,166
Pea & Gram flour	-	-	-	188	246	332	311	333	357	-
Beans, prepared or preserved	244	-	-	268	206	169	205	226	277	-
Peas, prepared or preserved	318	-	-	288	235	221	252	278	279	-
Vegetables, prepared or preserved	324	-	-	319	355	813	296	328	374	-
Raw sugar	98	92	70	40	39	74	75	150	122	-
Sugar, refined, other	-	-	-	72	72	85	87	89	76	-

Source CSO, Annual Statement of External Trade, 1964–72 and 1973 Computer Printout.

Table 4.9: IMPORTS OF LIVESTOCK AND LIVESTOCK PRODUCTS

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
					Quantity (in tons)					
Bulls not for slaughter 1/ 1/	-	29	53	99	34	32	141	72	131	-
Cow & calves not for slaughter	-	205	1	165	75	102	212	206	762	15
Cattle for slaughter 1/	4,081	10,777	11,071	25	-	18	2,575	1,973	368	735
Pigs not for slaughter 1/	-	58	33	21	-	-	54	3	282	136
Day-old chicks 1/	-	405,060	248,780	252,438	63,499	72,513	29,424	29,759	1,729,012	237.075
Beef, fresh	-	13.8	70 9	198.7	239.3	294.1	232.5	132 3	-	-
Beef, frozen	-	14.8	356.2	2,972.2	5,585.5	8,231 3	4,187.6	3,539 8	12,107.7	6,184.4
Beef, chilled	- 2/	921.8	2,800.3	1,823.2	2,352.1	1,311.2	570.7	1,715.7	1 476 4	69.2
Veal, fresh, frozen or chilled	2,362.1	-	-	33.5	-	-	-	9 9	-	-
Mutton, fresh, frozen or chilled	-	41.5	-	-	381.9	-	30.5	8.7	22 1	0.8
Lamb, fresh, frozen or chilled	-	576.3	-	-	670.1	1,006.3	401.8	442 7	736 1	338.8
Pork, fresh, frozen or chilled	662.2	468.9	-	-	385 1	1,066.2	405.7	434.6	425 5	274.8
Beef, or veal offal	-	27.7	225.9	827.4	1,193.3	260.3	2,029 6	1,542 4	3,395.9	766.7
Pork offal	-	16.7	21.2	1.4	12.1	3.9	3.3	2.1	9 0	-
Meat & offal, other, fresh	-	-	-	-	-	-	125.9	342.7	234.4	0.0
Bacon & ham	-	-	-	-	-	-	38.6	0 3	4 9	12 7
Other meat & offal, salted, dried, smoked	15.0	3.2	-	14.6	31.5	8.5	35 6	0.1	1.8	11 3
Meat or fish extracts and juices	10.0	-	-	7.9	9.5	5 4	-	2.2	3.5	-
Sausages	15.3	-	28.6	81 1	80.1	127.9	379.3	237.4	216.2	-
Meat pastes	2.6	4.0	2.3	8.8	5.5	21.1	22.4	44.8	60.3	-
Bacon & ham, tinned or not tinned	-	54.3	-	430.9	501 6	232.1	219.7	134 2	247.3	- .
Meat preparation, other	-	1,052.0	1,371.2	1,431.2	2,077.8	1,597.3	990.1	1,076.8	678.3	-
					Value (in 1,000 Kwacha)					
Bulls not for slaughter	-	8.6	20.4	41.7	24.6	18 6	62.2	45.5	61.4	-
Cow & calves not for slaughter	-	19.8	1.0	26.8	12.0	22.2	37.0	24.2	63.2	3.0
Cattle for slaughter	157.0	383.4	551.6	6 5	-	10.0	171 2	307.9	37.3	70.4
Pigs not for slaughter	-	1.6	2.0	1.4	-	-	3.0	1.0	47.8	36.8
Day-old chicks	-	107.4	62.8	84.9	51.3	42.7	23.3	19.7	186.2	108.0
Beef, fresh	-	3.0	16.8	44.8	55.4	64.5	63.3	41.9	-	-
Beef, frozen	-	4.2	195.8	1,355.0	2,822.2	3,777.4	2,156.8	1,834.5	6,072.0	3,725 8
Beef, chilled	-	313.4	1,100.2	712.0	1,138.6	557.4	282.3	881.1	755.9	35 8
Veal, fresh, frozen or chilled	694.0 2/	-	-	8.1	-	-	-	6.6	-	-
Mutton, fresh, frozen or chilled	-	18.0	-	-	117.2	-	9.9	2.8	15.5	0.5
Lamb, fresh, frozen or chilled	-	243.4	-	-	250.2	362.8	169.3	185.8	306.9	115 7
Pork, fresh, frozen or chilled	236.0	190.6	-	-	188.0	621.3	233 4	281.8	276.1	223.0
Beef, or veal offal	-	4.2	41.6	193.5	291.9	46.6	421.5	238.7	753 6	170 5
Pork offal	-	4.0	4.6	0.4	5.5	1.2	0 9	0.6	3.1	-
Meat & offal, other, fresh	-	-	-	-	-	-	50.1	167.4	89.9	0 0
Bacon & ham	-	-	-	-	-	-	30.3	0.6	4.7	7 7
Other meat & offal, salted, dried, smoked	14.0	4.2	-	7.3	21.0	2.5	22.5	0.2	3.0	9.1
Meat or fish extracts & juice	14.2	-	-	11.6	15.7	8.4	229.7	2.5	4.2	-
Sausages	12.8	-	16.2	54.6	63.1	88.6	229.7	140.0	139.9	-
Meat pastes	2.2	2.8	1.2	5.4	3.7	13.9	16.0	36.3	23.5	-
Bacon & ham, tinned or not tinned	-	36.0	-	341.9	421.9	186.9	163.5	112.8	157.3	-
Meat preparation, other	-	480.2	636.4	724.9	1,101.9	765.2	601.2	633.7	529.3	-
					Unit Value (in Kwacha/ton)					
Bulls not for slaughter 3/ 3/	-	294,896	383,170	421,394	724,353	582,500	441,475	631,556	468,527	
Cow & calves not for slaughter	-	96,498	944	161,927	160,000	217,647	174,623	117,476	82,951	200,000
Cattle for slaughter 3/	38,466	35,584	49,820	261,600	-	558,000	66,471	156,075	101,367	95,784
Pigs not for slaughter 3/	-	28,862	57,636	67,238	-	-	55,556	330,333	169,660	270,750
Day-old chicks 3/	-	266	252	336	808	589	793	662	108	455
Beef, fresh	-	222	236	226	232	219	272	317	-	-
Beef, frozen	-	284	550	456	505	459	515	518	501	603
Beef, chilled	-	340	392	391	484	425	495	514	512	517
Veal, fresh, frozen or chilled	294	-	-	243	-	-	-	668	-	-
Mutton, fresh, frozen or chilled	-	432	-	-	307	-	326	326	699	580
Lamb, fresh, frozen or chilled	-	422	-	-	373	361	421	420	417	342
Pork, fresh, frozen or chilled	356	406	-	-	488	583	575	649	649	811
Beef or veal offal	-	150	-	234	245	179	208	187	222	222
Pork offal	-	234	218	295	455	299	287	309	347	-
Meat & offal, other, fresh	-	-	-	-	-	-	398	488	379	889
Bacon & ham	-	-	-	-	-	-	784	2,298	950	607
Other meat & offal, salted, dried, smoked	936	1,314	-	500	666	295	632	2,260	1,658	809
Meat or fish extracts & juice	1,414	-	-	1,455	1,661	1,556		1,168	1,202	-
Sausages	840	-	564	673	788	692	606	590	647	-
Meat pastes	822	688	550	607	676	660	712	810	389	-
Bacon & ham, tinned or not tinned	-	664	-	794	841	805	744	841	636	-
Meat preparation, other	-	456	464	506	530	479	607	589	780	-

1/ In number of head.
2/ Beef & veal, fresh, frozen, chilled.
3/ Kwacha per 1,000 head.

Source CSO, Annual Statement of External Trade, 1964-72 and 1973 Computer Printout.

Table 4.10: IMPORTS OF DAIRY AND FISH PRODUCTS

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Quantity (in tons)										
Milk condensed, skimmed	5.7	16.3	3.1	32.9	151.2	333.1	770.0	701.9	344.7	394.2
Cream preserve, tinned	-	-	-	23.3	82.3	30.7	49 4	58.6	21.8	-
Milk powder, skimmed	352.7	457.9	775.4	1,543.6	1,774.4	2,111.7	2,714.4	3,857.5	2,501.2	1,633.1
Milk powder, full cream	423.0	416.0	577.3	1,117.9	467.4	911.4	969.8	901.4	333 0	385.5
Milk prepared for infants	-	-	-	-	-	-	1,574.7	1,300 4	1,139.7	1,013.6
Butter	561.6	444.5	783.9	567.1	697.6	720.1	643.9	963 0	966.6	1,450.5
Ghee	-	1.3	1.3	21.0	2.8	216.9	181.5	391.4	80.5	29.1
Cheese, Cheddar and Gouda	1.3	149.7	396.7	265.3	306.9	70.0	240.8	522 6	224 1	190.5
Cheese, other, tinned or processed	100.1	163.6	97.3	179.2	184.1	416.2	242.1	296 4	211 6	39 3
Fish, fresh, frozen or chilled	532.6	594.1	503.2	564.5	613.3	602.8	443.8	314.1	336 3	173 5
Fish, salted, smoked or prepared	3,807.5	4,326.5	3,844.9	4,593.9	3,585.1	5,608.0	5,741.0	6,005 8	5,235.7	2,798.6
Fish pastes, fish preparations	410.5	679.5	1,030.2	1,805.3	2,370.6	2,065.2	1,376.3	846.5	3,098 1	
Value (in 1,000 Kwacha)										
Milk condensed, skimmed	1.0	4.8	1.0	7.8	41.0	84.3	193.8	181.3	96.3	149.2
Cream preserve, tinned	-	-	-	10.7	36.1	13.9	32.4	21.4	14.8	-
Milk powder, skimmed	79.4	130.0	186.0	420.8	343.7	378.6	569.9	915.8	741 8	742.2
Milk powder, full cream	258.6	321.2	462.2	741.7	268.2	579.9	669.7	656.9	193.1	339.9
Milk prepared for infants	-	-	-	-	-	-	1,101.4	777.2	743 2	881.3
Butter	365.8	414.6	475.8	263.1	270.5	264.6	194.0	383.1	744.3	977.6
Ghee	-	0.6	0.4	4.6	1.7	88.3	78.4	181 0	68 9	22 9
Cheese, Cheddar and Gouda	1.0	71.8	182.2	125.9	124.6	31.4	100.5	229.9	110.6	111.4
Cheese, other, tinned or processed	84.0	129.6	80.6	130.6	118.6	221.8	142.9	200.5	204.8	31.1
Fish, fresh, frozen or chilled	215.2	245.4	247.2	232.1	277.6	282.7	213.8	147.0	217.6	183.7
Fish, salted, smoked or prepared	285.2	466.2	491.4	631.5	590.6	2,026.3	1,994.0	1,966.8	1,365.7	672 6
Fish pastes, fish preparations	180.8	312.4	385.0	682.5	786.7	696.9	528.3	344.6	1,081.3	
Unit Value (in Kwacha/ton)										
Milk condensed, skimmed	190	296	300	236	271	253	252	258	279	378
Cream preserve, tinned	-	-	-	458	438	452	655	366	682	-
Milk powder, skimmed	226	284	240	273	194	179	210	237	297	455
Milk powder, full cream	612	772	800	663	574	636	691	729	590	882
Milk prepared for infants	-	-	-	-	-	-	699	598	652	869
Butter	652	708	606	464	388	368	301	398	770	674
Ghee	-	506	274	220	598	407	432	463	856	786
Cheese, Cheddar and Gouda	790	480	460	475	406	449	417	440	494	585
Cheese, other, tinned or processed	840	792	828	429	645	533	590	676	968	790
Fish, fresh, frozen or chilled	404	412	492	411	453	469	482	468	647	1,058
Fish, salted, smoked or prepared	100	108	128	137	165	361	347	327	261	240
Fish pastes, fish preparations	440	460	374	378	332	337	384	407	349	

Source: CSO, Annual Statement of External Trade, 1964-72 and 1973 Computer Printout.

Commodity	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
					Quantities (in tons)					
Bran, Pollard, Sharps	-	7,854.7	8,432.1	7,359.5	10,478.5	10,270.2	9,084.6	4,782.7	5,901.6	136.1
Day-old Chicken 1/		52.9	256.8	192.8	203.2	471.6	774.1	912.0	1,297.0	1,192.1
Maize (in the grain)	12.2	47,272.0	39,892.1	198,100.9	63,989.7	8,441.5	0.5	8,597.7	1,896.0	50,085.8
Maize (Ground or Prepared)	1,959.5	1,743.3	484.3	141.0	18.1	-	2.7	-	-	7.3
Groundnuts (Shelled)	618.9	2,712.6	3,479.4	4,450.7	6,167.6	3,799.4	3,921.4	3,433.2	2,447.4	3,626.4
Groundnuts (Unshelled)	-	0.2	-	-	-	976.3	0.3	-	-	-
Cotton Linters	-	215.1	983.8	855.6	278.4	21.3	-	4,568.0	1,173.8	-
Cotton Seeds	543.8	-	-	-	-	-	5,659.6	-	6,637.5	237.9
Cotton Waste	33.8	104.6	78.8	101.8	97.9	24.7	-	-	-	-
Raw Cotton	463.9	49.9	-	-	-	-	-	-	-	-
Tobacco: Burley	1,717.9	2,038.0	909.8	245.3	65.1	91.9	49.2	45.0	115.7	-
Tobacco: Virginia	10,124.2	7,284.5	6,342.6	3,947.1	3,449.8	2,736.8	3,302.5	4,495.1	3,551.9	5,025.9
Tobacco: Turkish	431.2	387.2	17.0	165.6	-	-	115 8	-	-	-
Tobacco: Other	-	40.6	-	44.2	26.1	938.4	563.1	671.9	513 5	5.6
					Value (in 1,000 Kwacha)					
Bran, Pollard, Sharps	-	178.7	208.4	142.2	170.2	146.3	161.6	91.8	116.4	2.2
Day-old Chicken	-	12.2	52.8	41.8	40.5	86.1	132.9	155.6	212.0	210.9
Maize (in the grain)	0.4	1,893.5	1,796.2	8,749.0	2,837.9	373.7	0	176.6	100 1	2,642.9
Maize (Ground or Prepared)	108.4	105.9	20.5	6.9	1.4	-	0	-	-	0.8
Groundnuts (Shelled)	95.1	629.0	730.0	659.8	1,012.5	839.7	741.3	690.7	583.8	1,059.8
Groundnuts (Unshelled)	-	0	-	-	-	229.8	0	-	-	-
Cotton Linters	-	102.7	512.6	370.8	128.0	8.5	-	1,560.3	522.9	-
Cotton Seeds	14.9	-	-	-	-	-	276.5	-	312.6	120 6
Cotton Waste	2.8	10.4	5.2	6.0	6.0	1.5	-	-	-	-
Raw Cotton	218.7	23.2	-	-	-	-	-	-	-	-
Tobacco: Burley	605.1	639.3	312.1	56.9	38.7	56.4	3.4	10.8	1.2	-
Tobacco: Virginia	4,857.6	4,054.9	4,190.1	3,526.2	2,688.9	2,415.2	2,325.5	3,055.9	2,354.9	4,754.3
Tobacco: Turkish	200.7	167.0	11.6	91.9	-	-	76.5	-	-	-
Tobacco: Other	-	13.3	-	22.7	11.2	691.5	447.1	444.9	380.8	3.7
					Unit Value (K/ton)					
Bran, Pollard, Sharps	-	23	25	19	16	14	18	19	20	17
Day-old Chicken 2/	-	230	206	217	200	183	172	172	163	177
Maize (in the grain)	36	40	45	44	44	44	37	21	53	53
Maize (Ground or Prepared)	55	61	42	49	77	-	55	-	-	103
Groundnuts (Shelled)	154	232	210	148	164	221	189	201	239	292
Groundnuts (Unshelled)	-	91	-	-	-	235	331	-	-	-
Cotton Linters	-	477	521	433	460	400	-	342	445	-
Cotton Seeds	27	-	-	-	-	-	49	-	47	507
Cotton Waste	84	99	66	59	61	61	-	-	-	-
Raw Cotton	471	465	-	-	-	-	-	-	-	-
Tobacco: Burley	352	314	354	232	594	613	69	241	10	-
Tobacco: Virginia	480	557	661	893	779	883	704	680	663	946
Tobacco: Turkish	465	431	679	555	-	-	660	-	-	-
Tobacco: Other	-	329	-	513	429	737	794	662	742	663

1/ In 1,000 head.
2/ In Kawcha per 1,000 head.

Source: CSO, Annual Statement of External Trade, 1964-72 and 1973 Computer Printout.

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Cereals and Cereal Preparation [1]	3230	1218	3013	-3962	2455	8268	8768	24971	11682	3258
Vegetables and Fruits [2]	1586	1992	2367	2778	3133	2675	2470	2589	2346	1095
Sugar and Sugar Preparations	2287	3034	2322	2694	2305	1793	2213	1836	1550	1515
Meat and Animal Products [3]	3220	2898	6437	7709	9913	11805	10790	11056	15385	10370
Oils and Fats	789	1196	2219	2318	1902	2814	4018	4430	3676	4137
Cotton	-169	-67	-469	-312	-86	43	57	-1506	-433	n.a.
Tobacco	-4159	-3437	-2846	-3454	-2650	-3006	-2719	-3258	-2184	-4690
Other Ag. Commodities [4]	2936	5919	4659	4243	4229	6400	7995	10898	8324	n.a.
Net Import of ALL Ag. Commodities [5]	9720	12753	17702	12014	21201	30792	33592	51016	40364	n.a.
Net Import of Major Ag. Commodities [6]	6783	6741	13086	7631	16783	25116	26217	42566	32141	16084
All Food Imports [7]	15042	17814	22384	23675	26031	33225	34784	52623	40815	29847
% of Total Imports	9.6	8.5	9.1	7.7	8.0	10.3	10.2	13.2	10.1	7.6
All Ag. Exports [8]	8981	9193	9425	14958	8220	6014	5254	7017	5429	-
% of Total Exports	2.7	2.5	1.9	3.2	1.5	0.8	0.7	1.5	1.0	-

1/ Includes prepared cereals and cereal products
2/ Includes all fresh, frozen, dried and processed vegetables.
3/ Includes poultry, milk and similar products.
4/ Refers to all other agriculture commodities not included in above.
   listing such as tea, cocoa, spices, other prepared food, rubber,
   timber, hides and skins, animal and vegetable waxes.
5/ All agricultural commodities refer to SITC sections 0(food and live
   animals); 1(beverages and tobacco); 2(crude material, inedible) and
   4 (animal and vegetable oils and fats).

6/ Major agricultural commodities refer to the above listed items.
7/ All food includes SITC section 0 and 4, but excludes group 43 in section 4
   (animal and vegetable waxes).
8/ All agricultural exports includes SITC sections 0, 1, 2, and 4, excluding
   group 11 of section 1 (beverages) and 27 of section 2 (crude fertilizer and
   mineral) and also 28 in section 2 (metalliferous ores and metal scraps).

Source: Republic of Zambia, Central Statistical Office, Annual Statement of External Trade, 1964-72 and 1973 Computer Printout

Table 5.1:   PRICES OF FERTILIZER TO FARMERS
(Kwacha/50 kg Pocket)

Commodity	Nutrients	1971/72	1972/73	1973/74	1974/75
Tobacco Mixture					
A	2-18-15	2.18	3.00	4.00	4.00
C	6-18-12	2.48	3.20	3.90	3.90
V	4-18-15	2.48	3.15	3.90	3.90
Maize Mixture					
R	20-20-0	2.70	3.55	4.25	4.25
X	20-10-5	2.75	3.50	4.15	4.15
D	10-20-10	2.75	3.50	4.00	4.00
Nitrogenous Fertilizer					
Ammonia Nitrate	34-8-0	2.43	2.95	3.80	3.80
Sulphate of Ammonia	21-0-0	1.83	2.20	3.00	3.00
Urea	46-0-0	2.80	3.55	4.05	4.05
Nitrate of Soda	16-0-0	2.65	3.35	4.00	4.00
Phosphate Fertilizer					
Single Supers	0-19-0	1.48	1.90	1.90	1.90
Triple Supers	0-44-0	3.13	4.00	3.90	3.90
Potash Fertilizer					
Potassium Chloride	0-0-60	2.03	2.60	3.60	3.60
Potassium Sulphate	0-0-50	2.65	3.35	4.20	4.20
Miscellaneous					
Gypsum		1.75	2.10	2.10	2.10
Solubor		20.00	20.00	20.00	20.00

Source: MRD, Planning Unit.

Crops	Unit	1970/71	1971/72	1972/73	1973/74	1974/75	Remarks
1. Maize	90 kg bag	4.00	4.30	4.30	4.30	5 00	Delivered to NAMB main line of rail depots or EPCMA main depots.
	"	3.20	3.50	4.00	4.00	5.00	Delivered to EPCMA Village markets
	"	5.00	5.00	4.30	4.30	5 00	Delivered to Mongu
	"	4.80	5.00	4.30	4.30	5.00	Delivered to Kabompo
	"	3.20	3.50	4.00	4.00	5.00	Floor Price
2. Groundnuts	80 kg bag	10.20	10.20	12.60	17.00	17.00	Grade A. NAMB line of rail depots.
	"	-	9.90	12.00	16.00	16.00	Grade B. NAMB line of rail depots.
	"	9.60	9.60	12.60	17.00	17.00	Grade A. NAMB and NPCMU district centers
	"	-	9.30	12.00	16.00	16.00	Grade B. NAMB and NPCMU district centers
	"	10.80	10.80	12.60	17.00	19.00	Grade A. EPCMA main depots.
	"	9.00	9.00	12.00	16.00	17.00	Grade B. EPCMA main depots.
	"	8.10	8.10	11.40	-	15.00	Grade C. EPCMA main depots.
	"	10.20	10.20	-	-	-	Grade A. EPCMA village markets.
	"	8.40	8.40	-	-	-	Grade B. EPCMA village markets
	"	7.50	7.50	-	-	-	Grade C. EPCMA village markets
3. Sugar beans	90 kg bag	14.00	14.00	14.00	14.00	17.00	NAMB main line of rail depots
	"	10.20	10.20	10.20	10.20	17.00	NAMB and NPCMU district depots
4. Haricot beans	90 kg bag	10.50	10.50	10.50	10.50	-	NAMB line of rail depots
	"	9.60	9.60	9.60	9.60	-	NAMB and NPCMU district depots and EPCMA main depots
5. Soya beans	90 kg bag	8.40	8.40	8.40	13.20	13.20	NAMB line of rail and specified depots
6. Sorghum	90 kg bag	4.70	4.70	4.70	5.00	6.00	Malting grade. Delivered to NAMB
7. Paddy	kg	0.09	0.11	0.11	0.15	0.15	Delivered to district centers
8. Sunflower seed	50 kg bag	4.62	4.62	6.64	8.95	9.40	Delivered to line of rail
	"	-	-	7.50	9.80	-	Delivered to Refined Oil Product, Lusaka
9. Wheat	90 kg bag	-	-	7.50	7.50	12.00	At least 12% protein content. NAMB and Cooperative Union depots.
10. Maize seed	50 kg pkt.	-	16.50	18.00	18.00	18.00	At line of rail
	"	-	11.00	12.00	12.00	12.00	Rural areas
11. Seed cotton, Hand Picked Lusaka							
Grade A	N/kg	17.06	17.07	17.07	25.00	30.00	
Grade B	"	13.02	13.02	13.02	19.00	24.00	
Grade C	"	11.00	11.00	11.00	16.00	21.00	
Hand picked, Chipata							
Grade A	"	17.06	17.07	17.07	25.00	32.00	
Grade B	"	13.02	13.02	13.02	19.00	26.00	
Grade C	"	11.00	11.02	11.00	16.00	23.00	
Machine picked, Lusaka							
Grade A	"	15.05	15.05	15.05	22.00	27.00	
Grade B	"	11.00	11.00	11.00	16.00	21.00	
Grade C	"	8.08	8.08	8.08	13.00	18.00	
Machine picked, Chipata							
Grade A	"	15.04	15.05	15.05	22.00	29.00	
Grade B	"	11.00	11.00	11.00	16.00	23.00	
Grade C	"	8.08	8.08	8.08	13 00	20.00	

Source: Planning Unit, Ministry of Rural Development.

Table 5.3: RETAIL PRICES OF SELECTED AGRICULTURAL COMMODITIES*
(in Kwacha)

	Unit	1973	1974
Fresh Milk	Pint	0.10	0.11
Chedder Cheese	45kg	0.56	0.56
Butter, 1st Grade	250kg	0.37	0.37
Eggs	10 eggs	0.53	0.53
White Bread	800 g	0.13 1/	0.13
Rice	500 g	0.14-0.20	0.20
Wheat Flour	kg	0.14	0.14
Cooking Oil	26 oz	0.40 2/	0.40
Sugar	kg	0.22-0.24	0.24
Fresh Fish	kg	0.28	0.38
Dried Fish	kg	0 64	0.65
Potatoes	kg	0.32 3/	0.23 4/
Onions	kg	0.40 3/	0.21 4/
Cabbage	kg	0.25 3/	0.22 4/
Mealie Meal:			
Kabwe	90 kg	5.31	5.31
Ushaa	90 kg	10.32	10.32
Mongu	90 kg	8.52	8.52
Solwezi	90 kg	6.50	6.50
Kasempa	90 kg	8.00	8.00
Zambezi	90 kg	9.50	9.50
Breakfast Food:			
Copperbelt	50 kg	4.40	4.40
Lusaka	50 kg	4.40	4.40

* In Lusaka except where otherwise specified.
1/ Price increaed from 0.14 to 0.20 K/500 g or K/lb in August, 1973.
2/ Price increased from 0.22 to 0.24 K/kg in August, 1973
3/ Average of 1973
4/ November Prices.

Source: MRD, Quarterly Agricultural Statistical Bulletin, June, 1974,
(Advanced Copy)
CSO, Unpublished Price Worksheets.

Table 5.4: WHOLESALE PRICE OF BEEF AND BEEF PRODUCTS, 1974

Carcass Beef (K/100 kg):

Sides - Choice & Super 1/	101.00
Sides - Standard 1/	93.00
Sides - Commercial 1/	62.60
Forequarters	90.00
Hindquarters	115.00

Beef Cuts (K/kg):

Fillet Steak/Tenderloin	2.64
Rump Steak	2.15
Top Side	1.52
Silverside	1.52
Striploin/Porterhouse	2.15
Thick Flank/Gravy Beef	1.10
Thin Flank	0.74
Chops	1.50
Boneless Forequarters	1.50
Trimings/Skirts	1.10
Beef Pieces	1.10
Brisket-Bone In	0.90

Beef Offals (K/kg):

Tails	0.54
Tongues	0.85
Liver	0.85
Hearts	0.60
Kindey	0.85
Rough Tripe	0.40
Clean Tripe	0.56
Lungs	0.40
Spleen	0.40
Bybles	0.20
Casings	0.20
Cheek Meat	0.60
Head Meat	0.50
Udders	0.10
Fat and Bones	0.09
Cow Heals (each)	0.10
Heads (each)	1.20

1/ Gazetted Prices

Source: Cold Storage Board.

Table 5.5: WHOLESALE PRICES OF OTHER MEAT AND MEAT PRODUCTS, 1974

Imported Lamb (K/kg):

Lamb Carcass	1.70

Local Lamb, Mutton & Goat (K/kg):

Carcass	0.80
Offals - Liver	0.56
Offals - Tongues	0.56
Offals - Hearts	0.56
Offals - Lungs	0.30

Pork (K/kg):

Porkers	0.88
Manufacturing Pigs	0.70
Baconers	0.70
Pork Bones	0.30
Offals - Liver	0.56
Offals - Tongues	0.56
Offals - Hearts	0.56
Offals - Lungs	0.30

Veal (K/kg):

Carcass & Pluck	1.45

Poultry (K/kg):

Chickens	0.94
Ducks	1.30
Turkeys	2.60

Sausages and other Products (K/kg):

Beef Sausages	0.96
Pork Sausages	1.02
Cocktail Sausages	1.14
Frankfurters	1.38
Vienna Sausage	1.30
French Bologna	1.07
Garlic Bologna	1.07
Liver Bologna	1.16

Source: Cold Storage Board.

Table 5.6:   STATUTORY MINIMUM PRODUCER PRICE OF BEEF[1]/
(Kwacha/100 kg c.d.w.)

Period	Grades				
	Choice[2]/	Prime[3]/	Standard[4]/	Commercial[5]/	Utility[3]/
1965	-	35.23	30.39	25.33	20.37
1966	-	35.23	20.39	25.33	20.37
1967 (Apr.)	44.09	40.78	35.40	29.39	24.06
1968 (Jan.)	55.11	-	49.60	35.58	-
1969	55.11	-	49.60	35.58	-
1970	55.11	-	49.60	35.58	-
1971	55.11	-	49.60	35.58	-
1972 (May)	63.90	-	58.30	47.40	-
1973	63.90	-	58.30	47.40	-
1974 (Jan.)	73.50	-	67.05	52.15	-

1/ The minimum producer prices are gazetted by the Statutory Instruments.
Based on this gazetted price, the Cold Stoage Board stipulates monthly
producer prices, and these vary with area and season. In Western and
Eastern Provinces, 10 K/head is being charged as railage cost, compared
to 7 K/head in Southern, Central and Northern Provinces. The producer
price in December is being set highest while the price in March-July
lowest, with a margin of 14 - 15%. In addition, the Cold Storage Board
charges 3% for the cost of condamnation.
2/ Assumes 52% conversion, rate liveweight to c.d.w.
3/ The grades of prime and utility abolished in the beginning of 1968.
4/ Assumes 46% conversion rate liveweight to c.d.w.
5/ Assumes 43% conversion rate liveweight to c.d.w.

Source: MRD, Planning Unit.

Table 5.7: MAXIMUM STATUTORY RETAIL PRICE OF BEEF [1]

Beef Products	1972	1973	1974
Choice and Standard Grade Beef Cut			
Fillet Steak	1.87	1.87	3.30
Porter House	1.54	1.54	2.68
Rump Steak	1.54	1.54	2.62
Rolled Beef	1.32	1.32	2.06
Sirloin T. Bone Steak	1.21	1.21	1.90
Sirloin	1.21	1.21	1.90
Top Side	1.21	1.21	1.90
Silver Side	1.21	1.21	1.90
Aitchbone	1.21	1.21	1.90
Bolo	1.10	1.10	1.36
Gravy Beef	1.10	1.10	1.36
Wing Rib	0.99	0.99	1.30
Beef Ribs	0.77	0.77	0.92
Beef Flank	0.77	0.77	0.92
Chuck and Blade with Bone	0.77	0.77	0.92
Short Rib	0.77	0.77	0.92
Brisket with Bone	0.77	0.77	0.92
Think Flank	0.77	0.77	0.92
Neck	0.70	0.70	0.84
Shin Meat (Bone In)	0.70	0.70	0.84
Commercial Grade Beef			
Cut Beef	-	-	1.00
Beef with Bone	-	-	0.74
Offals and Manufacturing Beef			
Liver	0.88	0.88	1.06
Sausages and Boerewors	0.88	0.88	1.06
Kidney	0.84	0.84	1.06
Tongue	0.84	0.84	1.06
Mince Meat	0.77	0.77	0.92
Lean Trimmings	0.66	0.66	0.80
Heart	0.62	0.62	0.74
Tripe - Clean	0.60	0.60	0.70
Tails	0.57	0.57	0.68
Tripe - Rough	0.44	0.44	0.50
Lungs, Spleen Meat	0.44	0.44	0.50
Brains	0.44	0.44	0.50
Bybles, Casings	0.29	0.29	0.30
Fat-Suet	0.11	0.11	0.12
Bones	0.11	0.11	0.12

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[1] The retail price of beef and beef products have not been changed until 1974, since 1968.

Source: MRD, Quarterly Agricultural Statistical Bulletin, June 1974 (Advanced Copy).

Table 5.8: GUARANTEED MINIMUM PIG PRODUCER PRICES
(Ngwee/kg. c.d.w.)

	Porkers			Baconers			Manufacturing			Av. Producer
	Grade 1 Ngwee Per kg.	Grade 2 Ngwee Per kg.	Grade 3 Ngwee Per kg.	Super Grade A. Ngwee Per kg.	Grade A Ngwee Per kg.	Grade B Ngwee Per kg.	Grade A Ngwee Per kg.	Grade B Ngwee Per kg.	Inferior Grade Ngwee Per kg.	Price Ngwee Per kg. All Grades
1970	57.3	56.2	44.0	57.3	55.1	48.5	44.0	37.5	22.0	46.9
1971	57.3	56.2	44.0	57.3	55.1	48.5	44.0	37.5	22.0	46.9
1972	62.8	59.5	48.5	62.8	59.5	52.9	48.5	41.8	26.5	51.4
1973	62.8	59.5	48.5	62.8	59.5	52.9	48.5	41.8	26.5	51.4
1974	62.8	59.5	48.5	62.8	59.8	52.9	48.5	41.8	26.5	51.4

Source: MRD, Quarterly Agricultural Statistical Bulletin, June, 1974 (Advanced Copy).

Table 5.9:   GUARANTEED MILK PRODUCER PRICES
(NWGEE/Liter)

| Period | Midlands | | | Copperbelt | | | Yearly Average | | |
	Dec to Feb	March to June	July to Nov	Dec to Feb	March to June	July to Nov	Midlands	Copper-Belt	Line-of-Rail
1968	6.2	7.3	8.1	7.3	8.4	9.2	7.2	8.3	7.8
1969	6.8	7.9	8.8	7.9	9.0	9.9	7.8	8.9	8.3
1970	6.8	7.9	8.8	7.9	9.0	9.9	7.8	8.9	8.3
1971	6.8	7.9	8.8	7.9	9.0	9.9	7.8	8.9	8.3
1972	8.6	9.7	10.6	9.7	10.8	11.7	9.5	10.7	10.1
1973	8.6	9.7	10.6	9.7	10.8	11.7	9.5	10.7	10.1
1974	8.6	9.7	10.6	9.7	10.8	11.7	9.5	10.7	10.1

Source: MRD, Quarterly Agricultural Statistical Bulletin, June, 1974 (Advanced Copy).

Table 5.10: INDEX NUMBERS OF CONSUMER PRICES: HIGH INCOME GROUP: ALL CENTRES COMBINED
(1969=100)

	All Items	Food, Beverages & Tobacco	Clothing, & Footwear	Gross Rent, Fuel & Light	Furniture & Household	Medical Care, Health Services	Transport, Communications	Recreation, Entertainment Education	Other Goods & Services
Weight	1,000	309	79	194	130	13	158	79	38
1969	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1970	105.0	103.0	103.5	111.8	104.7	100.1	101.8	103.8	102.2
1971	110.9	109.7	109.4	119.7	109.1	102.0	107.3	110.3	104.2
1972	118.7	119.9	120.0	121.5	118.5	108.4	118.4	113.6	107.7
1973	126.4	128.8	131.9	125.0	128.6	113.2	127.1	119.1	111.4
1974:									
January	133.1	140.5	139.7	125.9	135.7	117.0	133.3	122.6	113.2
February	134.1	141.5	141.4	125.9	136.1	117.0	135.1	125.6	113.4
March	135.1	142.7	142.8	125.9	137.0	117.0	136.6	127.5	114.0
April	135.9	143.2	144.2	125.9	138.0	117.4	138.2	128.5	114.4
May	136.3	143.6	145.4	125.9	138.8	118.0	138.7	129.1	114.7
June	137.3	144.2	146.1	125.9	139.2	118.5	142.3	129.8	114.7
July	138.1	144.6	146.9	125.9	140.0	118.6	145.2	130.5	114.7
August	138.5	145.1	147.4	125.9	140.8	119.0	145.5	131.0	116.9

Source: CSO, Monthly Digest of Statistics, September, 1974.

Table 5.11: INDEX NUMBERS OF CONSUMER PRICES: LOW INCOME GROUP: ALL CENTERS COMBINED
(1969=100)

	All Items	Food, beverages and tobacco	Clothing, footwear	Rent, fuel, lighting	Furnishings and furniture, household equipment	All other goods and Services
Weight	1,000	647	136	111	65	41
1969	100.0	100.0	100.0	100.0	100.0	100.0
1970	102.6	102.3	10.27	102.7	106.7	104.8
1971	108.8	108.8	108.7	105.9	114.2	111.1
1972	114.6	113.9	117.6	108.8	123.3	117.1
1973	121.9	121.5	126.2	113.0	132.4	122.6
1974:						
January	129.0	130.0	132.4	115.3	137.4	125.7
February	129.8	130.9	133.5	115.3	138.0	130.0
March	130.5	131.5	134.3	115.3	138.6	130.5
April	131.0	131.9	135.5	115.3	139.3	130.8
May	131.8	132.0	136.5	115.3	139.8	131.6
June	131.9	132.5	137.1	115.3	140.5	136.3
July	132.4	132.7	137.8	117.6	141.0	136.5
August	132.7	132.9	138.1	118.0	141.8	137.1

Source: Monthly Digest of Statistics, September, 1974.

Table 5.12. INDEX NUMBERS OF WHOLESALE PRICES, 1966=100
(by Industrial Activity)

	Agriculture, Forestry & Fishing				Mining & Quarrying			Manufacturing									
Year/Month	Total all Commodities	Agriculture	Forestry	Fishing	Copper Mining	Other Metallic Mining	Other Mining & Quarrying	Food, Beverages, Tobacco	Textiles, Wearing, Leather Products	Wood Products, Furniture	Paper, Paper Products	Chemicals, Chemical Petroleum, Rubber, Plastic Products	Non-Metallic Mineral Products	Basic Metal Industries	Metal Products	Electricity	Total Non-Copper
Weight	1,000	67	7	8	428	23	8	80	60	10	7	53	15	16	202	16	572
1966	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1967	99.1	100.3	97.0	123.5	92.5	95.1	119.5	111.0	100.1	100.0	101.7	102.3	109.9	101.9	103.6	111.2	103.9
1968	106.7	100.3	97.0	144.5	101.6	95.0	151.8	133.9	108.4	100.3	102.0	103.6	112.2	107.7	107.5	109.5	110.4
1969	119.0	107.7	105.4	162.6	120.6	104.9	153.6	141.4	117.6	106.8	112.8	104.6	121.4	123.8	115.1	96.5	117.4
1970	119.6	127.4	106.4	162.8	117.2	108.2	153.8	142.0	118.5	109.2	116.3	105.9	127.6	127.8	118.1	94.5	121.5
1971	111.3	148.9	109.0	179.9	88.7	103.7	154.9	147.1	118.9	111.4	117.4	107.6	128.1	130.6	126.4	92.8	128.0
1972	114.9	144.8	109.3	194.0	86.7	118.7	158.2	164.6	122.7	112.8	128.8	111.0	129.2	141.7	136.8	92.8	136.4
1973	138.0	148.9	112.7	220.0	130.0	201.3	160.7	174.8	125.1	112.8	130.6	115.1	129.7	142.5	140.1	91.0	143.5
1974:																	
January	151.8	170.7	117.6	220.0	151.2	308.0	161.3	177.0	126.8	112.7	164.9	123.8	129.7	142.5	141.2	85.9	152.3
February	162.5	191.1	117.6	220.0	169.6	346.7	161.3	177.3	126.8	112.7	164.9	123.8	129.7	142.5	141.2	90.6	157.2
March	175.9	191.9	127.4	220.0	198.9	371.9	161.3	177.3	126.8	112.7	164.9	127.3	129.7	142.5	143.7	83.3	158.5
April	187.0	191.9	127.4	258.3	222.0	388.3	161.3	177.5	126.8	112.7	164.9	130.0	129.7	142.5	145.4	89.5	160.9
May	182.7	192.3	127.4	258.3	210.0	388.3	161.3	177.6	126.8	112.7	169.5	130.0	129.7	145.4	148.8	86.2	162.2

Table 6.1: NAMBOARD GRAIN STORAGE CAPACITY, 1974/75
(in 1,000 90 kg bags)

Depots	Silos	Covered Sheds 1/	Open Hard Standing	Total
Permanent Depots				
Kitwe	160	-	-	160
Bwana Mkubwa	250	225	560	1,035
Kabwe/Natuseko	250	150	475	875
Chisamba	250	120	582	952
Lusaka	160	300	803	1,263
Mazabuka	-	80	226	306
Monze	160	195	508	863
Pemba	-	30	175	205
Choma	-	23	496	519
Livingstone	-	40	621	661
Chambishi	-	-	600	600
Sub-total	1,230 2/	1,163	5,046	7,439
Rural Depots				
Mkushi	-	-	120	120
Mumbwa	-	-	60	60
Chipata	-	-	100	100
Luapula Province	-	-	122	122
North Western	-	60	40	100
Western Province	-	66	117	183
Sub-total	-	126	559	685
Transit Depots				
Chipongwe	-	-	20	20
Karubwe	-	-	345	345
Kasavasa	-	-	140	140
Chankwakwa	-	-	50	50
Kapiri Mposhi	-	40	358	398
Senkobo	-	-	20	20
Mayoba	-	-	20	20
Bowood	-	-	30	30
Kalomo	-	-	50	50
Tambero	-	-	20	20
Nega Nega	-	-	40	40
Kaleya	-	-	250	250
Lubombo	-	-	107	107
Tara	-	-	50	50
Sub-total	-	40	1,500	1,540
TOTAL	1,230	1,329	7,105	9,664

1/ All covered sheds in the permanent depots are being used to store fertilizer, seeds and other chemicals. Thus the total silo and covered shed capability for maize is about 2 million bags.
2/ Includes new 750,000 bag silo capacity built by ZCCO.

Source: NAMBoard.

Table 6.2: NUMBER OF DEPOTS FOR CROP INTAKE [1]

Provinces	NAMBoard	ECU	SPCMU	NPCMU	Total
Central	168	-	-	-	168
Southern	68	-	163	-	231
Copperbelt	17	-	-	-	17
Western	75	-	-	-	75
North-western	95	-	-	-	95
Luapula	85	-	-	-	85
Northern	3	-	-	400	403
Eastern	-	273[2]	-	-	273
Total:	511	273	163	400	1,347

[1] Each rural district normally has one permanent depots, i.e. the
District Center, all other depots are seasonal, and may or may not
be mobile depots. A mobile depot is a collection point where lorries
visit according to itineraries to purchase crops.

[2] Consists of 6 main depots, 249 markets and 18 buying points.

Source: NAMBoard and other Marketing Cooperatives.

Table 6.3:   NEW REGISTRATION OF MOTOR VEHICLES

	Passenger Transport		Cargo Transport		Construction Vehicles, Tractors	Motor Cycles	Total
	Passenger Cars	Omnibus	Vans	Trucks			
1964	5,647	15	1,480	445	362	524	8,473
1965	6,366	28	2,686	1,092	479	728	11,379
1966	4,510	37	2,374	1,773	660	1,123	10,477
1967	6,558	71	3,430	1,874	649	1,762	14,344
1968	7,240	36	3,364	1,707	394	2,197	14,938
1969	6,246	86	3,441	1,356	541	1,682	13,352
1970	5,984	54	3,743	1,470	622	1,657	13,530
1971	6,165	152	5,042	2,349	854	1,618	16,180
1972	5,539	274	4,321	1,747	836	1,824	14,541
1973 (Jan-June)	2,766	231	1,727	898	276	760	6,658

Source: CSO, Monthly Digest of Statistics, September, 1974.