INTRODUCTORY ASSESSMENT OF SMALLHOLDER FARMING SYSTEMS IN MALAWI (612-0212)

Prepared as a supplement to "An Assessment of Agricultural Extension and Training in Malawi," PDC-1406-I-01-1132-00 (ALNA No. 235-01).

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TABLE OF CONTENTS

NOTE OF EXPLANATION

These findings were developed as part of a team effort to assess the Agricultural Extension and Training in Malawi. They are presented here as a base document for future reference. The reason for this approach was mentioned in the PID (Malawi 612-0206, p. 22) which states:

"Obviously, the third-mentioned task cannot be carried out as thoroughly as the tasks previously described. Identifying the agronomic, economic and sociological problems of farmers, and specifying the solutions to these problems is a long-range continuing process that should be based on periodic surveys and agricultural research. Nevertheless, the assessment team will need to review the information presently available concerning smallholder decision-making procedures, cultural practices, crop mixes, consumption and cash crop patterns, etc., and to visit areas, in order to provide a broad description and assessment of problems, and to relate these problems to current extension and training practices."

Information assembled relative to the smallholder farming system is presented in this document.

SUMMARY

It is apparent that smallholders (men and women farmers of Malawi) working within the limits of their natural, agronomic, economic and social constraints are experienced and resourceful producers of agricultural commodities.

It is equally apparent that the Extension and Training Service is doing its utmost, within its resources, to meet the needs of the smallholders.

Women perform over fifty percent of the work on smallholders' farms. Their major constraints are their physical limitations in preparing the land and their culture's attitude toward their sex. In all other factors they appear to be equal to their male counterparts.

The Agricultural Development and Marketing Corporation (ADMARC), the most important single economic enterprise in Malawi, controls the smallholder's input and output prices, credit and marketing. As with any organization of this magnitude, there are bound to be problem areas. Those identified as affecting the smallholders are: confusion each season as to the kind of and amount of agricultural commodities to produce; the relationship of prices received by farmers for their output and ADMARC's selling price; and, the strong need for a credit system that provides several options in attaining and repaying credit.

OVERVIEW

Agriculture is the basis of Malawi's Economy. The remarkable growth of the Malawian economy since independence in 1964 has come from the vigor of its agricultural sector. Agricultural production consists of two main sub-sectors, smallholders and estates. This introductory assessment will concentrate on the smallholders (men and women farmers who farm their own holdings of customary land on either a part or full-time basis).

The smallholders account for over 85% of all agricultural production and, except for the 1970, 1976, and 1980 droughts, when maize had to be imported, the smallholders have provided adequate supplies to make their country self-sufficient.

To increase the general level of smallholder production, the Government decided, in 1977, to undertake a National Rural Development Program (NRDP) which would cover the entire country. The NRDP is a 20 year program which aims to:

- increase smallholder production of cash crops for export and for feeding the growing urban populations;
- provide them with the inputs and services required to increase yields; and,
- preserve natural resources by encouraging soil conservation, conserving key watershed areas, and developing forestry resources.

Under NRDP, emphasis is placed on increasing production of land already under cultivation rather than cultivation of new

lands. To this end, the Ministry of Agriculture (MOA) has been reorganized and the country divided into eight Agricultural Development Districts (ADDs) and a management unit has been assigned to administer the activities in each of these units.

To achieve the above objectives the NRDP is concentrating its efforts on increasing efficiency and expanding delivery systems with particular emphasis on agricultural services such as extension and training (Sections I and II), input supply, and marketing and credit (ADMARC).

Malawi will eventually, as population increases, run out of arable land. Its soils are tropical and quite diverse. In general, they are moderately productive and not a major obstacle to a viable agriculture. Malawi has three basic seasons:

- The rainy season from November to May;
- the cool season in June and July; and
- the hot, dry season in September and October.

There is substantial seasonal and regional variation in temperature. Frost is rare in most of the country. In general, temperatures do not act as a major constraint to agricultural production, and, in fact, provide the basis for the diversity of agriculture found here.

Though Malawi has relatively good rainfall her ground water resources are generally poor owing to a lack of underground aquifers to hold the water. Malawi has abundant lake resources (Lakes Malawi, Malombe and Chilwa). Water for irrigation is drawn from several rivers near their confluence with Lake Malawi and from the Shire River.

THE SMALLHOLDERS

It is apparent that the smallholders (men and women farmers) are experienced and resourceful producers of agricultural commodities. They have produced their agricultural needs for centuries and are continuing to do so. They are very perceptive, eager to learn, and willing to try new ideas, where applicable, to increase their production capabilities.

The amount of cash crops produced and the increased interest in intensified livestock production shows that the smallholders are well aware of the need to improve their economic conditions.

Most of the smallholders are essentially subsistence level farmers. Maize (corn) is the staple crop. Smallholders usually produce enough to satisfy their annual family food needs, with enough surplus to sell to provide for basic necessities. They also will save sufficient seed to plant the following season.

They raise sheep, goats, pigs, chickens and rabbits as their main sources of meat.

Their staple food, Nsima, is prepared by pounding maize to remove the seed coat and bran. The pounded maize is soaked in water, completely dried and ground into flour. The flour is then used to produce what appears to be little loaves of slightly moist solid bread without the crust.

In general, the average smallholder cultivates approximately 1-1/2 hectares of land, either by hand (hoe) or with a team of oxen. However, much of this land is fragmented into several parcels. Approximately 68% of this acreage is planted to maize while the remainder is planted to either another food crop (groundnuts) or cash crop (tobacco, cotton) or a combination of both.

The smallholders consume, on an average, 250-300 kgs of maize/head/year; at least 10 kgs of groundnuts, and approximately 20 kgs of pulses (beans). Their consumption of animal products is low and fish (mainly dried) takes preference over other meats. Understandably, their diet is low in fats which tends to reduce their energy level.

The size of the smallholders' families is about 4.45 persons. At today's prices, they need approximately K103 annually for basic subsistence, excluding food. Their average net annual income is approximately K130-K165 which does not include the value of farm consumption (LADD figures). Their most highly valued capital items are bicycles, radios, paraffin lamps and chairs.

There are several factors which affect the smallholder's decision-making processes, and some tend to be a constraint on increased agricultural production:

- Less than 25 percent are literate;
- They do not have clear title to their land. The land is owned by the village and allotted by the chief, although

some share-cropping does exist. There is only a single successor to this land (the major pattern is matrilineal although in some areas a patrilineal system is followed);

- By tradition they must share their wealth with their extended families who can claim a share of any increased output;
- They often receive low prices for their products and pay high prices for their inputs (Appendix, Pages 24 - 30, Price List) [ADMARC];
- They do not have access to several credit options to provide them with the short and long term production capital required for maximum production coupled with various repayment options (ADMARC):
- For their own consumption they prefer varieties of maize that taste and store well and these do not produce the highest yield;
- They do not appear to have a strong desire for consumer goods.

It is obvious, however, that the smallholders are dependable producers who work hard with the limitations of the above constraints. They:

- Are cultivating, to their standards, their allotted acreage;
- Are willing to intensify and increase production if they are told crops to produce and how much to grow, as long as they receive reasonable prices for their output and can

get realistic credit for their inputs. The same hold true for livestock production;

- Are aware of and practice as much as possible, good land, crop, and livestock husbandry;
- Are more interested in improving local cattle for their meat, dairy, and power needs rather than importing them or using farm power machinery;
- Are continuing to form farmers' clubs as a communal method of increasing self-help and production efficiency.
- Are aware that research can improve crop varieties and help meet their livestock needs; and
- Are eager to learn how to improve their standard of living.

WOMEN'S ROLE

In describing the smallholders, it was noted that at least 50% of the farm production work is performed by women. Thus women represent at least one-half of the country's agricultural production force. Their major constraint is that it is physically difficult for them to prepare the land for crop production. Their other significant constraint is their culture's attitude toward their sex. In all other factors they appear to be equal to their male counterparts.

Women extension workers receive a divided program of general agriculture and home economics at Thuchila Farm Institute for one year. They enter the extension service as Farm Home Assistants (FHAs) and concentrate on home economics. There are some women

graduates of Colby and Bunda Agricultural Colleges, but few of them are employed in the extension service or other parts of agriculture.

It is rumored that women prefer being trained at Thuchila, rather than Colby, because its program is for one year and few have a strong interest in agriculture as a profession.

It appears that women FAs are well received by men farmers. The only complaint voiced by women FAs concerned their mode of transportation. Using a bicycle to cover their areas, in some cases 25 miles a day, is exhausting.

The extension service, in recognizing the economic importance of women smallholders, is attempting to obtain more women on its staff who are trained in agriculture. It has also increased its activities in providing women farmers with training courses, at various centers, in animal and crop production. It is also instructing its FAs to increase their contact with smallholder women and provide them with the same information and services received by their male counterparts.

FARMING SYSTEMS

Crops Production

Presently, smallholders represent about 90% of Malawi's population. They are expected to produce enough food for themselves and the remaining 10% of the population, plus a surplus for export. These next two sections describe how.

Smallholders produce maize, groundnuts, pulses (beans), peas, cassava, sugar, and/or pigeon and/or cowpeas. They are finding that maize and pulses seem to be the best combination.

Average yields (LADD figures) per hectare of some of the crops are:

- Maize: 1,373 Kg/Hectare
- Maize/Pulses: 1,325 Kg/Hectare/111
- Groundnuts: 315 Kg/Hectare
- Pulses: 421 Kg/Hectare
- Tobacco: 800 Kg/Hectare

Basically, they prepare the soil as follows:

- After harvest, livestock is permitted to clean off most of the residues;
- The remaining residues are then removed by hand;
- The denuded soil is then ridged in rows, by hand (hoe) or plowed and ridged by oxen. With either method the ridges end-up being approximately 1' high with 2' between the rows.

When planting seeds, the distance between the plants within the rows, and the depth the seeds are planted, seems to be done by eye rather than any other method. Maize, however, is planted with three or more seeds to one hole.

Fertilizer, if available and affordable, is then applied. (Maize - 200 Kg/hectare; tobacco - 100 Kg/hectare). The ends of the rows are then sealed with soil to prevent run-off.

Systematic weeding seems to be the exception rather than the rule.

All food and cash crops, with the exception of maize, are usually harvested when ready. Maize is left on the stalks to dry thoroughly. After picking, the stalks are cut and stacked to be used as fodder.

Maize, on the cob, is stored in handmade cribs which are raised off the ground and the roofs are thatched. (Rats are a problem.)

The remaining food crops not sold are dried and also stored. Tobacco is smoke cured before being sold.

General management practices performed are:

- Crop rotations - usually maize, groundnuts and cash-crop;
- Planting natural livestock barriers;
- Spraying insecticides, fungicides, herbicides when available and affordable;
- Preparing crops for market;
- Some terracing on slopes and hillsides;
- Planting fast growing trees (NGABU) to serve as wind breakers and a future wood supply;
- Irrigation (Map 17)

The smallholders are also:

- Conserving the soil (burning crop residues before tilling had virtually stopped) by leaving crop residues to prevent soil erosion;
- Aware of the effect that over fertilization is having on the soil (Ammonium Sulphate has lower soil pH in may areas);

- Aware that research findings provided through extension can improve crop varieties.

As with the purchase of inputs, ADMARC is synonymous with the marketing (Maps 12, 31, 32) of almost all agricultural products. There are some private traders who also purchase produce but they are few in number.

Using 1981 ADMARC prices, excluding smallholders time and labor, let us look at three major crops; their production costs and the gross income the smallholders received from each:

- Maize (1,515 Kg/hectare) Receive	K99.99
- Seed cost: K9.38/hectare	-K 9.38
- Fertilizer cost K22.50/hectare	-K22.50
Gross Return	K68.10
- Groundnuts (302 Kg/hectare) Receive	K99.66
- Seed cost: K46.00/hectare	-K46.00
Gross Return	K53.66
- Tobacco (400 Kg/hectare) Receive	K196.00
- Fertilizer cost: K25.50 Kg/hectare	- 25.50
Gross Return	K170.50

Livestock Production

The cattle population of Malawi (Zebu, Brahma, and other mixed breeds) is distributed throughout the country with the

largest concentration in the Central Region (Map 7). In addition to cattle, small stock such as goats, sheep, pigs, rabbits, and poultry are kept. The national average herd size is 7.7 cattle (LADD).

Most cattle are raised by smallholders using traditional methods. During the rainy season communal grazing systems operate in the dambos (marshy areas) while during the dry season grazing is largely unrestricted (crop residues included). Because cattle are considered a source of wealth rather than commodities for sale, it seems that very little commercial value is attached to them.

Cattle are rarely slaughtered except at times of special celebration, but any terminally ill animal is immediately slaughtered and the meat shared with neighbors.

The recently increased (1980) Government minimum prices offered at the cattle markets has provoked a response to increase cattle production. It appears that, providing the financial incentive is attractive, the traditional cattle producer is willing to sell sufficient slaughter and feeder grade stock to satisfy national demand.

Stall feeding of cattle was first established in the Shire Highlands area of the Southern Region in 1957. The principal objectives were:

- To increase farmers' income by selling a higher grade finished product to the abattoir;

- To produce large quantities of manure for the maintenance of soil fertility; and
- To utilize crop residues and the traditional by-product Madeya (maize bran) as animal feeds.

For stall feeding, the smallholders use their own steers or purchase them locally. The stalls are sturdily constructed from wood and the roofs thatched. The animals are creep fed for three (3) to four (4) months to approximately 354 kilos ±. Their ration consists of grasses, legumes, banana trees (sliced) and a concentrate of corn bran with salt added. (Madea and/or Madeya).

Monthly cattle sales are held (Map 17) where officials from the Department of Agriculture act as auctioneers. Local butchers and the Cold Storage Company are the main buyers.

There is also an increasing interest among smallholders to develop oxen as a means of farm power and transportation. There is an extension oxen training center (Salima) that trains oxen teams (two weeks). Farmers may purchase these teams on a credit basis. They cost approximately K280/team. LADD has a team that trains farmers' oxen at no charge.

The hides and skins are a renumerative by-product of the beef industry and are processed and exported by the Cold Storage Company, Malawi..

Presently, Malawi imports most of its dairy requirements. The Government is encouraging smallholders and other large scale

farmers to increase milk production to curtail its imports.

Dairy development is distributed throughout the country, with a heavier concentration in the Southern Region (Map 8). Artificial insemination centers, under the Department of Veterinary Services, are also distributed throughout the country (Map 6). All the milk produced is sold to Malawi Milk Marketing Dairies for processing.

To start in dairy production, the smallholders express this desire through the Extension Service Field Assistants. Highlights of LADD's extension program are:

- Smallholders are contacted and the program outlined and explained in detail;
- A milking parlor (concrete floor, stanchion feeder, thatched roof) and a calf and cowpen;
- Acreage for pasture is set aside, plowed and seeded (local grasses and legume mix) to be used for pasture and hay;
- Trench silos are dug to make silage (Napia [Elephant Grass] is encouraged to be used as silage rather than maize). The silos are filled by hand chopping grass into 6-8" pieces. Dried cane is placed on the bottom and top and the silo is then sealed with soil;
- Two cows in calf are purchased by the smallholder (approximately K300), and after calving they will be artificially inseminated;

- The cows are fed at the rate of 6 kg of madea plus salt per 10 litres of milk; and are hand milked twice daily (their annual production is approximately 1,350 litres/year);
- The milk is strained and placed in a covered milking pail;
- Once a day, the milk is taken to a central milk cooling center and weighed, and tested for water content. Weights are recorded and credited to the farmer's account. It is then picked up by Malawi Milk Marketing Dairies for processing;
- The present price of milk to the farmer is K8.25/litre.

The smallholders, in this area (LADD), have formed a Dairy Farmers' Club consisting of 19 members. Cooperatives are not encouraged but are permitted if the proper authorities are convinced that the groups can carry through their proposed schemes. The failure of past cooperatives and the dominant role of ADMARC could possibly explain the reluctance of the Government actively to promote them. At present, Farmer Clubs are a good alternative.

For disease control, most cattle are either hand sprayed or taken to dipping tanks (Maps 9 & 35) to control the usual tick-borne diseases (East Coast Fever and Theulirosis). They are also given, when available, ascaricides. Mastitis and brucellosis have also been found.

For cattle production costs and returns to the smallholders see Appendix, Pages 18-23 (LADD).

Intensified swine production is slowly beginning to be practiced among smallholders in order to meet the increased local demand.

Sheep and goats are herded and grazed as cattle and rabbits are confined to hutches. These three, along with poultry, are the main sources of meat in village communities.

Commercial poultry production (confining broilers and layers) is beginning to increase among smallholder farmers. The Department of Animal Health and Industry (Mikolongwe) has a poultry breeding and production center and intends to open one in Lilongwe to supply chicks to the Central and Northern Regions. Another center at Blantyre will serve the Southern Region. The smallholder farmers are also producing pigeons, ducks and turkeys. Good quality feed concentrates are available locally.

The Department of Animal Health and Industry should be commended for its efforts to facilitate livestock and livestock product marketing.

ADMARC

The Agricultural Development and Marketing Corporation (ADMARC) was established on April 1, 1971, by the Agricultural Development and Marketing Corporation Act and charged with the responsibility to :

- Promote the economic interests of Malawi by increasing the volume of exportable crops and improving the standards of the country's agricultural production;
- Provide and maintain an efficient system of marketing of agricultural inputs for farmers on customary land; and
- Maintain and improve, with a view to profitability, a system of marketing agricultural produce for export and to promote the consumption of such produce abroad and in Malawi. (1/1/ADMARC Act, Section 5.)

ADMARC is administered by its Executive Chairman and Directors from its headquarters in Limbe and three regional offices.

The principal produce marketed by ADMARC is maize, groundnuts, rice, pulses (beans) and cassava. All produce intended for sale to ADMARC has to be transported to the ADMARC depot or bush market. There, the produce is graded and weighed and the farmer is paid in cash. Credit repayment and Post Office Saving facilities are found at each "permanent" market (Maps 12, 31 and 32).

Prices paid at ADMARC markets are uniform throughout the country and are fixed by ADMARC in consultation with the Government. The ADMARC Board of Directors meets every year with representatives

of the Ministry of Agriculture and Natural Resources, Ministry of Finance and Ministry of Trade and Industry to make price recommendations which are submitted to the Minister of Agriculture and Natural Resources for final approval. The producer prices are announced each year before the start of the planting season so that smallholders know what they can expect to earn when they come to sell their crops.

According to ADMARC, producer prices are fixed with the twin aim of ensuring a "reasonable return to the farmer, while enabling ADMARC to earn surpluses to support national development programs." In fact, ADMARC pricing policy has aimed at very gradual increases over the years, and while this has shielded farmers from the fluctuations and uncertainties of the international commodity markets, farmers have received only a small, if any, share of the realized export earnings.

The price structure is further complicated by the high cost of transporting crops across the country. Producers in centrally located areas, adequately served by roads and rail transport, are subsidizing producers in remote, outlying areas.

In addition to crop marketing, ADMARC is also charged with the task of distributing agricultural inputs such as improved seed, fertilizers, pesticides, spraying equipment, and spares to the smallholders.

Fertilizers and seeds procured by ADMARC are stored in its depots and permanent market storage sheds before being sold to the smallholders.

Established in 1979, the National Seed Company of Malawi is an ADMARC/CDC (Commonwealth Development Corporation) venture, with ADMARC as the major shareholder and CDC providing the management expertise. It has taken over all seed production formerly operated by ADMARC, with the exception of cotton, which is produced by the Makoka Research Station. After growing, cleaning, processing and bagging, the bulk of the seed is handed over to the ADMARC for distribution.

The smallholders have identified three problem areas affecting ADMARC policies that are major constraints to their production capabilities:

- They are confused each season as to the kind of and amount of agricultural commodities to produce;
- The disparity between prices they receive for their output and ADMARC's selling price of these same commodities has had a demoralizing effect upon them;
- They need a realistic credit system that provides several options in attaining and repaying credit.

CONCLUSIONS

It is evident that the smallholders in Malawi, working within the limits of their natural and cultural limitations are typical of hard working farmers found elsewhere. It is equally evident that the Extension and Training Service is doing its utmost, again within its constraints, to meet the needs of the smallholders. It appears that the complaints the smallholders

have against ADMARC's present policies have a major effect on Malawi's agricultural goals.

RECOMMENDATIONS

ADMARC take immediate action in solving the major problem areas identified by the smallholders.

The smallholders should be encouraged to take a more active role in expressing their needs to the Extension Service and to the Research Service.

LIVESTOCK PRODUCTION COSTS

SIMPLE BUDGET FOR BEEF INTERPRISES

(Producer animals refer to those provided by the farmer himself and not issued on credit.)

PRODUCER STALL FEEDER

Grade at start	: Feeder
Grade at finish	: Choice
Live weight at start	: 263 Kg
Live weight at finish	: 351 Kg
Average gain per day	: 0.59 Kg
Days in stall	: 150
Killing out percentage	: 55%

OUTPUT: 197 Kg c.d.w. at K1,103/Kg (choice)	K213.00
VARIABLE COSTS:	
Feed steer 263 Kg at 0.44t/live weight Kg	K116.00
6.80 Kg madeya at 1.102t/Kg	K 7.50
11.07 Kg salt at 28.66t/Kg	K 2.60
Transport to abattoir	K 5.20
Insurance at 1% c.d.w. value	K 1.81
	K133.11
GROSS MARGIN	K 79.89

NOTES:

If the steer had finished at Prime it would be worth 193 Kg at 0.629t/Kg or K121.41. The gross margin would then be K3163.

Better liveweight gains and a shorter feeding period than above may be achieved by including 0.907 Kg per day of dried LEUCOENA during the dry season

While the above figures relate to one animal it is normal to feed two animals at a time if possible.

The value of manure produced, now considerable is not included.

OLD CATTLE FATTENED IN STALL TO STANDARD GRADE

Grade at start	: Commercial
Grade at finish	: Standard
Liveweight at start	: 295 Kg
Liveweight at finish	: 354 Kg
Average gain per day	: 0.594 Kg
Days in stall	: 100
Killing out percentage	: 52%

OUTPUT

(a) If sold at cattle market where average bid price for Standard Grade in 1974 was 39.6t/Kg and average bid price for Commercial Grade was 23.10t/Kg.

354 Kg at 39.6t/Kg = K140.40

(b) If sold at the abattoir:

200 Kg c.d.w. at 88t/Kg = K184.00

VARIABLE COSTS:

(a) Sold at cattle market:

Commercial cow 295 Kg at 33t/Kg	=	K 97.50
454 Kg madeya at 1.1t/Kg	=	K 5.00
6 Kg salt at 28.16t/Kg	=	K 1.69
		K104.19

(b) Sold at abattoir:

As above	=	K104.19
Transport to abattoir	=	K 5.20
Insurance at 1½% c.d.w. value	=	K 1.64
		K111.03

Killing out 50% 140.40 - 104.19 = K 39.21

OR

Gross Margin 184.00 - 111.03 = K 72.97

Rhodes Grass Pasture Fattening (Grazing During Rains - Jan - April)

A. FEEDER ISSUED ON CREDIT

Grade at start	: Feeder	
Grade at finish	: Choice	
Liveweight at start	: 368 Kg	
Liveweight at finish	: 453 Kg	
Average gain per day	: 0.77 Kg	
Days at grass	: 115	
Killing out 55%	: K1.103/Kg	= K213.00

OUTPUT: 193 Kg c.d.w.

VARIABLE COSTS	System 1 Low stocking rate (2 per 0.4 ha) Low Supplement K	System 2 High stocking (4 per 0.4 ha) High Supplement K
Feeder steer 263 at 44t/Kg	116.00	116.00
Interest, insurance, transport, etc.	23.20	23.20
Madeya at 11t/Kg (i) 209 Kg (ii) 522 Kg	2.30	5.75
Salt 35.2 Kg	2.00	2.00
Fertilizer 200 Kg/ha 45 Kg S/A at K7.00 45 Kg 20:20:0 at K8.50 = 15.50/ha	7.75	3.88
Fencing depreciation at K4.17/0.4 ha block	4.05	2.03
TOTAL	115.30	152.86
GROSS MARGIN	213.00-155.30	213.00-152
	57.70	60.14

NOTES:

1. The grass fattening system is based on well managed fertilized grass pasture established at no cost by undersowing with maize.

2. On the fertile Lilongwe soils stocking rates of feeder grade Malawi Zebu steers may go from 2 steers per 0.4 ha with 1.8 Kg madeya per day to 4 steers per 0.4 ha with 4.5 Kg madeya per day.

3. Fertilizer costs are based on 1980/81 prices.

4. Fencing costs are based on 1,024 metres of barbed wire for 0.4 ha (4 strand fence) with local poles, depreciation over 10 years.

5. Returns per 0.4 ha on the two systems would therefore be:

   2 feeders per 0.4 ha - 2 x K57.70 = K115.40

   4 feeders per 0.4 ha - 4 x K60.14 = K240.56

6. Returns per animal are slightly less than for stall fed feeders but the system is very much less demanding on labor with no cutting or carrying, allowing more animals to be fed per unit of labor and results in a shorter feed period because of the better daily gains in liveweight.

B. SELF PRODUCER FARMER

Transport to abattoir	K5.40
Insurance at 1½% c.d.w.	K2.66
	K8.06

This compares with a figure of K15.08 in the previous example where the feeding is issued on credit. Here, margins are therefore higher by K9.40 per animal.

Gross Margin (K)	System 1	System 2
	(2 feeders/0.4 ha)	(4 feeders/0.4 ha)
Per animal	K 67.10	K 69.54
Per animal	K134.20	K139.08

BUDGET FOR A TWO COW DAIRY UNIT

Cow ½ Bred @ K150	=	K300
Fencing Wire, Wire Nails, post @ K62 per acre	=	K186
Buildings	=	K 45
Utensils: 1 Pail = K12, 1x20 litre churn K35	=	K 47
1 Sprayer	=	K 48
Pasture 3 acres @ K26 per acre	=	K 78
		K704

ANNUAL COSTS AND RETURN

Depreciation[4]

Cow, 6 years	=	Nil
Fencing, 10 years	=	K 18.60
Pasture, 4 years	=	K 19.50
Building,10 years	=	K 4.50
Equipment,6 years	=	K 13.83
Bucket, 2 years	=	K 6.00
		K 62.43

DIRECT COSTS	1575 Litre/Lact.	1800 Litre/Lact.
Pasture Maintenance	K 36.00	K 36.00
3xK12 Per Acre	K 28.35	K 32.40
Feeds[1]	-	-
Veterinary 2xK18 (inc. dipping)	K 36.00	K 36.00
Insurance 20% + 20t Stamp Duty	K 60.20	K 60.20
Miscellaneous	K 10.00	K 10.00
	K170.55	K174.60
TOTAL ANNUAL COST	K232.98	K237.03

RETURNS

Milk Sales[2]	K297	K330
Calf Sales[3]	K 67	K 67
	K364	K397
MARGIN	K131.02	K159.97
Margin per acre	K 43.67	K 53.32
Margin per cow	K 65.51	K 79.99

NOTES:

1. Feed at the rate of 6 Kg Madea/Salt per 10 litres Milk produced.
   Madea + Salt = 3 tambala per Kg.
   1575 Litre/Lactation = 1350 Litres per year
   1880 Litre/Lactation = 1800 Litres per year

2. 5 Lactations per 6 years @ 11 tambala per litre (with bulking groups this could be increased on quantity bonus).

3. Price per Calf K40. Five (5) Calves per cow over 6 years
   If the farmer was to grow out his steers for slaughter this would fetch in the region of K250-K300 at 2½ years old.

4. Cow not depreciated as its original value would be realised at time of slaughter with a possible higher price.

ADMARC INPUT PRICE LISTS

1. AGRICULTURAL IMPREMENTS

Item	Price
Axe Handles	K 1.85 each
Axe without Handles	8.56 each
Fertilizer Cups	K .04 each
Garden Forks	K 8.25 each
Garden Rakes	K 2.72 each
Hoe Handles	K 0.16 each
Hoes Best 43	K 2.34 each
Jute Twine	K 0.77 per kg
Large Gunny Sacks	K 0.81 each
Large Pruning Knives	K 1.95 each
Matchets	K 5.52 each
P.V.C. Tobacco Curing Tents	K31.00 each
Pick Handles	K 3.46 each
Picks	K 8.24 each
Pise Moulds	K 0.55 each
Plastic Cotton Bags	K 0.65 each
Pruning Saws	K 4.95 each
Rain Capes	K10.40 each
Shovels	K 7.08 each
Sickles	K 2.14 each
Small Pruning Knives	K 1.19 each
String	K 9.19 per roll
Tobacco Sewing Needles	K 0.40 each
Vickers Sacateurs	K 4.10 each
Water Buckets	K 4.24 each
Watering Can with Rose	K 6.60 each
Wheel Barrows	K51.02 each

2. AGRIMAL IMPLEMENTS

(a) CULTIVATORS, PLANTER AND PLOUGHS

Item	Price
M.C. 5 Cultivator	K138.43 each
G. 51 Light Cultivator	K 91.85 each
G. 51 Standard Cultivator	K127.44 each
Single Row with Fertilizer	K243.57 each
8" Flat Share Plough	K 88.92 each
8" Upset Share Plough	K 89.22 each
10" Flat Share Plough	K 89.50 each
10" Upset Share Plough	K 90.02 each
High Wing Ridging Plough	K121.11 each

(b) CULTIVATOR SPARE PARTS

Item	Price
Expanding Beams	K 5.79 each
Hiller Arms	K 6.41 each
Hillers, Left or Right Hand	K 3.27 each
of 3"	K 1.49 each
S. 51 6" Wheel and Armset Complete	K 5.77 each

(b) CULTIVATOR SPARE PARTS continued

Item	Price
S. 51 10" Sweeps	K 2.82 each
S. 51 Backbone	K 8.51 each
S. 51 Expanding Link Stay	K 1.09 each
S. 51 Expanding Link Stay Assembly, Left or Right Hand	K 1.83 each
S. 51 Hand Lever Assembly	K 3.91 each
S. 51 Handles, Left or Right Hand	K 4.59 each
S. 51 Hinge Plate	K 0.98 each
S. 51 Slide Assembly	K 6.80 each
S. 51 Spreader Bar Assemly	K 1.52 each
S. 51 Wheel Arms in Pairs	K 2.59 each pair
Shivel Bracket, Left or Right Hand	K 1.95 each
S. 51 Share Arms, Left or Right Hand	K 2.84 each

(c) CULTIVATOR BOLTS AND NUTS - PER 10 UNITS

Item	Price
C9-M10 x 30 CSK Sq (Tynes)	K 1.80
C10-M10 x 25 XOX	K 1.37
C11-M10 x 40 XOX	K 2.72
C12-M10 x 45 XOX	K 2.28

(d) PLOUGHS SPARE PARTS

Item	Price
6" Wheel	K 2.21 each
6" Wheel and Armset Complete	K 5.53 each
7" Wheel	K 3.48 each
8" Flat Share	K 2.97 each
8" Upset Share	K 3.04 each
10" Upset Share	K 3.04 each
Adjusting Barholder with Screw	K 0.95 each
Cross Brace - Long	K 0.81 each
Cross Brace - Short	K 0.66 each
Drawbar Assembly	K 4.71 each
Handle Bar, Left or Right Hand	K 3.80 each
Handle Set Complete	K12.33 each
Handle Stay, Left or Right Hand	K 0.68 each
Handle to Mould Board	K 0.66 each
Landside Plain	K 3.00 each
Mould Board	K 5.85 each
Plough Beam	K18.74 each
Plough Frog	K 5.53 each
Plough Wheet Arms Pairs	K 2.84 each
Regulator	K 2.53 each
Spacers Sleeve (bush)	K 0.12 each
Spanner	K 0.95 each
Spreader	K 0.85 each
Stay Beam to Mould Board	K 0.62 each
Clamp Assembly	K 0.95 each
Wheel Axles	K 0.37 each
10" Upset Share	K 3.21 each

(b) LEHAVOT SPRAYER SPARE PARTS

Item	Price
Cotton Room Springs	K 1.13 each
Double Spanner	K 1.11 each
Gun Value	K 7.80 each
Hand Crips	K 0.29 each
Hose Clip	K 0.18 each
Large Strainers	K 1.85 each
Lids, Complete with Handle	K 2.19 each
Nozzle Body	K 1.24 each
Nozzle Cup	K 1.36 each
Pistons	K 1.31 each
Pumper Levers C/W/H and Grip	K 2.24 each
Pump Plunger	K 1.28 each
Pumping Rod	K 2.14 each
Pumps, Complete	K23.25 each
Pressure Hose	K 0.80 each
Small Split Pins	K 0.06 each
Small Strainers	K 1.64 each
Spanners with Screw Driver	K 1.11 each
Split Pins	K 0.13 each
Spraying Guns, Complete	K15.60 each
Sprating Tip	K 2.85 each
Swivel Bolt	K 0.25 each
Swivel Nut	K 0.14 each
Thumb Screw	K 0.54 each
Top Cup	K 1.42 each
Top Hook	K 0.62 each
Valve Springs	K 0.32 each
Washer	K 0.06 each
Wing Nut	K 0.32 each
Wing for Nuts for Agitator	K 0.21 each

(c) U.L.V. SPRAYER SPARE PARTS

Item	Price
2006 Motor, Complete	K 4.07 each
2015 Atomiser Disc	K 0.49 each
2018 Atomiser Cover	K 0.49 each
2019 042 Standard Jet	K 0.27 each
2019 H2-067 Jet	K 0.27 each
2026 Bottle Holder Cover	K 0.09 each
2027 30 Mesh Filter	K 0.22 each
2901 Base	K 0.48 each
2902 Top Cover	K 2.14 each
2904 Carrying Strap	K 0.27 each
4903 Bottle for Chemical	K 0.55 each
5123 Clamp Belt	K 0.27 each
5133 Wing Nut	K 0.07 each
6007 Battery Plug-Red	K 0.12 each
6008 Battery Plug-Black	K 0.12 each
6010 Spade Terminal	K 0.12 each
Battery Lead Cable	K 1.66 each
Cotton Twine 2.5 kg	K 9.19 each
Spray Shield	K 6.11 each

(e) PLOUGH BOLTS AND NUTS - PER 10 UNITS

Item	Price
A-M10 x 30 CSK Sq (Mould Board Bolt)	K 1.80 each
B-M10 x 30 XOX (Handle Bolt)	K 2.09 each
C1-M12 x 45 CSK Sq (King Bolt)	K 2.61 each
C2-M10 x 50 CUP Sq (Beam/Handle Bolt)	K 3.23 each
C3-M10 x 40 XOX (Beam/Handle Stay)	K 2.72 each
C4-M12 x 50 XOX (Beam/Regulator Bolt)	K 3.21 each
C5-M12 x 75 XOX (Beams/Draker Shackle)	K 3.65
C6-M12 x 40 Set Screw (Adjusting Barholder)	2.48
C8-M12 x 100 XOX (Axle Bolt)	K 3.02
S-M12 x 35 CSK Sq (Share Bolt)	K 2.40
I-M12 x 30 CSK Sq (Landside Bolt)	K 2.33

(f) RIDGER SPARE PARTS

Item	Price
Beam Extension Assembly	K 6.37 each
Breast Plate with Hinges	K11.75 each
Clevis Rock	K 1.69 each
Cross Brace	K 1.12 each
Depth Clevis	K 3.04 each
Depth Clevis Assembly	K13.28 each
Handle Par, Left or Right Hand	K 4.32 each
Handle Set Complete	K13.87 each
High Wing Assembly, Left or Right Hand	K 7.27 each
Hinge Assembly	K 1.11 each
Ridger Beam	K18.00 each
Ridger Square	K 4.64 each
Rudder	K 2.05 each
Spreading Bar	K 0.90 each
Stay Beam to Handle	K 0.98 each
Ridger Frog	K 3.29 each

(g) RIDGER BOLT AND NUT - PER 10 UNITS

Item	Price
C13-M12 x 70 CUP Sq	K 3.45
C14-M10 x 25 CSK Sq	K 1.68
C15-M16 x 75 CSK Sq	K 5.01

(h) HARROWS

Item	Price
3 Section Drawbar	K 26.06 each
4 Section Drawbar	K 40.91 each
Diamond Inner	K 51.83 each
Diamond Outer	K 62.66 each
Section Drawbar	K 21.93 each
Triangular	K 68.31 each
Zigzag Heavy	K 76.79 each
Zigzag Medium	K100.14 each

(i) TRECK CHAINS WITH STANDARD LENGTH OF 2.6 METRES

Item	Price
TR2-6 mm Treck Chain	K 6.38 each
TR3-7 mm Treck Chain	K 6.96 each
TR4-9 mm Treck Chain	K11.97 each
TR5-10.5 mm Treck Chain	K16.00 each
TR6-12mm Treck Chain	K19.33 each
TR7-14 mm Treck Chain	K27.31 each

BARBED WIRE OF 13 GAUGE AND COFFEE EQUIPMENT

Item	Price
12 Kg Roll of Barbed Wire	K17.60 per ro
25 Kg Roll of Barbed Wire	K34.65 per ro
45 Kg Roll of Barbed Wire	K67.65 per ro
Black Wire Brushes	K 1.00 each
Brass Wire Brushes	K 1.00 each

COTTON PEST EQUIPMENT

(a) SPRAYERS

Item	Price
Lancot Sprayers	K27.00 each
Lehavot Sprayers	K61.97 each
New U.L.V. Sprayer with eight U.L.V. Alkaline Batteries	K39.50 each
U.L.V. Alkaline Batteries	K 0.80 each
U.L.V. Sprayers	K22.50 each
U.L.V. Sprayer Batteries	K 3.25 each

(b) LEHAVOT SPRAYER PARTS

Item	Price
Adjusting Swivel	K 1.79 each
Axle Pin	K 0.85 each
Ball Housing	K 1.39 each
Blocking Gusket	K 0.09 each
Bottom Bracket	K 1.11 each
Bottom Cup	K 1.42 each
Bottom Hook	K 0.62 each
Buckle	K 0.50 each
Carrying Strap	K 2.47 each
	K 3.60 each

FARMCARTS AND SPARE PARTS

Item	Price
Chikupila Steal Deck	K366.00 each
Chikupila Wooden Deck	K347.00 each
Petroleum Services Steel/Wooden Deck	K544.50 each
Axles Brakes	K 0.20 each
Axle Collars	K 0.45 each
Axle Guskets	K 1.65 each
Axle Long	K 31.62 each
Axle Nuts	K 1.65 each
Axle Studs	K 71.09 each
Brake Blocks	K 0.42 each
Circlips	K 0.12 each
Complete Hub	K 52.25 each
Diesel Boom Burgler	K 0.6C each
Diesel Boom	K 1.40 each
Foot Pumps	K 12.65 each
Hand Pumps	K 16.50 each
Hook Belts	K 0.25 each
Hub Assembly	K 30.08 each
Hub Cuts	K 1.26 each
Hub Stubs	K 0.70 each
Inner Bearing	K 7.43 each
Lock Nuts	K 0.21 each
Oil Seals	K 1.85 each
Outer Bearing	K 10.89 each
Rims 600 x 16	K 41.11 each
Tubes 600 x 16	K 8.54 each
U Bolts	K 4.40 each
Wheel Cuts	K 0.71 each

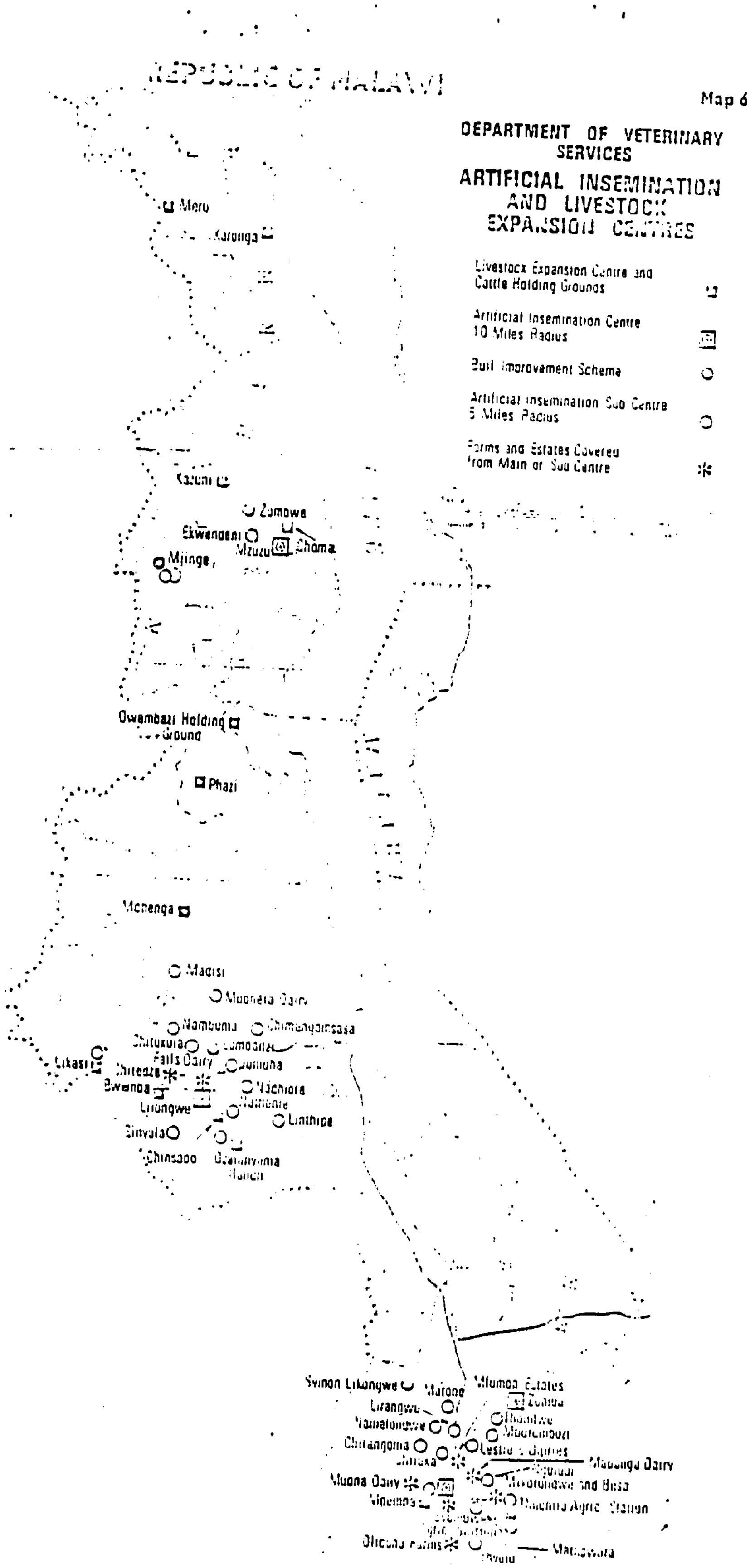
6. FERTILIZERS

Type	Price
Ammonia Sulphate	K 9.00 per 50kg bag
20:20:0: NPK for Sales of below 100 bags	K 8.50 per 50kg bag
20:20:0: NPK for Sales 100 bag lots	K 8.00 per 50kg bag
C.A.N. 26% N	K10.34 per 50kg bag
Urea for sales of below 100 bags	K10.50 per 50kg bag
Urea for sales of 100 bag lots	K10.00 per 50kg bag
A Mixture	K17.69 per 50kg bag
B Mixture	K17.99 per 50kg bag
C Mixture	K18.38 per 50kg bag
S Mixture	K17.18 per 50kg bag

7. INSECTICIDES AND PESTICIDES

Item	Price
Actellic 2% Dust in 200g packets	K 0.55 per packet
Actellic 2% Dust in 1.5kg packet	3.48 per packet
Aldrin	K 3.52 per kg
Carbaryl U.L.V. Liquid	K 1.50 per litre
D.D.T. 2-1/2% Dust	K 0.22 per kg
D.D.T. 5% Dust	K 1.36 per kg
D.D.T. 20% Dust	K 1.13 per kg
D.D.T. 25% Dust	K 0.13 per kg
D.D.T. 75% W.P.	K 0.17 per sacket
D.D.T. UIV Liquid	K 0.70 Litre
Dieldrin	K 5.06 per kg
Dimetheate 20% W.P. in 34g sackets	K 0.08 per sacket
Dimetheate 20% W.P. in 130g packet	K 0.32 per packet
Dimetheate U.L.V. Liquid	K 0.30 per 100cc
Diptrex 2-1/2% and 500 g packets	K 0137 per packet
Diphane M45 in 200g packets	K 2.38 per packet
Melathion 25% in 500g packets	K 3.23 per packet
Melathion 50%	K 1.47 per kg
Sevin 85% W.P.	K 0.29 per sacket
Scluber in 500g packets	K 0.41 per packet
Sulpher Dust	K 0.51 per kg

MAPS


Map 6
DEPARTMENT OF VETERINARY SERVICES
ARTIFICIAL INSEMINATION AND LIVESTOCK EXPANSION CENTRES
Livestock Expansion Centre and Cattle Holding Grounds
Artificial Insemination Centre 10 Miles Radius
Bull Improvement Schema
Artificial Insemination Sub Centre 5 Miles Radius
Farms and Estates Covered from Main or Sub Centre
Karonga
Zombwe
Ekwendeni
Mzuzu
Mjinge
Chomba
Owambazi Holding Ground
Phazi
Mchenga
Madisi
Nambuma
Falls Dairy
Likasi
Bwemba
Linthipe
Chinsapo
Symon Likongwe
Mlumba Estates
Chitangoma
Mbabanga Dairy
Muona Dairy

REPUBLIC OF MALAWI

DEPARTMENT OF VETERINARY SERVICES

CATTLE MARKETS AND TRADE ROUTES

- Cattle Market
- Proposed Cattle Market
- Permanent Holding Ground
- Temporary Holding Ground
- Cattle Route Khola
- Railway Station
- Main Abattoir
- Trial Markets

NORTHERN REGION

During 1979, 4,397 cattle were sold through the markets of which 1,948 went to the Central Region and the remainder were bought by local butchers.

CENTRAL REGION

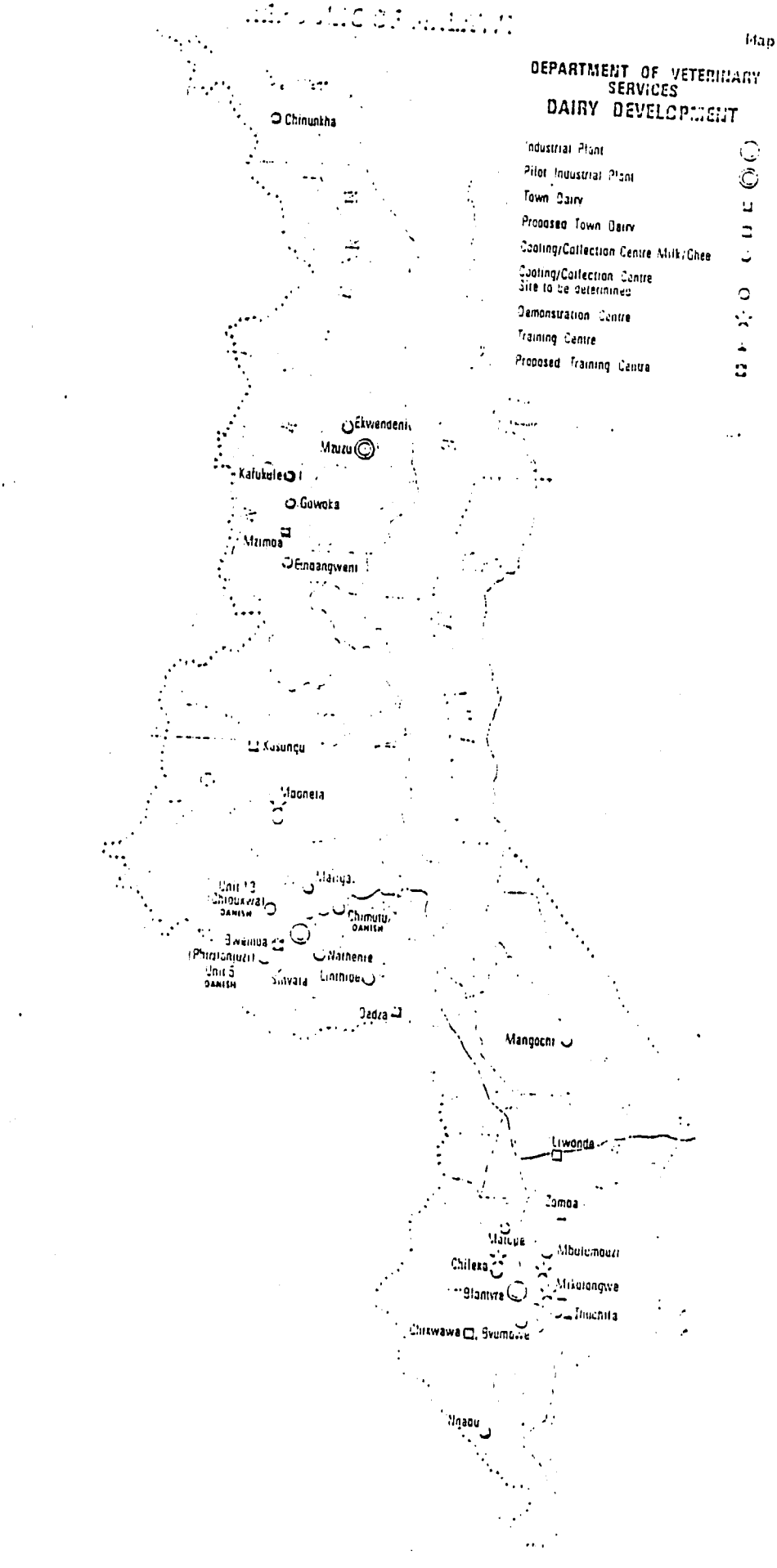
A total of 8,176 head of cattle was sold through the markets in 1979. Nicheu market supplied 1,850 cattle to Blantyre abattoir. Lilongwe abattoir slaughtered 10,201 cattle.

SOUTHERN REGION

Due to the relatively small cattle population in this Region and the high demand for slaughter stock, a considerable number are sold in the villages. In 1979, 2,750 cattle were sold through markets. The most successful markets in this Region were Chimombo, Ntcheu, Ngabu, and Tengani in the Lower Shire area and Mzuzu and Phuteya in the Lake Chilwa area. A total of 4,307 cattle were slaughtered at Blantyre abattoir.

In 1979, the Malawi National herd numbered 789,529. Approximately 79,999 were slaughtered, representing an off take of [illegible] of the National herd. A total of 19,529 were sold through cattle markets for a cash value of over K1,000,000 paid out to producers.

Map 6

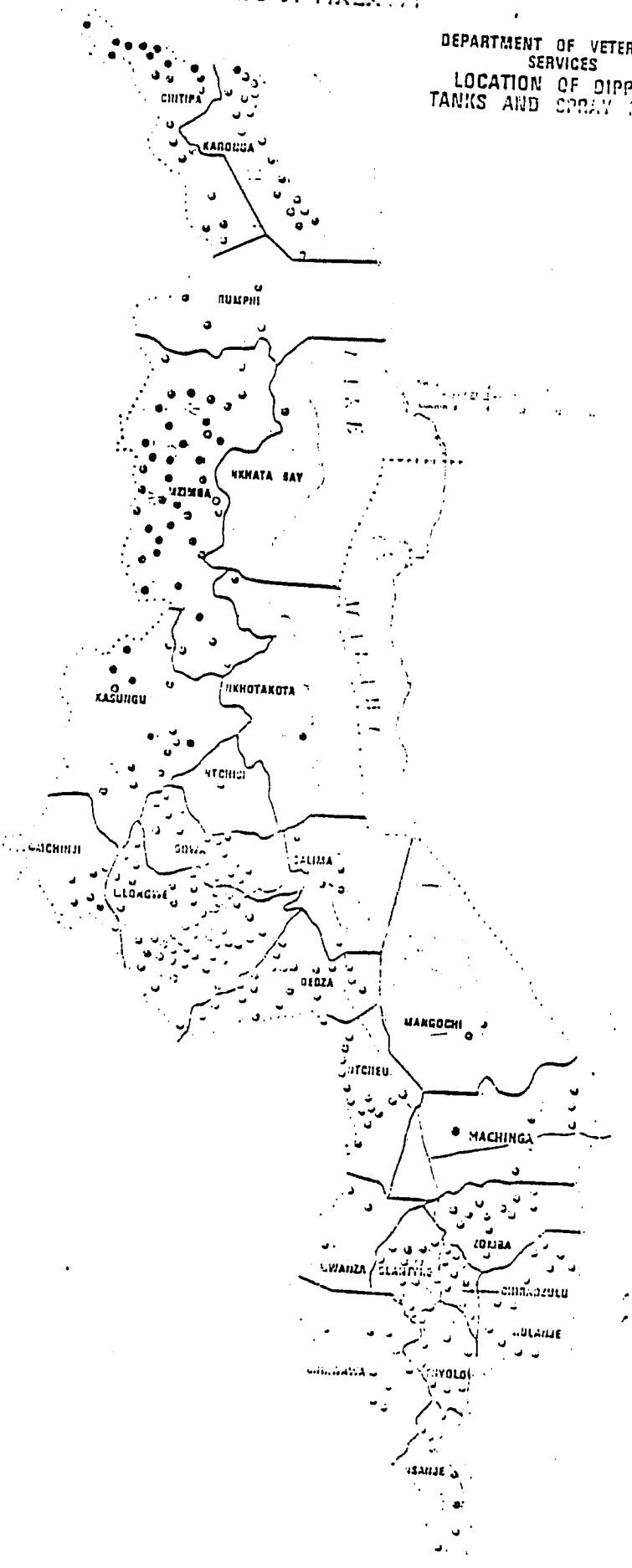

DEPARTMENT OF VETERINARY SERVICES
DAIRY DEVELOPMENT
Industrial Plant
Pilot Industrial Plant
Town Dairy
Proposed Town Dairy
Cooling/Collection Centre Milk/Ghee
Cooling/Collection Centre Site to be determined
Demonstration Centre
Training Centre
Proposed Training Centre
Chinunkha
Ekwendeni
Mzuzu
Kafukule
Gowoka
Mzimoa
Enaangwani
Kasungu
Maoneia
Unit 13 Chiowawa DANISH
Mankya
Chimutu DANISH
Bwaimua
Phirilongwe
Unit 5 DANISH
Nathenie
Linthipe
Dedza
Mangochi
Liwonde
Zomba
Mulanje
Mbulumouzi
Chileka
Blantyre
Mwanangwe
Thuchila
Chikwawa
Nsanje

REPUBLIC OF MALAWI

Map 9

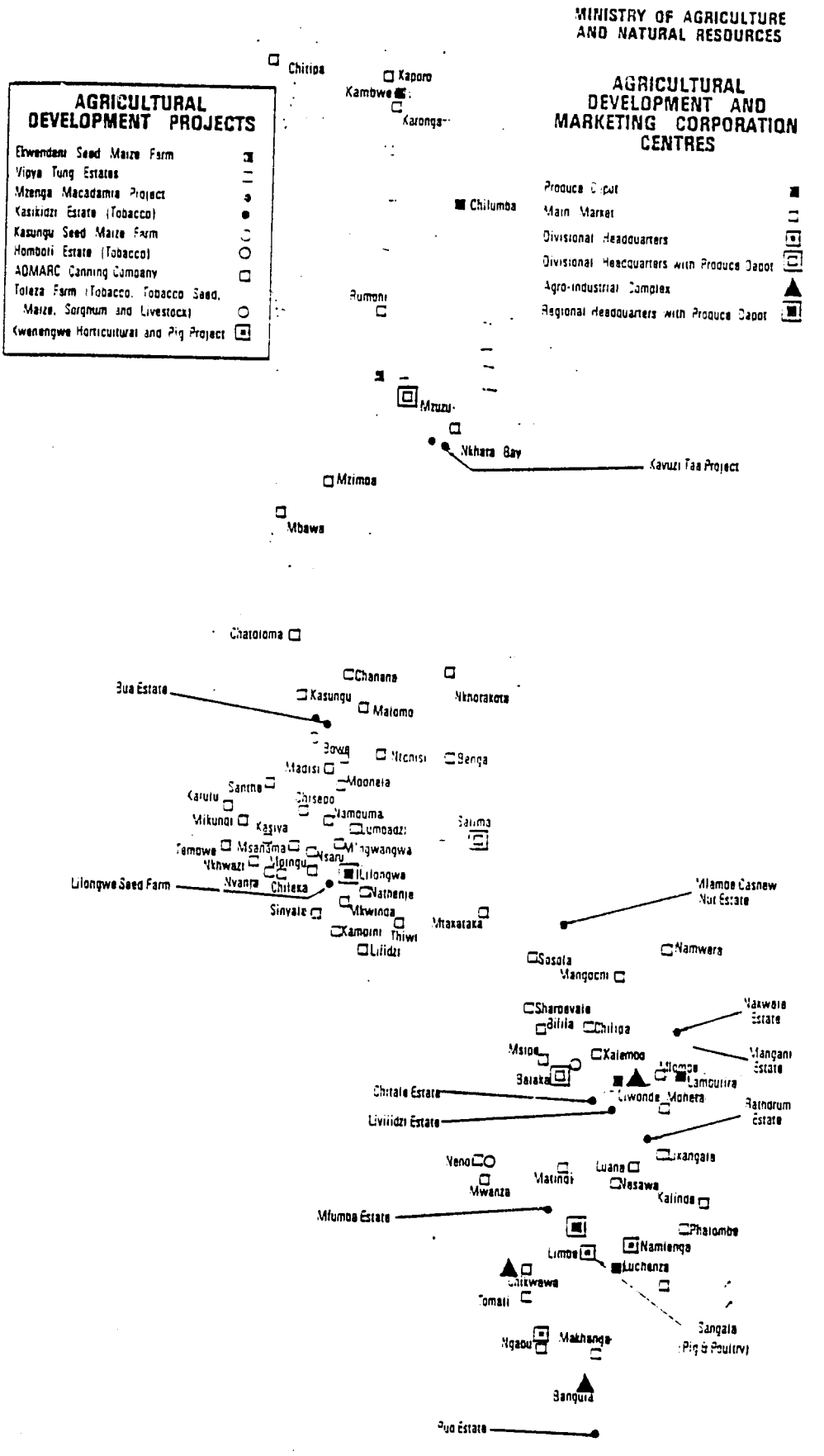
DEPARTMENT OF VETERINARY SERVICES

LOCATION OF DIPPING TANKS AND SPRAY RACES



Map 12

MINISTRY OF AGRICULTURE AND NATURAL RESOURCES



MINISTRY OF AGRICULTURE AND NATURAL RESOURCES

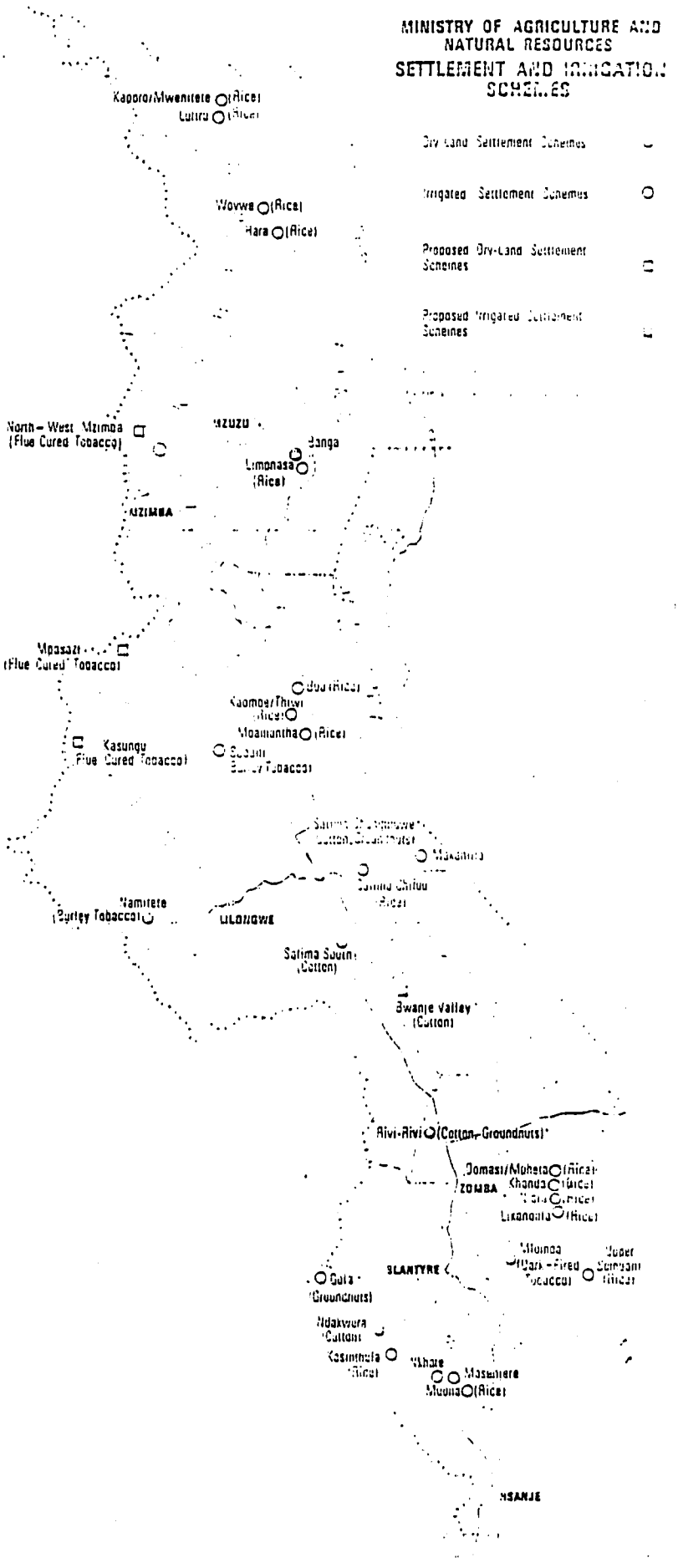
SETTLEMENT AND IRRIGATION SCHEMES

Dry Land Settlement Schemes

Irrigated Settlement Schemes

Proposed Dry-Land Settlement Schemes

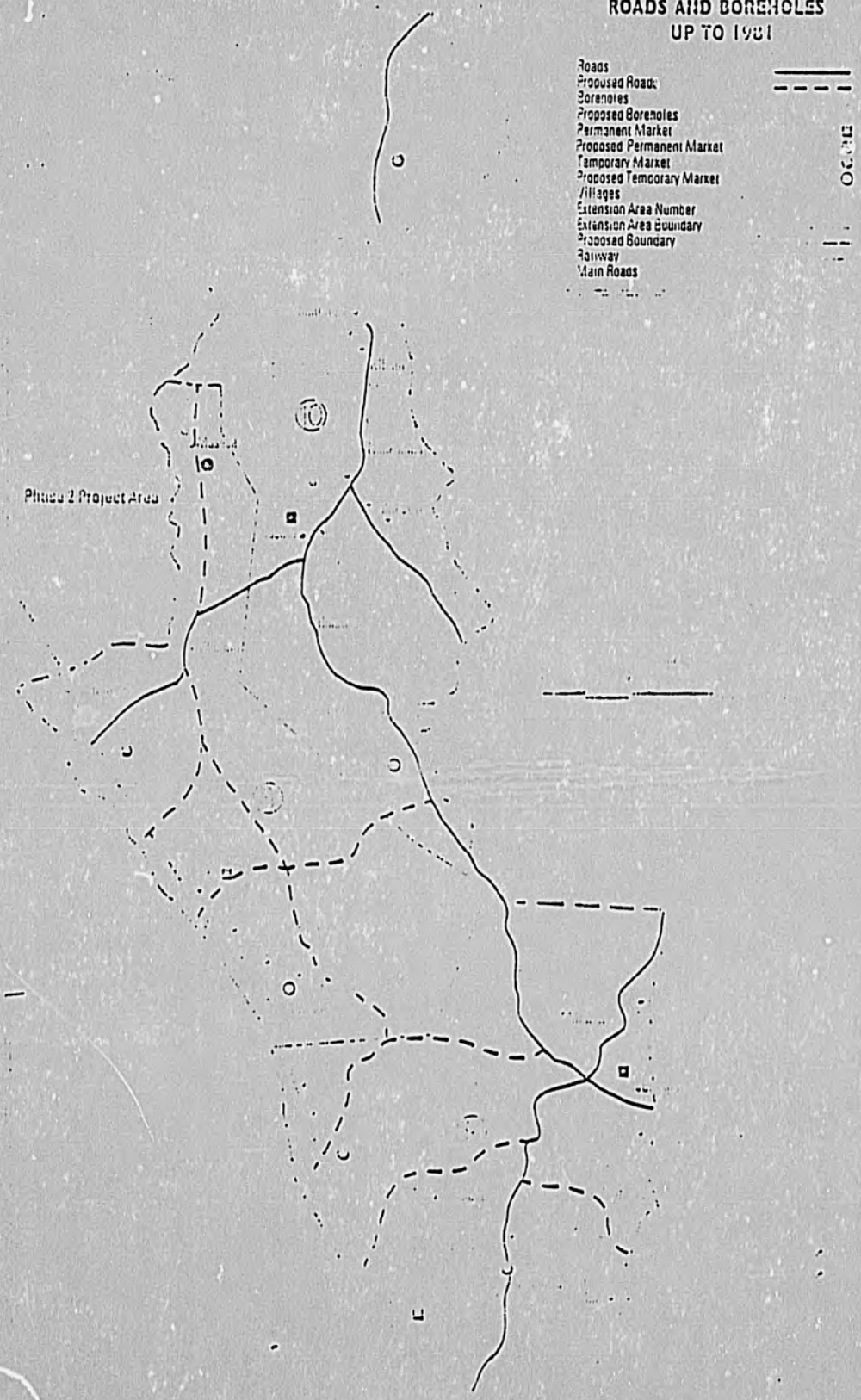
Proposed Irrigated Settlement Schemes



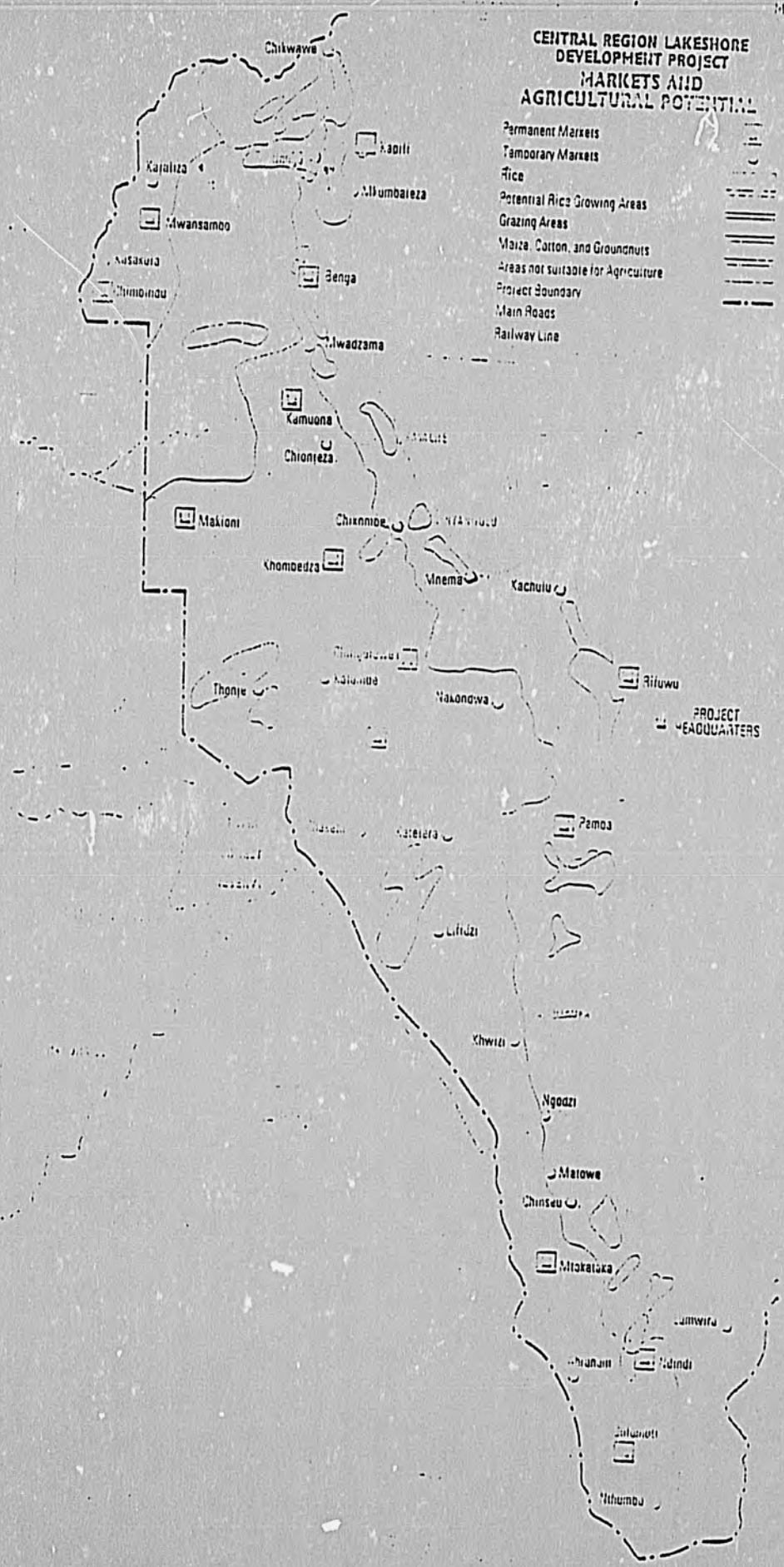
Map 31

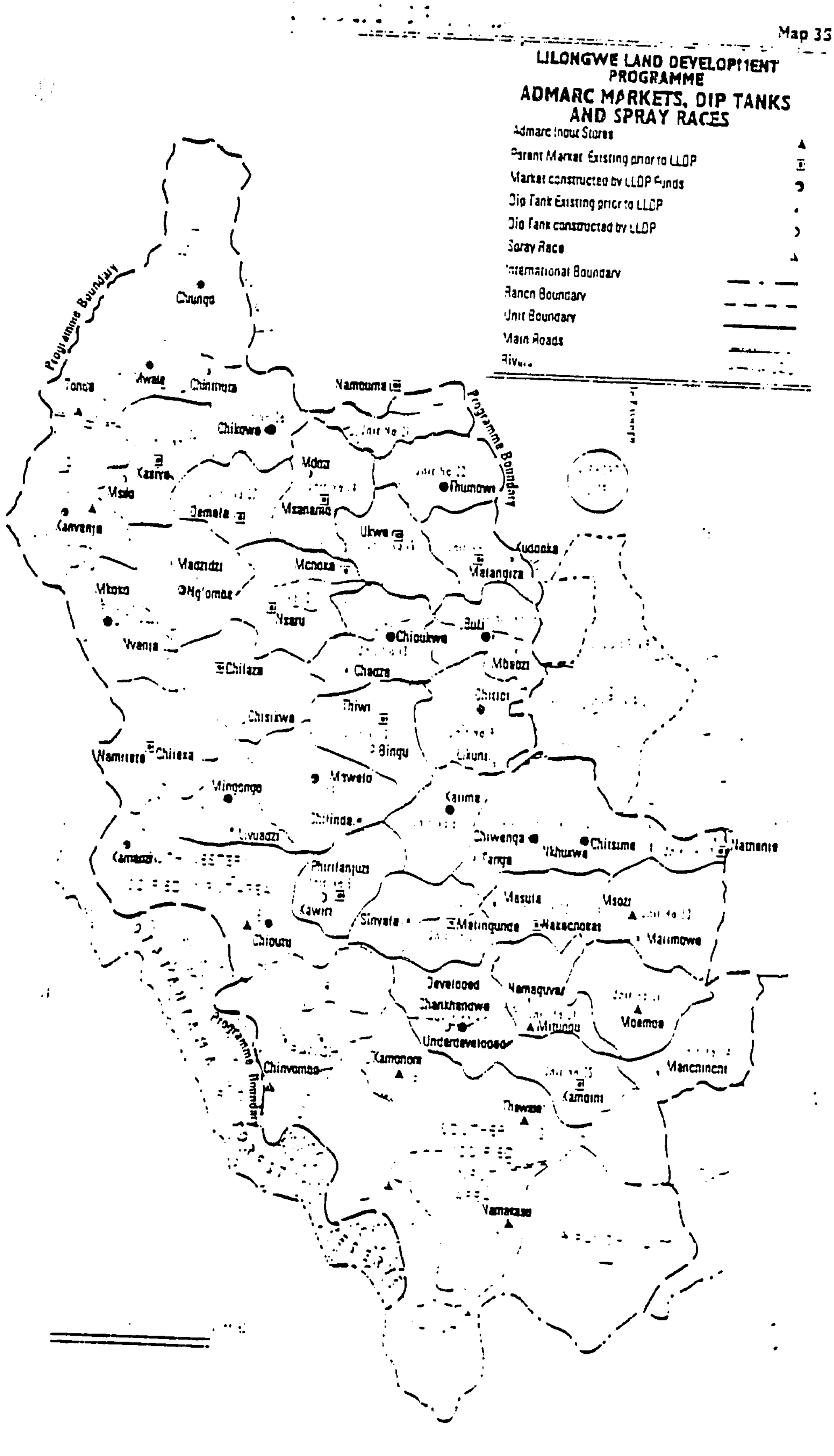
BWANJE VALLEY

ADMARC MARKETS,
ROADS AND BOREHOLES
UP TO 1981



Map 32


CENTRAL REGION LAKESHORE DEVELOPMENT PROJECT
MARKETS AND AGRICULTURAL POTENTIAL
Permanent Markets
Temporary Markets
Rice
Potential Rice Growing Areas
Grazing Areas
Maize, Cotton, and Groundnuts
Areas not suitable for Agriculture
Project Boundary
Main Roads
Railway Line
Chikwawa
Kapiri
Kajaliza
Mumbaleza
Mwansambo
Benga
Mwadzama
Kamuona
Chionjeza
Makioni
Khombedza
Mnema
Kachulu
Rifuwu
PROJECT HEADQUARTERS
Thonje
Nakondwa
Pamoa
Lifidzi
Khwizi
Ngodzi
Matowe
Chinseu
Mtakataka
Ndindi
Nthumba


Map 35
LILONGWE LAND DEVELOPMENT PROGRAMME
ADMARC MARKETS, DIP TANKS AND SPRAY RACES
Admarc Input Stores
Parent Market Existing prior to LLDP
Market constructed by LLDP Funds
Dip Tank Existing prior to LLDP
Dip Tank constructed by LLDP
Spray Race
International Boundary
Ranch Boundary
Unit Boundary
Main Roads
Programme Boundary
Chungo
Chimmora
Namoumba
Chikowa
Kasiya
Msalo
Kanyanja
Demala
Mzanama
Ukwe
Thumbwe
Kudonka
Malangiza
Mbobo
Mchoka
Nsaru
Chiloukwa
Chilaza
Chadza
Mbsozi
Chisitwa
Chitera
Bingu
Mitwelo
Mingongo
Chinde
Chiwenga
Chitsime
Masula
Msozi
Malinqunde
Malimowe
Developed
Chankhandwe
Underdeveloped
Mitundu
Mosmoe
Chinvomba
Kamonora
Mancinincni
Kamoini
Thawale
Namakasi