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Food and Agriculture

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INTRODUCTION

As requested by the Luanda meeting of the SADCC Council of Ministers, June 1982, Agriculture Ministers from the nine Member States met in Harare on 5 November 1982 to agree projects for the Maseru Conference. The following paper, which includes documentation relating to all the approved projects, is divided into three sections:

- Section One: Food Security
(coordinated by the Government of Zimbabwe)
- Section Two: Animal Disease Control
(coordinated by the Government of Botswana)
- Section Three: Fisheries and Wildlife
(coordinated by the Government of Malawi)

The November meeting, which was the first occasion on which SADCC Agriculture Ministers have come together in order to develop and strengthen further a regional approach in this strategically important area of cooperation, agreed a communique which, as well as inviting the international community to contribute positively to the economic development of the region, underlined the urgent need for peace in Southern Africa:

"A prime objective of SADCC's food programme is to increase productivity and thereby improve the standard of living of the mass of the people who are dependent on Agriculture for their very existence...in many countries of the region the most direct threat to these people is war... The highest priority for facilitating agricultural development is the prevention of war."

SECTION ONE - FOOD SECURITY

A. INTRODUCTION

The Declaration of the independent governments of Southern Africa, Southern Africa: Toward Economic Liberation, signed in Lusaka on 1st April 1980, defines Agriculture as one of the principal areas of SADCC cooperation aimed at reducing economic dependence particularly, but not only, on the Republic of South Africa and achieving economic liberation for the Member States of the region.

In view of the fact that the majority of the people in the region depend on agriculture and livestock for subsistence and that food production is at present insufficient in most countries, the Lusaka Declaration defines as priorities for concerted action:

- Food Security
- Protection of the Environment
- Joint Exploitation of Natural Resources
- Agricultural Research
- Animal Disease Control

In this context responsibility for the coordination of specific areas has been given to certain Member States:

- Food Security :- Republic of Zimbabwe
- Animal Disease Control :- Republic of Botswana
- Fisheries :- Republic of Malawi
- Crop Research :- Republic of Botswana*
- Soil Conservation and Land Utilisation :- Kingdom of Lesotho

A regional programme for food security and several projects for the control of animal diseases have been identified and approved. Preliminary work has also been done in the field of crop research in the semi-arid tropics, in wild-life and in fisheries.

In the area of Food Security the following projects were presented to the 1981 Blantyre Conference:

- Project One - A Technical Assistance Programme
Designed to Achieve Coordination &
Cooperation on all Agrarian Issues
- Project Two - An Early Warning System for Food Security
- Project Three - A Regional Resources Information System
- Project Four - A Regional Inventory of Agricultural
Resource Base
- Project Five - A Regional Food Reserve
- Project Six - Regional Post Harvest Food Loss Reduction
- Project Seven - Regional Food Processing Technology

* SADCC Agriculture Ministers, at their meeting in Harare in November 1982, agreed to propose to the Council of Ministers that Botswana be charged with responsibility for coordination in the field of Agricultural Research (i.e. crop and livestock).

Project Eight - Regional Food Marketing Infrastructure
Project Nine - Regional Food Aid

A Progress Report on the implementation of these projects, all of which were funded, appears on page 7. Substantive papers on three of the completed projects are also included: Projects Six and Seven, p 27, Project Two, p 11.

The progress achieved in the past two years clearly indicates the will of Member States to develop and consolidate regional cooperation in the area of Agriculture.

Nevertheless it is true that the bulk of the programme consists at present of studies, often of an extensive and complex nature, rather than of concrete projects. This is particularly true in the field of food security.

These studies are essential in order to define a coherent strategy and formulate a viable medium and long term programme for the sector. However, the need for a more immediate and practical response, combining short term priority actions with the studies already referred to, is also recognised.

In this context the SADCC Council of Ministers, held in Luanda in June 1982, decided that Agriculture should be one of the main subjects for SADCC: MASERU and agreed to convene a Meeting of Agriculture Ministers to approve projects for the conference. The Food Security sector projects approved fall into two categories: regional projects which have been developed from the eight approved feasibility studies (see pages 11 to 52); projects presented by Member States which, though national in character, contribute to the achievement of SADCC's regional objectives.

This introduction to the Food Security projects is inspired by the principles of the Lusaka Declaration and has been approved by SADCC Agriculture Ministers as a contribution to the development of a common approach to the problems of regional food security. The paper seeks to integrate short term practical objectives, which will assist the region in confronting its present problems, with the longer term process of constructing and strengthening regional cooperation.

Criteria for the Development and Implementation of a Regional Food Security Programme

The SADCC Food Security Programme includes three main objectives:

- to satisfy the basic need for food of the whole population of the region and progressively to improve food supplies to the people irrespective of the specific economic situation of each person or their position in society;

- to achieve national self sufficiency in food supply in order to free the region from the constraints which the present situation of dependence imposes on its development;
- to eliminate the periodic food crises which affect areas or countries in the region and which, besides having catastrophic social consequences, reinforce dependence and underdevelopment.

These obviously interrelated concerns combine to represent a set of problems which must be addressed in developing a regional Food Security policy. They also represent an articulation of the strategic objectives to which such a policy must be directed and show clearly the key role this policy plays for the economic development and liberation of the region.

Given the region's present stage of development an economic strategy aimed at achieving these basic objectives should comprise the following elements:

(a) Reinforcement of national and regional food production capacity

In the first phase, the achievement of the above-mentioned central objectives presupposes a solution of the problems of national food production.

Such an expansion of production will: improve the internal food supply - and consequently the food situation of the people; allow for the substitution of imports; and, build up the necessary surpluses to establish security stocks, both at national and regional level. Without doubt progress obtained in this field will determine the path which regional cooperation will follow in the sphere of food security.

Obviously the extent to which food production can be increased depends on the measures which each country of the region undertakes according to its own capacity and priorities. There exists in this context a wide range of concrete actions which can be implemented to strengthen the efforts being carried out at national level and, at the same time, develop links and mechanisms of cooperation within SADCC.

Some preparatory work in this area has already been identified and is in some cases being implemented, for example the studies at present being carried out to assess the potential productive resources of the region.

Further actions aimed at increasing food production can be developed in various areas, for instance:

- (i) Solutions must be found to the problem of guaranteeing adequate and regular supplies of essential inputs. Regional self sufficiency in this respect would reduce external dependence particularly on South Africa.

In this particular area, emphasis should be given to:

- regional production and distribution of seeds, in respect of the agricultural sector, and reproducers, in the case of animal production;
 - production of tools, agricultural equipment, agro-chemicals and other inputs from the industrial sector (with which it will be necessary to establish close coordination);
 - improvement of the infrastructure necessary for the distribution of inputs at national and regional level.
- (ii) Technical and scientific development should be encouraged, particularly regarding the better use of existing technical resources and the transfer of available technology in the region. This requires a careful survey of existing institutions and a commitment to increased use of local resources, the development of appropriate technologies and the expansion of modern agriculture.
- (iii) Agricultural production should be encouraged either through the rehabilitation and better use of existing facilities or through the implementation of new development projects. Special attention should be given to transforming and developing family sector production.

(b) Improved systems for delivery, conservation, processing and food storage

The increase of national food availability and the reliability of supply - both of which are essential to the achievement of the strategic objectives mentioned above - depend on the capacity and efficiency of the food marketing, processing and delivery systems. Without a balanced development between both sectors i.e. production and marketing, the strengthening of national productive capacity will have only a limited impact on achieving regional food security objectives.

Of paramount importance in this regard is the efficient and timely delivery of what is produced, the reduction of post-harvest food losses and the improvement of handling, conservation and food processing technologies, including those most appropriate to the family sector.

Certain programmes and projects have already been initiated in relation to some of these problems. Nevertheless, given the enormous importance and immediate impact that such actions can have it is clear that, within a framework of regionally agreed priorities, the strengthening and expansion

of national infrastructure for marketing is of special importance. This must, however, take place within the context of the needs of the region and must be integrated with present and future production and distribution networks.

(c) Establishment of systems for the prevention of food crises

The creation of a regional capability for the prevention and control of food emergencies is of fundamental importance in order to ensure national security of supply, to minimise the tragic consequences associated with the destruction of crops and stocks caused by climatic and other problems and to guarantee the political and economic independence of the region.

The development of this capacity involves five main elements: the implementation of an early warning system, first at national level and later at regional level, the prevention of plaques and diseases, the creation of security reserves at national and regional levels, the creation of seed stocks of the basic food crops and the establishment of regional mechanisms for the coordination of external support in times of emergency.

In this context and in addition to the actions already being carried out, it is urgent to proceed with the effective implementation of systems for food security and seed reserves. This requires the creation of the necessary infrastructure and the mobilisation of international cooperation as well as the reinforcement of national programmes which will ultimately constitute the basis for and fulfilment of such a regional system.

In brief, these three problem areas constitute the nucleus of a food security strategy for the region. It is in relation to these various components that the above development of SADCC's regional programme is presented. The programme requires a determination of specific objectives, priorities, requirements and operational mechanisms as well as the formulation of national and regional projects which will, at various stages, represent the basic elements in the regional food security strategy.

The character and content of the proposed regional scheme of cooperation is based on the identification of existing problems and on the convergence between national development objectives and regional objectives for economic liberation. The adoption of this scheme will, without doubt, involve a major effort of coordination, articulation and implementation and must be coherent in its different stages and component parts.

B. REGIONAL FOOD SECURITY PROJECTS

1. Progress Report

The following report details, in summary form, the progress which has been achieved in the implementation of the nine Food Security projects presented to the 1981 SADCC Blantyre Conference.

Project One - A Technical Assistance Programme Designed to Achieve Coordination and Cooperation on all Agrarian Issues

The project has been finalised and a Document of Agreement was signed with USAID in mid-1982. As originally envisaged in the project agreement, its implementation was somewhat delayed, however, pending the appointment of personnel to the Zimbabwe Ministry of Agriculture's Administrative Support Unit (see p10). This problem has been overcome and the staff recruited in mid-October 1982 have been formally appointed by the Public Service Commission and have taken up their posts.

Despite this delay it was agreed to proceed with the inaugural meetings of the Consultative Technical Committees. These took place in Harare from 22-25 November 1982. Terms of Reference for the three Consultative Technical Committees were approved as basic guidelines by SADCC Agriculture Ministers at their November meeting.

Project One, which has an initial life of thirty months, provides the finance necessary to hold three meetings of each CTC; to cover a number of workshops and seminars; and in addition to finance the cost of holding technical meetings to consider the recommendations of the food security programme feasibility studies. Two such meetings dealing with food security Projects Three and Four were held in Harare from 10 -17 November 1982. These meetings were attended by technical experts from the nine SADCC countries. In addition, Project One provides for the travel and other expenses which may be incurred by Zimbabwe Ministry of Agriculture officials in carrying out regional food security work. Finally, the project contains funds for the establishment of a Food Security Library in the Ministry of Agriculture in Harare which will be at the disposal not only of Zimbabwe but also of officials from other SADCC Member States.

Project Two - An Early Warning System for Regional Food Security

Having completed the field work phase of this project the team responsible for the study returned to FAO headquarters in Rome to prepare a draft report. An official from the Zimbabwe Ministry of Agriculture assisted in this work. The main outlines of FAO's recommendations were clarified in consultation with the Zimbabwe representative and a brief report has been prepared by FAO. This document, known as the Terminal Report, appears on page 11. The estimated cost

of this project, which includes both the regional centre and the national components, will amount to US\$4 065 000. A technical meeting will be held in Harare to consider the detailed recommendations of the full report. SADCC Ministers of Agriculture have approved, in principle, the recommendations of the Terminal Report. It is hoped that pledges of support will be forthcoming from FAO for the provision of technical assistance required for certain aspects of the project. In addition, a pledge of financial support for a significant portion of the implementation stage of the project will probably be made by UNDP.

It is anticipated that the technical meeting to discuss the project will take place in late February or early March 1983. If the report requires amendment this will be undertaken by FAO before the mid-1983 meeting of the SADCC Council of Ministers. The implementation stage could proceed more rapidly thereafter particularly if SADCC is already in possession of pledges in principle for both financial and technical aid.

Within the context of this project the Government of Mozambique is seeking to establish a national early warning system so that production crises can be foreseen and remedial action taken in good time (see p70). The total donor funding for this project is US\$976 000 which is part of the US\$4 065 000 foreseen in the Terminal Report (and quoted above).

Project Three - A Regional Resources Information System

The feasibility study for this project, financed by the Commonwealth Fund for Technical Cooperation (CFTC), has been undertaken by the Food Supply Analysis Group (FSAG), Queen Elizabeth House, Oxford, UK. The FSAG has completed the draft report both for this project and for Project Four. The two reports were submitted to the Zimbabwe Ministry of Agriculture which has since circulated them to Member States. A technical meeting to discuss the recommendations of both reports took place in Harare from 10-17 November 1982. Both reports are highly technical and involve important and complicated issues. The final reports should be available by the end of 1982. Once approved by the SADCC Council of Ministers they will be presented to donors for consideration. It is not possible for these reports to be ready for formal presentation at Maseru. If these projects are approved by the Maseru Council of Ministers Zimbabwe will make copies available to interested donors.

Project Four - A Regional Inventory of Agricultural Resource Base

A progress report on this project, which is financed by CFTC and carried out by FSAG, is contained in the remarks relating to Project Three above.

Project Five - A Regional Food Reserve

The feasibility study for this project is financed by the European Economic Community (EEC) and a consultant has been selected to undertake the work. The field work phase of the study began in early October 1982 and it is expected that the first draft report will be ready by April 1983. This report will be examined at a technical level by SADCC experts before being submitted to the Council of Ministers for approval.

Project Six - Regional Post-Harvest Food Loss Reduction

Project Seven - Regional Food Processing Technology

The Canadian Government, through its International Development Research Centre (IDRC) has financed and undertaken a combined feasibility study relating to Projects Six and Seven. The draft report was submitted to Zimbabwe and a meeting of technical experts was convened in Harare to discuss it. IDRC subsequently prepared the final report which was circulated at the Luanda meeting. This document incorporates all the major amendments recommended by the meeting of technical experts. An extract from the full report appears on page 27. This document contains the summary of IDRC's recommendations. SADCC Ministers of Agriculture approved the recommendations contained in these reports and agreed that the project be presented to SADCC: MASERU. The total donor funding for this project amounts to US\$1 250 000.

The unit proposed in this project will be established in a flexible and gradual manner. Furthermore the technical units or institutional structures which may arise from the other studies will be carefully evaluated in relation to the capacity of existing institutions. There is no desire by SADCC to see a proliferation of such structures in this sector.

Project Eight - Regional Food Marketing Infrastructure

A feasibility study for this project is being financed by the CFTC and undertaken by a Canadian consultancy firm (AGRODEV Canada Inc.). The field work phase of the study has been completed and the draft report was finalised at the end of October 1982. The report has been distributed to technical experts in all SADCC countries for their consideration. It is proposed that a meeting of experts take place in Harare probably during the second week of February 1983. AGRODEV will incorporate the necessary amendments to the final report which will be submitted by Zimbabwe to the May 1983 Council of Ministers.

Project Nine - Regional Food Aid

The feasibility study for this project is being financed by the European Economic Community (EEC) and a consultant has been selected to undertake the work. The firm involved (Technosynthesis Planning and Engineering Consultancy S.p.a. -Rome) began the field work phase in early October. The consultant is also responsible for the feasibility study of Project Five (A Regional Food Reserve). Although both studies are being conducted simultaneously, reports will be prepared separately for each. It is expected that the first draft report will be available by April 1983 after which it will be submitted by Zimbabwe for consideration by SADCC technical experts. The final report will be presented to the Council of Ministers.

The Administrative Support Unit

The Zimbabwe Ministry of Agriculture has established a small Administrative Support Unit within its own organisation to work full time on the regional Food Security Programme. The Unit is needed particularly to service Project One. Appointments were made to the Unit in mid-October 1982 and the individuals involved took up their duties in mid-November. Although Zimbabwe is responsible for this Unit, which is part of its own administration, the Australian Government will provide financial assistance towards its operating costs and, in addition, will provide an Australian specialist to strengthen its expertise. This person is expected to assume his duties in Harare some time in February 1983.

2. An Early Warning System for Food Security - Project Two

Terminal Report
prepared by the Food & Agriculture Organisation of the UN

1. INTRODUCTION

1.1 General

At the summit meeting of the Southern Africa Development Coordination Conference (SADCC) held in Lusaka in April 1980, the Government of Zimbabwe was charged with the task of preparing a food security plan embracing the nine SADCC countries, viz. Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe. The proposals and project ideas suggested by Zimbabwe were accepted by SADCC at a meeting held in Maputo in November 1980.

Crucial to any regional food security plan is the availability of timely information on the food supply position. Since food production within the region is characterized by considerable variability from year to year, crop progress and food supplies have to be effectively monitored. Existing crop reporting and food supply monitoring systems within the region vary from country to country, but few of the countries have at their disposal sufficient data to provide accurate and timely assessments.

The establishment of a Regional Early Warning System (REWS) on staple food supplies is a necessary step towards food security. A Regional Early Warning System will have to depend on the timely availability of relevant data in each SADCC country.

1.2 Objectives of the Project

The objectives of the TCP assistance were:

- (i) To devise and suggest how to establish a Regional Early Warning System (REWS), drawing on existing national early warning systems, which will provide timely key information on supply prospects of basic foodstuffs in order to determine if, when and how domestic food supplies need augmentation either from other countries within the region or from sources outside the region.
- (ii) To recommend and formulate proposals based on practical measures and taking into account the physical and other limitations of the SADCC countries to strengthen existing national systems or create new ones, especially in crop forecasting techniques, as required within a basic regional framework.

- (iii) Possibly, to make general recommendations which could enhance the operation of the system at a later stage by the use of more sophisticated techniques as they become available.

1.3 Implementation of the Project

Discussions and meetings in Rome and Zimbabwe led to a written formal request on the 14th September 1981 from the Government of Zimbabwe for FAO to undertake the feasibility study relating to the establishment of a Regional Early Warning System. This in turn led to the TCP/RAF/2202 "Preparation of Project Proposals for the Establishment of an Early Warning System for Regional Food Security (SADCC Countries)" with an FAO contribution of US\$ 130 000 approved by the Director-General of FAO in mid-January 1982.

The FAO staff members 1/ involved worked in close collaboration with the Zimbabwe Ministry of Agriculture in Harare and with the National Authorities concerned in each member country, particularly those dealing with food supply, marketing, trade, agricultural statistics, crop forecasting and agricultural meteorology.

Contacts with the representatives of FAO, UNDP and other agencies dealing with technical assistance related to the subject as well as with bi- and multilateral projects which deal with relevant aspects were also maintained.

The FAO team made field trips to all the nine countries commencing in April 1982 and ending in July 1982.

Messrs Frere, Marsili and Lombard made field visits to Botswana, Lesotho and Angola between 18th April and 20th May. They also met officials in Mozambique in connection with that country's request for assistance with preparing a Project Document for a National Early Warning System, and had discussions with

1/ The mission leader, C.S. Lombard (AGO), was based in the Ministry of Agriculture, Harare, Zimbabwe with Mr. P. Murphy, Head, Economics and Markets Branch, Ministry of Agriculture as counterpart. The other four FAO mission members were: M. Frere (Agro-meteorologist, AGP); R. Marsili (Economist, ESCF); R. Petricevic (Statistician, ESSS) and G. Popov (Agro-meteorologist, AGP).

officials in Zimbabwe. Messrs Popov, Petricevic and Lombard made field visits to Zimbabwe, Mozambique, Malawi, Swaziland and Zambia between 22nd May and the 6th July. Mr. Popov visited Tanzania in July. All officials met were given a copy of the TCP Project Agreement. The FAO Plant Production and Protection Paper No. 17 "Agrometeorological crop monitoring and forecasting" was given to appropriate people in all nine countries. Staff members of the agro-meteorological services in the respective countries were introduced to the application of the methodology described in this paper.

At all times, close contact was maintained with the Ministry of Agriculture in Zimbabwe, through the Counterpart as well as the SADCC Liaison Officer Mr. R. Masundire. Cooperation with other teams, like the Commonwealth Secretariat, was maintained whenever appropriate and time permitted.

The purpose of the individual country missions was to review existing national early warning systems and to formulate proposals to strengthen them with a view to the eventual supply of national data to the proposed Regional Early Warning System. Reports were drafted during the field work phase of the study and finalized in FAO Headquarters and issued in a one-volume Mission Report 1/, which is summarized in this Terminal Statement.

The Mission was well received in all countries. All national officers concerned expressed interest in cooperating with the SADCC regional project and agreed to submit periodically the information which would flow from their National Early Warning Systems to the regional one.

2. RESULTS AND CONCLUSIONS

The Mission concludes that a Regional EWU is a viable proposition. The logical way for SADCC to achieve the desired objectives is to:

- (i) Establish a Regional Early Warning Unit (REWU) to be located in Zimbabwe as soon as possible.

1/ FAO, TCP Mission Report on the Preparation of Project Proposals for the Establishment of an Early Warning System for Regional Food Security (SADCC Countries). Rome, 1982. AG:TCP/RAF/2202, Mission Report.

- (ii) Establish or further develop National Early Warning Units (NEWU) in each of the SADCC countries, which would not only provide those countries with good early warning systems of their own but which would also feed information to a REWS and act as a national receiving centre for the output from that source.

Some systems of pre-harvest assessment of the food situation exist in Zimbabwe and Malawi although in both cases the system is not satisfactory and needs improvement. In Lesotho, Angola, Swaziland and Mozambique no early warning system exists. Mozambique has recently begun to negotiate with FAO for the establishment of a national system. Tanzania has an FAO-sponsored Early Warning System of its own in operation while another FAO-sponsored Early Warning System has begun to operate in Zambia. The Mission was very impressed with the level of sophistication and competence of the Botswana EWS. In Zimbabwe, while information is excellent and timely for the commercial sector, there is very little for the traditional sector. The views and recommendations of the Mission in relation to the individual National Early Warning Units are summarized below.

3. RECOMMENDATIONS

3.1 Regional Early Warning Unit (REWU)

- (a) It is recommended that SADCC establish a REWU located in Zimbabwe supported by individual NEWUs in the nine member countries. The links between individual NEWUs and the REWU are very important. The implementation of the recommendations will necessitate international technical assistance and funding.
- (b) The REWU must provide advance information on basic foodcrop production and food supplies in the nine SADCC countries. Its major purpose will be to generally alert all those concerned, well in advance, of impending food shortages and surpluses on a Region-wide basis so that suitable and timely remedial action can be taken. An efficient REWS is an essential prerequisite for the attainment of the objectives of food security.
- (c) In order to achieve the objective, the activities which are set out in the specification for the Regional Unit must be undertaken. In essence, if the action recommended is implemented it will lead to the establishment of a fully operational institutionalized Regional Early Warning Unit (REWU). The functions

of the REWU include the collection of relevant information from the NEWU, the analysis of these data, and the preparation of regular periodic reports for the use of member governments. These reports will allow Governments to react to a given situation on a Regional basis. In so doing, the REWU will be a tool for decision-making especially in regard to the possible supply of foodgrains within SADCC from areas of surplus to areas of deficit, or to the possible need to obtain essential foodgrains from external sources in a timely and economical manner. It is also proposed that the information available through the Unit could be used to assist in the management of food reserves including their release and replenishment.

(d) The REWU should be attached to the Zimbabwe Ministry of Agriculture in Harare. Through their Programme of Action, SADCC has given Zimbabwe responsibility for food security and it would, therefore, appear logical to locate the proposed REWU there. Zimbabwe has the added advantage of being conveniently placed especially from the communications and speedy accessibility point of view.

(e) The SADCC REWS Project would have focal points in each of the nine member countries, i.e.:

national Early Warning Units which already exist in those countries with a currently operational FAO-sponsored NEWU of their own, namely Tanzania and Zambia, and those which the Mission proposes should be established in the other seven countries. Details of the Mission proposals regarding the NEWUs are summarized below.

3.2 National Early Warning Units (NEWU)

The recommendations for the individual NEWUs vary from country to country as each country is at a different stage in terms of crop monitoring and early assessments of the situation.

In Angola the Mission's conclusion is that it would be too difficult to establish a fully fledged EWS now. This is fundamentally due to the lack of basic data and the current difficult security situation, which largely affects the key food producing areas. Nevertheless certain measures are identified that can assist the Government to improve its overall food supply monitoring. These are:

- ..(i) introduction of crop condition monitoring based on the analysis of existing rainfall data;

- (ii) improvement in the coordination between the key food Ministries - Agriculture and Internal Commerce;
- (iii) regular revision of cereal import plans and estimates;
- (iv) drawing the Ministry of Planning's early attention to the revised estimates of marketed production and import plans issued by the Ministries of Agriculture and Internal Commerce, for required action viz-à-viz food imports.

Donor assistance is required to assist in implementation and prepare the ground for an Angolan EWU.

Botswana has several well-organized groups collecting information actually used in effective crop monitoring and in the assessments of relief requirements in drought years. The Interministerial Drought Committee successfully monitors the onset of drought, declares emergencies and coordinates relief programmes. The Botswana NEWU should be located there. Minor changes will be required. Although the Meteorological Service is aware of the importance of rainfall for agriculture, some donor assistance is needed to assist it to use FAO's water balance approach for crop monitoring and forecasting, and in establishing the NEWU.

Lesotho has the basic elements of an early warning system, but there is no systematic attempt to bring these elements together. The Government has already recognized the need for an NEWS and recommendations are before the Cabinet for approval. There are many agencies dealing with food matters. These need to be coordinated into one agency. The Food and Nutrition Coordinating Office, reporting directly to the Prime Minister's Office, should become the Lesotho EWU. A full donor assisted project is needed to establish the Lesotho EWU.

In **Malawi** Government activities concentrate on evaluating the emerging food supply situation based on estimates of marketed production. The different government services, located in different towns, contain the elements of early warning activities. These need to be brought together through the establishment of an EWU in the Ministry of Agriculture. This EWU will be the Secretariat of the Crop Estimates Committee. Specific donor assistance is required in setting up the EWU.

Mozambique has no Government agency providing advanced estimates of food production or making qualitative assessments of the food situation throughout the growing season. Different aspects of early warning activities are, however, undertaken in different Ministries. These services concern themselves to varying degrees with the four government-defined agricultural sectors: state, cooperative, family and private. An Early Warning Unit in the Ministry of Agriculture should be established. At the request of the Government, the Mission prepared a comprehensive draft Project Document for donor assistance. Its planned first phase duration is for two years with a donor contribution of around US\$ 880 000.

At present, no government agency in **Swaziland** is able to provide advance estimates of food crop production. There are data, but these are not available before the harvest. A National Meteorological Service is still to be established. The only elements and infrastructure which could be used for early warning activities are in the Agricultural Department of the Ministry of Agriculture and Cooperatives through the Rural Development Areas (RDA). It is recommended that an Early Warning Unit be established based on these RDAs, in the Ministry of Agriculture. Some technical assistance in the form of personnel services is required. Swaziland has the advantage of an ongoing FAO/UNDP project "Assistance in Marketing for Rural Development" which will be able to assist in the establishment of the EWU.

As **Tanzania** has an FAO-sponsored Early Warning Project, now in its second phase, it is fully capable of fulfilling its national crop monitoring obligations. All that is now necessary is to formalize its involvement with the proposed REWU. This is also true for **Zambia** where an FAO-sponsored Early Warning Project has recently begun to operate.

Zimbabwe has many activities relating to crop monitoring and early warning activities. A system of crop forecasting already exists. However this really only covers the activity of large-scale farmers. It is therefore recommended that an EWU be set up in the Ministry of Agriculture to cover both the modern and large-scale communal lands sectors. In this way the different elements will be brought together so that comprehensive overall coverage materializes. Donor assistance is recommended in the form of a comprehensive project.

ANNEX
Summary of Project Proposals

A. REGIONAL

Project Title: Assistance in the Establishment of an Early Warning System for Regional Food Security.

(i) Objective

The objective of the technical assistance is to assist SADCC establish an Early Warning System for Regional Food Security. This will provide advance information on basic foodcrop production and food supplies in the region and enable SADCC to generally alert all those concerned, well in advance, of impending food shortages and surpluses on a region-wide basis so that suitable and timely action can be taken.

(ii) External Inputs

a) Personnel Services

One Team Leader/Agro-Economist
One Agricultural Statistician
One Agro-meteorologist
Consultants (12 man-months)
Administrative Assistant
Secretary
Driver/Messenger

b) Supplies and Materials

Two vehicles
One mini-computer/word processor

c) Fellowships, seminars and in-service training

Fellowships for the three Senior SADCC professionals, seminars, computer training and study tours.

(iii) Duration

A first phase of three years.

(iv) Total cost of External Inputs

This is estimated to be of the order of US\$ 1.5 million.

B. NATIONAL

1. ANGOLA

Project Title: Assistance in Preparing for a National Early Warning Unit.(EWU).

(i) Objective

Given the conditions currently prevailing in the country it is difficult for Angola to establish a national EWU at this time. Nevertheless, preparatory work can be undertaken in anticipation of suitable conditions emerging. This will involve technical assistance only in the form of personnel services, at this stage.

(ii) External Inputs

a) Personnel services

One Economist/Agricultural statistician

One Agro-meteorologist

(iii) Duration

Six man-months each.

(iv) Total cost of External Inputs

This is estimated to be of the order of US\$ 75 000.

2. BOTSWANA

Project Title: Assistance in Strengthening Early Warning Activities

(i) Objective

There are well developed crop monitoring arrangements in Botswana already, but improvements are necessary. The objective of technical assistance is to establish operational crop monitoring activities using rainfall data. Assistance is needed in making the first estimates on area available before the harvest.

(ii) External Inputs

(a) Personnel Services

These are consultancies for:

One Team Leader

One Agricultural Statistician

One Agro-meteorologist.

(b) Supplies and Materials

Two vehicles, mini-computer and calculators

(c) Fellowships, seminars and in-service training

Fellowships for three Senior Nationals, in-service training and study tours.

(iii) Duration

Three man-months each consultancy

(iv) Total cost of External Inputs

This is estimated to be of the order of US\$ 110 000.

3. LESOTHO

Project Title: Assistance in Establishing a National Early Warning Unit (EWU)

(i) Objective

Considerable effort will be necessary to get a national Early Warning Unit properly established in Lesotho. There is need for one Government agency to execute necessary crop monitoring and early warning activities. This agency should have enough authority to bring together all the other Government agencies dealing with food matters. Technical assistance is needed in firmly establishing the EWU. This should take the form of a fully fledged project and includes agro-meteorological, agro-economics and agricultural statistics personnel services.

(ii) External Inputs

(a) Personnel Services

One Team Leader/Chief Technical Adviser/Agro-economist

One Agro-meteorologist

Consultancies

(b) Supplies and materials

Two vehicles, mini-computer, calculators and meteorological equipment

(c) Fellowships, seminars and in-service training

Fellowships for three Senior Nationals, seminars, in-service training and study tours

(iii) Duration

24 man-months for each of the two experts

Three man-months for an Agricultural Statistician

(iv) Total cost of External Inputs

This is estimated to be of the order of US\$ 600 000.

4. MALAWI

Project Title: Assistance in Strengthening Early Warning Activities

(i) Objectives

The main objective of the technical assistance is to enable the various services to be brought together into a national EWU. This assistance will be mainly in the form of personnel services.

(ii) External Inputs

(a) Personnel Services

One Team Leader/Agro-economist
 One Agricultural Statistician
 One Agro-meteorologist

b) Supplies and materials

Two vehicles, mini-computer, calculators and meteorological equipment

c) Fellowships, Seminars and in-service training

Three fellowships for three Senior Nationals, seminars, in-service training and study tours

(iii) Duration

Six man-months for each of the experts

(iv) Total cost of External Inputs

This is estimated to be of the order of US\$ 200 000.

5. MOZAMBIQUE

Project Title: Establishment of a Crop Forecasting and Early Warning System

(i) Objective

Considerable effort will be necessary to get a national Early Warning Unit properly established in Mozambique. There is need for one Government agency to execute necessary crop monitoring and early warning activities. This agency should have enough authority to bring together all the other Government agencies dealing with food matters. Technical assistance is needed in firmly establishing the EWU. This should take the form of a fully fledged project and include agro-meteorological, agro-economics and personnel services.

(ii) External Inputs

a) Personnel Services

One Agro-Economist/Team Leader

One Agro-meteorologist

Consultancies

Secretary (bilingual)

Two drivers

b) Supplies and materials

Three vehicles

Desk top calculator

Meteorological equipment

Office equipment

c) Fellowships, seminars and in-service training

Two fellowships for the Nationals, seminars, in-service training and study tours

(iii) Duration

A first phase of two years

(iv) Total cost of External Inputs

This is estimated to be in the order of US\$ 880 000.

6. SWAZILAND

Project Title: Assistance in Establishing a National Early Warning Unit (EWU)

(i) Objective

At present no Government agency is executing early warning functions although the elements of crop monitoring and advance warning do exist in the country. The main objective of technical assistance is to analyse rainfall data in relation to crop phenological information so as to make advance assessments of the food crop situation. Assistance is also needed to finance a National to be trained in agro-meteorology at degree level. Technical assistance is also required in agricultural statistics in regard to utilizing collected statistics in a timely manner.

(ii) External Inputs

a) Personnel Services

These are consultancies for:

One Agricultural Statistician

One Agro-meteorologist

b) Supplies and materials

Some calculators and meteorological equipment

c) Fellowships, seminars and in-service training

Fellowships for two Senior Nationals including one degree level Agro-meteorologist. Seminars and in-service training for meteorological observers.

(iii) Duration

Six man-months each

(iv) Total cost of External Inputs

This is estimated to be of the order of US\$ 100 000.

7. TANZANIA

Project Title: Early Warning System and Crop Monitoring

Tanzania has had an Early Warning Project since 1978. The project is now in a second phase of three years with a total budgeted external assistance cost of US\$ 1.3 million funded by the Netherlands Government through FAO Trust Funds.

The existing project is fully capable of fulfilling the reporting obligations to the Regional Early Warning Unit (REWU). All that is necessary is to formalize its involvement with the proposed REWU. For this, no additional external assistance is likely to be required.

8. ZAMBIA

Project Title: Crop Forecasting and Early Warning System

Zambia's Early Warning Project began its operation in early 1982. The project is now in a second phase of two and a half years with a total budgeted external assistance cost of US\$ 0.9 million funded by the Netherlands Government through FAO Trust Funds.

The existing project is fully capable of fulfilling the reporting obligations to the Regional Early Warning Unit (REWU). All that is necessary is to formalize its involvement with the proposed REWU. For this, no additional external assistance is likely to be required.

9. ZIMBABWE

Project Title: Assistance in Establishing a National Early Warning Unit (EWU)

(i) Objective

Information on the large scale commercial sector is currently well covered. Technical assistance needs to be concentrated in the first instance in the communal lands sector where the majority of the population live. A national EWU is needed to provide the Government with timely assessments of the food situation for all sectors so that appropriate advance action can be taken.

(ii) External Inputs

a) Personnel services

One Team Leader/Agro-economist
 One Agro-meteorologist
 One Agricultural Statistician
 Driver
 Administrative assistant

b) Supplies and materials

Two vehicles
 Desk top computer
 Meteorological and statistical equipment

c) Fellowships, seminars and in-service training

Three fellowships for National staff; seminars, computer training and study tours.

(iii) Duration

Two years
 One year - Agro-meteorologist
 One year - Agricultural Statistician

(iv) Total cost of External Inputs

This is estimated to be in the order of US\$ 600 000.

3. Regional Post-Harvest Food Loss Reduction - Project Six
and
Regional Food Processing Technology - Project Seven

Extract from Report & Recommendations
Prepared by a Technical Advisory Mission
from the International Development Research Centre (IDRC)

Terms of Reference

A Mission composed of four scientists, provided by the International Development Research Centre (IDRC) during September and October 1981, studied two of the nine projects identified by SADCC members as essential to a regional food security program. The two projects studied are closely interrelated, one being concerned with post-production food systems, the second with research and training for food processing enterprises.

The Mission pursued what it understood as the spirit rather than the exact letter of the suggested Terms of Reference and interpreted its purpose to be to advise and recommend to the SADCC Regional Food Security Secretariat, through the Minister of Agriculture for Zimbabwe, those actions desirable:

- 1) to reduce post-harvest losses through the establishment of efficient post-production systems for the principal food sources of plant and animal origin in each of the SADCC countries; and
- 2) to establish reliable industries and facilities for the preservation, processing, distribution and marketing of processed foods to meet the nutritional needs and market demands of present and future inhabitants of the SADCC countries.

Because the future course of agricultural and industrial development will be influenced by political decisions, the Mission has formulated

its recommendations to insure that scientific and technological activities will be sensitive to and in harmony with regional and national political policies.

Major Recommendations

The Mission has recommended that, under the direction of SADCC, a research and advisory capability be created consisting of the following:

A Post-production and Food Industry Advisory Unit (PFIAU)

PFIAU would be responsible for advising SADCC governments, institutions, agencies and industrial organizations within member countries of the research, technological development, training and information necessary to ensure that existing and future post-production systems, food processing and distribution industries operate efficiently and effectively. PFIAU should eventually be composed of several scientists and technologists including, from the outset, a marketing economist and an economist specializing in food policy. The policy economist's major responsibility would be to collect and analyze information bearing upon the food, agricultural and agro-industrial policies of SADCC member nations in order that PFIAU may be advised on an ongoing basis of the policy environment in which its technical development and training initiatives must operate.

The advisory unit must be sensitive to government policies. It is not proposed, however, that PFIAU engage in the formulation of food and agricultural policies though, in due course, it may have valuable advice to offer to policy makers.

It is recommended that during the first year, the Team Leader and the economist (policy) be employed and, in consultation with the Ministry of Agriculture in Zimbabwe and with the

assistance of specialist consultants, prepare the program of work for the succeeding years. Early in the second year three additional people should be added: (a) an agricultural engineer; (b) a food technologist; and (c) an information specialist.

At various locations within the SADCC region extremely efficient organizations, systems and technologies are to be found in the public, parastatal and private commercial sectors, in rural industries and among the smallholder and subsistence farming sectors. Equally across this spectrum there are many instances in need of significant improvement. Therefore the first responsibility of the advisory unit should be to identify the many efficient systems and technologies that exist and encourage by demonstration and other methods of communication that these be more widely adopted.

Several industries, marketing boards, cooperatives, rural advisory and extension services provide well-designed training programs. The advisory unit should examine how these training facilities could be expanded and be made available to those who could benefit but at present do not have access to these programs.

Supporting Recommendations

- 1) More attention needs to be given by research scientists, rural extension agents and advisers to the post-production food sector. At present post-production receives much less attention than crop production improvement.
- 2) Before embarking on the development of new products and processes, scientists and technologists should first study and comprehend the opportunities and constraints within existing industries and the post-production sectors. Rather than confining themselves to

new product development in their laboratories, it would be more productive for SADCC country scientists to carry out applied and adaptive research within rural communities and operations studies in the existing food processing industries. It appears to be the wish of several SADCC members that highest priority be given to food preservation at the village and rural household level. Therefore, scientists and technologists in government services and universities should be encouraged to devote their skills to the relevant issues.

- 3) A great deal of valuable knowledge and experience relevant to post-production systems and food processing exists within the SADCC countries. This knowledge and experience should be applied and adapted more extensively before seeking to transfer exotic technologies to the SADCC region from elsewhere.
- 4) Before creating new regional institutions it is recommended that existing institutions be strengthened to serve both national and regional food security objectives. The strengthening of existing research and technological institutions does not, in the first instance, call for large capital investments. The most pressing need is to re-orient the programs of some institutions to address the most urgent post-harvest problems, particularly within the low income rural sector rather than the pursuit of new products and technological processes for which little if any demonstrable market demand exists. In planning their programs, some institutions need to develop a closer working relation with those they should seek to serve.

- 5) The creation of a regional Institute of Food Science and Technology for research and training is not recommended. The Mission recommends a planned and organized system of inservice training and use of existing local research and training institutions to study subjects of regional concern and to support the formation of qualified technical, scientific and managerial personnel to serve in post-production system functions - specifically:
- i) That a regionally accepted and recognized system of technical qualifications in food related areas of study be formulated and established. The provision of routes to these qualifications would best be national for those personnel required in greatest numbers and regional for the more highly specialized.
 - ii) Emphasis should be given to expanding and strengthening existing institutes for research and training, those more highly specialized making adequate provision to admit students and trainees from other SADCC countries.
 - iii) As the need for research scientists and facilities increases these should be realized by increasing research and training opportunities in existing universities and institutes. Particular attention needs to be given to the style and content of both under-graduate and post-graduate university courses to ensure their absolute relevance to SADCC country needs. Patterns established in the older universities of Europe and North America are not necessarily best suited to the needs of the SADCC countries.

- iv) That a series of regional seminars for commodity board managers be held during which the most effective post-production systems presently in use in the region could be made known to all concerned. These should be supported by comparative studies encouraged by PFIAU of existing rural post-production systems and component technologies.
 - v) Agricultural extension and rural advisory technicians should be trained in the principles and practices of post-production systems and technologies, through short courses to be designed by the advisory unit and to be provided by existing technical institutions.
 - vi) That particular attention be given to training in systems methods in order that existing post-production facilities and their components may be studied as total systems.
- 6) Initial priority commodities for post-production systems research and development in SADCC countries are maize, sorghum, the millets, wheat, oilseeds (especially groundnuts, soybeans and cottonseed), root crops such as cassava and potatoes, bananas, meat and meat by-products. The processing of vegetable crops for export appears as a matter of individual national policy, but some industries might serve both an export and a regional food security objective.

General Observation

It will be important, as other food security projects are started, that the Advisory Unit recommended in this report be appropriately rationalized and integrated with the other related activities. It will therefore require adequate funds for travel and to convene appropriate working groups and training seminars.

Probable Cost

A budget is presented at the end of the report in which it is estimated that the cost of the proposed advisory service would increase in Zimbabwe dollars from Z\$102 thousand in the first year to Z\$302 thousand in the fifth year, and that the total would be approximately Z\$1,225 thousand for the five years. From this distance in time and given the present universal state of economic uncertainty, these estimates must be regarded as approximate and will need to be reviewed throughout the course of the program if the recommendations made are accepted.

It is assumed in arriving at the budget estimates that certain local costs will be met by the host government or by SADCC collectively. If this is not so, some additions to the budget will be necessary.

SPECIFIC RECOMMENDATIONS

The following recommendations are in several respects different from what the Mission submitted in its original draft report. They result from a detailed and constructively critical appraisal of the Mission's report by a committee of SADCC country representatives presented to and discussed with the leader of the Mission which recommended upon Projects 6 and 7.

While accepting the SADCC food security committee's significant change to its original proposal, the Mission is still concerned that an adequate mechanism be devised to ensure that the advisory unit recommended be sensitive to and guided by policy directives consistent with the objectives defined and agreed upon by all the SADCC member governments.

Specifically, it is recommended that a Post-production and Food Industry Advisory Unit (PFIAU) be created with its headquarters in Harare, Zimbabwe. The following outlines the rationale for and proposed composition of PFIAU.

POST-PRODUCTION AND FOOD INDUSTRY ADVISORY UNIT (PFIAU)

Post-production systems are composed of a variety of inter-linked and inter-dependent technical, economic and human activities and operations. Food processing industries and preservation technologies represent a vital component of most post-production systems. The degree to which they reduce post-harvest losses indicates the technical efficiency of food preservation technologies. Consequently, the proposed PFIAU will concern itself both with post-production systems as a whole, with food processing industries as components of each post-production systems, and with preservation and processing at the rural community and farm levels. Though in due course all significant post-production systems should be studied and evaluated, during its early years PFIAU should concentrate upon the post-production systems that relate to food grains (cereals, legumes, oilseeds), to root and other significant vegetable crops, and to important animal products, with particular attention to those that affect the poorer rural communities.

Though PFIAU will be composed of several disciplines, its prime purpose will be to encourage a systematic approach in research, development, demonstration and training, examining each system as a whole rather than as a set of isolated post-production components.

The purpose of PFIAU will be:

- a) To improve the efficiency and effectiveness of existing post-production systems, food processing industries and technologies; and
- b) To recommend the research, development and training facilities and programs necessary to the creation of improved post-production systems and food preservation processes.

PFIAU should work through existing government, parastatal, cooperative, academic and private research, development and training agencies seeking at first to strengthen the existing agencies and organizations rather than to create new research institutions. If, as proposed, the advisory unit is located

In Zimbabwe, the whole of SADCC will benefit from the extensive relevant experience that exists in Zimbabwe. Furthermore, the PFIAU could assist those Zimbabwean agencies responsible for rural industrial development to adapt the technological and marketing experience available in the more advanced industries.

In cooperation with existing agencies in SADCC countries, PFIAU will engage in at least four major activities:

1. To study and evaluate existing post-production, food processing and preservation systems and technologies to identify those which are effective and should be more widely demonstrated, to determine needs for research, development and training, and to prescribe courses of action within SADCC regions to satisfy these needs.
2. To help formulate demonstration, training, research and development projects relevant to post-production systems, rural food industrialization and preservation.
3. To review and evaluate the existing facilities for education and training throughout SADCC, relevant to its purpose, and to advise on new or revised training programs and materials of instruction for essential training programs.
4. To devise mechanisms to encourage cooperation and communication among research, development, demonstration and training organizations, marketing boards and food industries throughout SADCC to insure that the valuable knowledge available in any one country is made known to and can be adapted by others.

PFIAU MEMBERS

The eventual size of the proposed advisory unit will depend upon the demand for its services and the financial support provided to sustain it. It is the Mission's opinion that following a growth period of 3 to 5 years the following specialists will be the minimum required to serve the needs of the SADCC nations:

1. Team Leader - a Food and Agriculture Industries Marketing Economist
2. Economist (Policy Research)
3. Agricultural Engineer specializing in post-production systems
4. Food Processing Technologist
5. Communications and Information specialist
6. Food Processing Engineer
7. Rural Nutritionist - Home Economist
8. Education and training Specialist

The SADCC food security secretariat and committee requested that during the first five years a relatively small advisory unit be considered and that reliance be placed upon competent consultants to provide additional knowledge and advice. Unquestionably the SADCC region embodies among its citizens, persons eminently qualified to act as team members and as consultants. It is hoped that the indigenous experience and expertise will be made available to the advisory unit recommended.

In response to the desire of the SADCC secretariat and food security committee for a small advisory unit, the following composition and sequence of recruiting is suggested:

FIRST YEAR

Team Leader (Marketing Economist)
Economist (Policy Analysis)

SECOND YEAR

Agricultural Engineer
Food Processing Technologist
Information Specialist

The PFIAU team will require technician and secretarial support, office accommodation, access to a small computer and library, and the means to publish and distribute informational, educational and training documents. PFIAU will require a budget adequate to permit regular visits to SADCC member countries, to organize working groups and meetings, and to hire consultants to advise on specific matters of concern. Each of these is referred to later in the notes on the budget.

RESPONSIBILITIES

1. An Industrial Marketing Economist is proposed as Team Leader since all post-production and industrial enterprises must ultimately be judged by their economic efficiency. Furthermore, the first essential in establishing or expanding any food processing industry is to ensure there exists a potential market for its products and that it has access to an adequate and economic source of raw materials. Even industries for social benefit that provide nutritionally supplementary foods to the very poor require to be adequately financed and the extent of the consumer market demand determined before processing facilities are created. The team leader should be chosen first and assisted in his choice of other members to ensure that the whole group work together as a systematically integrated team.

2. The Economist (Policy Analysis), during the first year, in cooperation with the SADCC food security secretariat and member governments, will need to determine an order of priorities and, with the Team Leader and consultants, draw up a program of work for the future years. The specific categories to be considered for overall priority will include: (a) village and small farm post-production systems for the principal subsistence crops; (b) on-farm household and small-scale food and agricultural by-product processing industries; (c) medium and large-scale processing industries to serve low income urban communities; and (d) industries to distribute preserved and processed foods among SADCC countries and, if so desired, for export outside the region. The Economist (Policy) will need to undertake the following or to obtain the necessary information described from other sources within the SADCC food security system:

- a. to prepare and maintain a continual review of food and agricultural policies among all SADCC members;
- b. to predict the effect of and changes in these policies upon national and regional food production and availability for storage, processing and distribution;
- c. to collect and analyze all available food crop and animal production data including comparisons of realized against forecast crop and animal production; and of imports and exports of essential food commodities in both raw and processed forms;
- d. to prepare an annual comparative review of marketing policies and practices including legislative fixed prices, price variations among raw and processed food materials, subsidies and incentives to producing, storage, marketing, and processing organizations;
- e. to prepare forecasts of anticipated food surpluses and deficiencies among SADCC countries and anticipate their probable effect on storage, distribution, and processing facilities;
- f. to prepare an analytical statistical review of the food marketing and processing facilities and capacities among the SADCC countries; and
- g. to review and record annually changes in food consumption patterns among the SADCC member countries.

It is evident that several of the above activities will be needed by other SADCC food security projects. All are essential to the effective function of PFIAU, as envisaged by the Mission, and must be provided by one means or another.

3. The Agricultural Engineer will be largely responsible for advising on existing post-production systems, particularly as they relate to food grains, cereals, oilseeds, root crops and legumes. Many of the agricultural engineering departments in SADCC countries appear oriented either to farm mechanization or large commercial farm structures. A systems trained engineer, familiar with traditional farming and the prevailing agro-environments,

could generate extensive improvements in post-production systems and help to lay the basis for more effective techniques of harvesting, drying, storage, processing and utilization, consistent with prevailing logistic, distribution and marketing facilities.

4. The Food Processing Technologist would concentrate largely upon the processing of cereals, legumes and oilseeds, together with the design and establishment of rural industries, the machinery and equipment necessary to their operation. This engineer could also advise upon industrial technologies related to preservation of other vegetable and animal products, and where necessary prescribe research and development projects needed to create more efficient technologies and processing systems. With the assistance of a consultant, the technologist and the engineer need to advise upon operations research methods to enable existing food industries, whatever their nature or size, to make the most efficient use of such essential resources as energy and human labour.
5. The Communications and Information Specialist would have the following responsibilities:
 - a) to assist the other members of the PFIAU team in the preparation, production, dissemination, recording, stock holding and updating of informational, educational and training documents and other material (eg. visual aids, film strips) arising from their activities. This informational material may be issued on an ad hoc or regular basis;
 - b) to develop and maintain links with other resource bases (eg. universities, agricultural colleges, government ministries, parastatal and private industry) so that already existing data and information may be identified, obtained and

- considered by the PFIAU team. Initially this communication traffic will be one-way but subsequently PFIAU will be in a position to provide information to other institutions;
- c) to act as the corporate memory of PFIAU by maintaining an index to PFIAU's own activities (publications, lectures, reports of visits, answers to technical enquiries) and to other sources of information;
 - d) to maintain a small working library for PFIAU (dictionaries local directories, relevant official publications) while making maximum use of existing resource bases referred to in (b) above.

The Communication and Information Specialist should be educated to university degree or diploma level in a subject specialty which will be recognized as giving equivalent status within the team. An ability to write and speak fluently, concisely and clearly in the principal working languages is essential. Since the incumbent will be responsible for operating a communications organization that will serve practical objectives, post academic experience is desirable, preferably in an industry oriented organization.

Though omitted at the request of the SADCC committee, it was originally foreseen that another food processing technologist would eventually be needed. This person's responsibilities would be to concentrate upon other food industries, particularly those that employ "wet" processes as in the preservation of meat, fish, fruits and vegetables by canning, the sterilization of milk and fruit juices, fermentation technologies and by-product recovery.

12-

FOOD POLICY RESEARCH AND ADVICE

As pointed out earlier in this report, enhanced food security through agro-industrial development in the SADCC countries will take place in a policy environment wherein philosophical and practical approaches to the food economy and to the goals of research will be very diverse among countries and over time. It is beyond the terms of reference of this Mission to recommend means for bringing professional competence to bear upon analysis and prediction of interactions among national policies within SADCC. Nevertheless, a regional technical advisory unit such as the PFIAU proposed must have a thorough and up to date awareness of these diverse and changing policies if its demonstration research, training and advisory activities are to be directed towards ends which are both useful and possible of achievement. It makes little sense to devote substantial resources to small-scale food processing technologies if, for example, government policy strongly favours large industry or vice versa. Changes in the support price structure for various agricultural commodities will influence how much of each is grown and marketed and thus what type and scale of post-production activities is required. Intelligent and reliable technological planning and action requires the ability to comprehend and react sensitively to government political policies.

The economist responsible for policy studies will require access to relevant statistical acquisition and analytical facilities and the freedom to express an independent opinion to the Ministry responsible concerning the influence of national policies or uncertainties therein upon those issues that relate to the advisory unit's recommended responsibilities.

IMPLEMENTATION

If the Mission's recommendations are accepted by those responsible in SADCC, they might be implemented in one of several ways:

- (1) SADCC might establish a selection committee from its member countries to choose the Team Leader for PFIAU and the Economist (Policy Analysis). In consultation with these two persons, the committee may select and appoint the other members of the proposed unit;
- (2) Alternatively, SADCC might employ an internationally recruited committee to assist in making the necessary staff selections;
- (3) A third alternative is that SADCC request an internationally recognized organization to act as Executing Agency for the implementation of the proposals. This Executing Agency would be responsible, in close consultation with SADCC authorities, for drawing up terms and conditions of appointment and for helping the unit leader to select and recruit the other members of the advisory unit proposed. The Executing Agency would also assist the advisory unit in preparing their program of work. One advantage of employing an experienced external Executing Agency is that it would carry out its task impartially and with professional knowledge.

Whichever of these or other options is decided upon, it is important that the staff of the unit be selected on the basis of demonstrable qualifications and experience. While it is hoped that most if not all the staff might be recruited from SADCC countries, staff selections should not be made by assigning one post to each member country or on the basis of any other political system of priorities. Adequate country representation can be achieved in whatever governing council SADCC creates and to which PFIAU would ultimately be responsible.

GOVERNANCE AND POLICY GUIDANCE

After its draft report and recommendations had been written, the Mission was informed that the advisory unit recommended, if created, will be directly responsible to the Ministry of Agriculture of Zimbabwe, in its capacity as coordinator of the SADCC Regional Food Security Program. Since the advisory unit proposed is to be composed of competent experienced professional scientists and technologists, having agreed upon the order of priorities and program of work, it is recommended that they then be permitted and enabled to get on with their job and not be required to seek approval for every day to day activity. A clearly defined statement of responsibilities and authority, together with a system of reporting and accountability, will need to be prepared by the Team Leader and the Ministry from the outset.

DURATION OF THE PROGRAM

The Mission believes the program proposed should continue for five years and then be reviewed. The budgets for years 4 and 5 should be reassessed after the first three years since a reliable five year forecast is virtually impossible to make in the present time of economic uncertainty. It is assumed that, if acceptable, for the first five years the SADCC community would seek financial support from external sources. If, however, during the five year period the pattern proposed proves satisfactory, it would seem desirable that a precise plan be evolved by which SADCC would subsequently assume full control and financial responsibility for the advisory unit recommended.

FINANCIAL IMPLICATIONS

The budget presented in Table I (in Zimbabwe dollars) is explained in the accompanying budget notes. As stated in these notes, salaries are according to present scales in Zimbabwe with a 20% increase in the staffing rate. While it is hoped they will prove attractive to persons adequately and competently qualified, some elements provided by other agencies such as child educational and home leave allowances have not been included. It is assumed that at some early date the SADCC members will establish a policy of practices for those employed specifically in SADCC regional programs.

No provision has been made for the salaries and allowances of support staff or for working accommodation (office space and facilities) since it is assumed that such will form part of SADCC's counterpart contribution. In the Mission's experience with bilaterally and multilaterally financed projects, it is customary for the recipient country or countries to provide local working accommodation and support services as their counterpart contribution. If this proves not to be so (a matter to be resolved between SADCC and whichever donor(s) provide(s) external financial support), the costs will have to be appropriately increased. If the SADCC authorities decide to request that all costs be met by external donor financing, as stated in the budget notes it will be necessary to add the office accommodation and support staff costs.

COST AND POTENTIAL BENEFIT

Given the exceptions and uncertainties stated above and in the budget notes, the total 5-year cost of the proposed advisory unit is estimated at Z\$1.228 million, equivalent to approximately US\$1.6 million. It is difficult to predict with any accuracy the probable return or cash saving that will result from this forecast cost for the advisory unit proposed. Most estimates of the value of post-production losses appear at best to be based upon educated assessments rather than precise measurements. One assessment, made by an experienced entomologist, reported the "post-harvest" loss of maize in one SADCC country during one year to be valued at over US\$3 million. Since much of the loss appears to occur among rural smallholders where most of the grain is for local subsistence and does not enter the cash market, predictions of cost versus benefit become very difficult indeed.

It can be stated with certainty that the annual cost for the proposed advisory unit after 3 years would be significantly less than the cost of establishing and operating a regional food research and training institute. An institute of modest proportions and facilities would cost in excess of US\$5 million to construct and equip. The professional staff required for a research institute would be much greater in number than the proposed advisory unit, in addition to which laboratory and maintenance technicians would be needed as well as secretarial and other supporting services. An industrial food research and development institute created in Canada 5 years ago cost US\$6 million. Today, it would cost at least \$8 million.

The Food Research Institute (FRI) of the Canada Department of Agriculture, which serves a nation of 24 million people, has an annual budget in excess of US\$1.76 million. The nine SADCC countries have a total population of 54 million and great diversity of socio-economic and agro-climatological conditions. The FRI focuses entirely upon research and has no mandate for training. While accepting that one cannot make a direct comparison between an institute in Canada and one intended to serve a group of African countries, it can be stated categorically that a food research and training institute would take considerably longer to create and set in motion, and would cost very much more than the advisory unit proposed. In any event, acceptance of the Mission's recommendation in no way pre-empts or impedes the eventual establishment of a regional or several national food research institutes. Indeed it is hoped that the advisory unit's studies and experience over 3 to 5 years would be a reliable basis from which to decide whether or not a regional institute is desirable in the future and what its structure, organization and specific responsibilities should entail.

For the immediate future, the Mission remains convinced that to strengthen existing national research, demonstration, extension and training institutions and organizations is a more desirable objective.

The Mission is convinced that a competent advisory unit with the full cooperation of SADCC government and non-government organizations will help to realize:

- (a) Significant reductions in quantitative and qualitative losses of foodstuffs as they pass through various components of the post-production system;

- (b) Improvement in the efficiency of both the physical and human resources that are consumed and employed in the post-production food system; and
- (c) Multiplier effects of generating additional and/or more productive employment and therefore more income in the economies concerned.

It is unlikely that world cereal prices for maize and sorghum, both in excess of \$130/tonne, will decline during the next several years. An annual loss equivalent to one percent of SADCC maize and sorghum production would have a cash value of about \$8 million. Therefore, it requires relatively little proportional improvement in post-production efficiency to cover the cost of the proposed advisory unit. When one considers the many other commodities, processed and unprocessed, together with the increased employment opportunities, that could result from an expansion of the food processing and distributing sector, the proposed cost is probably not excessive.

TABLE I

TECHNICAL ADVISORY UNIT BUDGET
(Z\$,000)

<u>SALARIES</u>	<u>YEAR 1</u>	<u>YEAR 2</u>	<u>YEAR 3</u>	<u>YEAR 4</u>	<u>YEAR 5</u>	<u>TOTAL</u>
Team Leader (Marketing Economist)	21.0	24.2	27.8	32.0	36.8	141.8
Economist (Policy)	16.8	19.3	22.2	25.6	29.4	113.3
Agricultural Engineer		16.8	19.3	22.2	25.6	83.9
Food Technologist		16.8	19.3	22.2	25.6	83.9
Information Officer		15.0	17.3	19.8	22.8	74.9
REMOVAL COSTS	20.0	30.0				50.0
<u>CONSULTANTS</u>						
Education (30 days x \$200)	10.5		10.5			21.0
Technical Training (30 days x 200)		9.0	9.0	9.0	9.0	36.0
Industrial Management (21 days)		8.0	8.0	8.0	8.0	32.0
Nutrition (30 days)		9.0	9.0	9.0	9.0	36.0
TRAINING WORKSHOPS		30.0	45.0	45.0	45.0	165.0
TRAVEL	24.0	60.0	60.0	60.0	60.0	264.0
REPORTS AND PUBLICATIONS		2.0	3.0	3.0	4.0	12.0
CONTINGENCY	<u>10.0</u>	<u>24.0</u>	<u>25.0</u>	<u>25.0</u>	<u>27.0</u>	<u>111.0</u>
	102.3	264.1	275.4	280.8	302.2	1224.8

BUDGET NOTES

All amounts are in Zimbabwe dollars

SALARIES

As suggested by the Zimbabwe Ministry of Agriculture, these are based upon Zimbabwe government salaries plus 20% for the first year, an increment of 15% being added for each succeeding year. The Team Leader is at the Chief Agricultural Economist level, the remainder of the team being at what appear appropriate levels in the economist, research, engineering and biometrics categories.

REMOVAL COSTS

A nominal sum of Z\$10,000 per person has been allowed for removal to Harare. It is assumed that all staff will be recruited from SADCC or nearby countries. If persons from outside the region are employed the removal costs may be substantially greater and some allowance for home leave may be required every second year.

CONSULTANTS

The fees suggested (based upon Zimbabwe fee scales) are Z\$200 per day each for 30 days per year for the Education, Technical Training and Nutrition consultants and Z\$250 per day for the Industr. , Management consultant. An allowance of Z\$80 per day is made for living expenses to which a sum for travel has been added. It is assumed that all but the Education consultant will be recruited from the region.

TRAINING WORKSHOPS

The subjects have not been specified but several have been suggested in the text. It is assumed that 4 workshops will be held in the second year and 6 in each succeeding year, with 18 participants per course. An airfare of Z\$250 per person plus Z\$60 per person per day living expenses has been budgeted.

TRAVEL

A travel allowance of Z\$12,000 per year for each member of the Advisory Unit has been assumed. This will be largely used for visits to the member countries, during the first year to determine policy priorities and subsequently to organize training workshops and give advice to national research, training and rural development agencies.

REPORTS & PUBLICATIONS

It is anticipated that various bulletins, descriptive materials and other publications will be issued during the second through fifth years.

CONTINGENCY

A 10% contingency item has been added to compensate for currency fluctuations, inflation and other unpredictable costs. Given the long term uncertainty of such an activity, it is recommended that the budget be reviewed after the first three years and, if necessary, readjusted.

OTHER POSSIBLE COSTS

No provision is made for secretarial support, for office space, or for equipment since it is assumed that these will be provided by the host SADCC country. If this is not the case, the cost of office

space and equipment plus one secretary during the first year and two secretaries during the second to fifth years must be added.

It is also assumed that local transportation will be provided from the government motor pool. If vehicles are not available, two sturdy 4-wheel drive vehicles at a cost of about Z\$8,000 each must be added.

C. NATIONAL PROJECTS WITH A REGIONAL IMPACT (NPRI)

1. Summary of Approved Projects

A brief project description of each proposal follows this summary paper (pages 55-82). More detailed information can be obtained from the Member State presenting the project.

Production of Groundnut & Sorghum Seed - Mozambique

This project seeks to increase the production of groundnut and sorghum seed in the family/cooperative sector by improving the availability and quality of seed. The project will contribute to the achievement of national self sufficiency in seed production and also the possibility of building up the surpluses necessary to establish a stock to meet emergencies either national or regional. The total of donor funding sought is US\$5 000 000. (NPRI 1, see page 55)

Establishment of Seed Security Stock - Mozambique

The objective of this project is the establishment of a national capacity capable of storing maize, rice, sorghum, groundnut and bean seeds. Such a capacity will not only protect Mozambique farmers from supply problems in times of crises but will also reduce the risk of disease caused by the importation of large quantities of seed. The total of donor funding sought is US\$2 500 000. (NPRI 2, see page 58)

Reinforcement of the Food Marketing Network in Mozambique

This project, which includes four sub-projects, seeks to improve the distribution of surplus production from the family and cooperative sectors by strengthening Mozambique's national marketing network. The total of donor funding sought is US\$3 550 500. (NPRI 3, see page 61)

Reduction of Post-Production Losses - Mozambique

This project is designed to contribute to the reduction of post-production losses by developing efficient methods to meet the problem and by the training of key personnel. The total donor funding sought is US\$520 000. (NPRI 4, see page 67)

An Early Warning System - Mozambique

Within the context of the regional early warning project (see page 11) the Government of Mozambique is seeking to establish a national early warning system so that production crises can be foreseen and remedial action taken in good time. The total donor funding sought for this project is US\$976 000, which is part of the US\$4.06 million foreseen in the Terminal Report for the regional project. (NPRI 5, see page 70)

Establishment of a Network of Quarantine Stations - Mozambique

The objective of this project is to re-establish a first line of defence against imported plant disease by, in the first instance, setting up seven inspection stations, mainly at the ports, with the necessary equipment and facilities. The total donor funding sought is US\$750 000. (NPRI 6, see page 73)

Establishment of Food Security Storage Facilities - Mozambique

FAO has recommended the establishment of a 60 000 ton food security stock for Mozambique. The project seeks to set up a network of stores with a capacity of 45 000 tons. The total donor funding sought is US\$13 130 000. (NPRI 7, see page 75)

Interim Regional Grain Reserve - Zimbabwe

This project seeks financial support to enable the Government of Zimbabwe to hold a 250 000 tonne grain reserve for the SADCC region. The cost of this project, which covers a period of one year, amounts to Z\$8 750 000. It is anticipated that more comprehensive and permanent proposals to meet the need for a regional food reserve will emerge from the feasibility study being undertaken under Project Five - A Regional Food Reserve.* (NPRI 8, see page 78)

Improvement of Food Storage Capacity - Lesotho

This project seeks to increase storage for produce from the field by 40 000 tons so as to limit production losses, and to provide capacity of 20 000 tons for the storage of security reserves. It is estimated that the donor funding sought for this project is approximately US\$6 million. (NPRI 9, see page 80)

Construction of Storage Facilities in Rural Areas - Zambia

This project seeks to increase the capacity of Zambia's grain storage facilities. The project has not been costed. More complete documentation, including costing, will be made available at the Maseru Conference. (NPRI 10, see page 81)

* see page 9

2. Production of Groundnut & Sorghum Seed - Mozambique

Geographical coverage:	national
Duration:	1983/87
Cost:	US\$ 5 000 000

Objectives

The project is directed towards increasing basic food production and has a complementary role regarding already programmed actions for seed production in other essential areas. Its main objectives are:

- (a) to increase the production of groundnut and sorghum seed in the family/cooperative sectors through a progressive and continuous renewal of seeds used by these sectors;
- (b) to achieve self sufficiency in national seed production of both crops;
- (c) to create surpluses in order to build up security stocks to meet emergency situations either at national or regional level.

Justification

In the People's Republic of Mozambique groundnuts and sorghum are mainly produced by the family sector in which production technology is primitive and productivity low. The situation of these crops has worsened due to seed degeneration and to a progressive decrease in seed stocks. Both factors have caused increased deterioration in production and in the already low productivity levels, with serious consequences for the internal food supply, for rural standards of living and for the economic situation of the country as a whole. It is, therefore, necessary to start an immediate process of seed renewal for this sector in order to reverse the present trend as well as to strengthen production and to transform the family sector. This project is intended to create a production capacity, at present almost non-existent, and to carry out this process in a planned and coherent manner.

Project Description

This project is intended to support the development of 2.750 tons of sorghum seed and 4.000 tons of groundnut seed, in particular in the provision of the necessary technical assistance and equipment.

It is anticipated that the project will start its activities during the agricultural campaign 1983/84 and will have a duration of 5 years.

As part of the preparatory work for the implementation of the programme, a consultancy composed of two experts in groundnut and sorghum seed production will be commissioned to assist in the elaboration of a working plan for a five year period of the project. They will define with accuracy the location and production requirements, including the detailed specifications of the necessary equipment and technical assistance.

The production programme will be developed gradually over a total crop area of 8.000 hectares, divided into eight production units each of 1.000 ha, according to the following implementation programme:

	Extension Area	Production Area	Total Area
1983/84	1.000	-	1.000
1984/85	1.500	1.000	2.500
1985/86	2.500	2.500	5.000
1986/87	3.000	5.000	8.000
1987/88	-	8.000	8.000

This plan for the project's development will, within the relevant period, allow for a complete renewal of the seed at present in use in the family and cooperative sectors. After the conclusion of the project a new phase for the strengthening and technical improvement of seed production will be started. The development of the new phase will depend directly on the sorghum and groundnut programme which will have been established.

Specialised technicians, both at high and medium level, will be required for the implementation of the programme and for the further development of the project. As well as providing technical support for the development of production the technical assistance component will also provide training for national staff.

To complement this project, and as part of the integral efforts of the Mozambique Government, various other actions will be carried out in the seed sector. They will be implemented in order to assure the processing, storage and conservation, delivery and use of the produced seeds. Some of these actions are foreseen in other projects approved for presentation to the Maseru Conference. Others, related for instance to the organisation of the producers, are part of national programmes already being carried out or in study and planning phase.

Indicative Cost

Additional to the amount in national currency - financed by the People's Republic of Mozambique - the estimated costs for the project are US\$5 000 000 which includes the following main items:

	US\$
(a) preparatory missions (4 m/m consultancy)	40 000
(b) technical assistance during the implementation phase of the project, including consultancies on specific technical aspects	960 000
(c) equipment	4 000 000

Regional Framework

The project contributes to the economic development and to the strengthening of the regional cooperation described in the Introduction to the Food Security sector of this report. It will also contribute to an increase in basic food production, to the reduction of extra-regional seed imports as well as the creation of the conditions necessary to prevent food crises at national and regional level.

NPRI 1

3. Establishment of Seed Security Stock - Mozambique

Geographical coverage:	national
Duration:	1983/85
Preliminary studies:	US\$ 20 000
Cost:	US\$ 2 500 000

Objectives

The primary objective of the project is the establishment of a national capacity for long term storage and conservation of certified seed of maize, rice, sorghum, groundnuts and beans, to minimize the effects of losses caused by natural disaster and/or disease.

The existence of these stocks, apart from their value as a mechanism to prevent national or regional crises, will reduce the risk of, for instance, the introduction of diseases which as yet do not exist in Mozambique, as often happens when large quantities of seeds are imported.

Justification

During recent years, the People's Republic of Mozambique has been suffering from a succession of natural disasters which have caused significant decrease in production and losses of crops. For instance, mention can be made of the droughts experienced in the Maputo, Gaza and Inhambane Provinces in 1979/80 as well as those suffered in the coastal provinces of Nampula and Cabo Delgado in 1980/81. These droughts brought about total loss of crops in the family sector - in consequence the peasants had to use their own seed stock as food.

In order to prevent the effects of these disasters and to strengthen the strategy for development and transformation of national agriculture, the People's Republic of Mozambique is taking its first steps in the establishment of national seed production. Among other activities, seven seed processing centres for the main food crops are being established. In the 1983/85 national programme for seed production, the volume of seed needed to create a security stock has been estimated. However, the appropriate facilities for storage and conservation of seed over long periods do not exist in the country at present.

The purpose of the project is to remedy this deficiency by the establishment of a network of stores in different regions of the country. It is also intended that these stores should be integrated into the national network for seed supplies.

Description of Project

The project includes a network of stores attached to each processing centre throughout the country. The proposed localities are as follows:

South	Lionde and Moamba
Centre	Chimoio
North	Nante, Lioma, Namialo and Lichinga

The total storage capacity envisaged in this network of stores will be approximately 6.000 tons, distributed in units of 300, 600 and 1.200 tons according to the requirements of the different production zones.

Each of these units must be equipped with a cooling system with a capacity to guarantee the stabilisation of inside temperature between 5 and 10 degrees centigrade. They must also be equipped with the necessary facilities for air drying, sanitary treatment and handling. In Lichinga, Chimoio and Lioma, it will also be necessary to install drying units with a capacity of 1 ton/day.

The duration of the project is expected to be three years, starting in 1983. Before starting the implementation phase and with the aim of defining more accurately the capacity of storage to be installed and the technology to be adopted, it will be necessary to carry out a short study which will include a survey of the whole storage network and seed distribution system throughout the country so that both networks can be properly integrated. Where specific inter-regional agreements exist this study should also consider any additional storage capacity which may be required by other countries of the region.

The proposed programme of construction is submitted to the following timetable of implementation:

1983	Lionde and Moamba
1984	Namialo, Lioma and Chimoio
1985	Nante and Lichinga

Estimated Costs

The estimated investment costs, excluding the Mozambique contribution, are US\$ 2 500 000 which is made up of the following items:

	US\$
Construction and installations	220 000
Cooling equipment	2 000 000
Drying equipment	90 000
Lifting equipment	100 000
Miscellaneous	70 000

It is estimated that the preliminary study referred to above will cost US\$ 20 000 corresponding to 2 man/months of consultancy work.

Regional Framework

The creation of national stocks constitutes the basis for the establishment of a regional system of agricultural seed security. In addition, due to the similarity of the agro-climatic conditions of the countries of the region and to the fact that some of the difference species of crops are the same or very similar, the existence of stocks of seed in any member country constitutes a valuable resource for insurance against natural disasters and will be of great benefit to the region as a whole.

NPRI 2

4. Reinforcement of the Food Marketing Network in Mozambique

Geographical coverage:	national
Duration:	1983/84
Cost:	US\$ 3 551 500

Objectives

The project is designed to support the efforts which are being made to increase food production and to regulate internal flows of supply. Its principal objective is to increase the marketing of surpluses from the family and cooperative sectors through the reinforcement of the purchase network of the Empresa de Comercializacao Agricola and the normalisation of the rural supply.

Justification

The family sector is an important production source of basic food, whose potential has not been adequately tapped because of the breakdown of the marketing network which took place after Independence. The breakdown not only drastically reduced the intake of products from the sector but also discouraged the production of a marketable surplus because of the unavailability of non-agricultural goods for exchange which was caused by this disruption. The reorganisation of the marketing network is thus of strategic importance as an instrument to transform the present situation and to dynamise food production in the family sector.

Many steps have been taken in this direction, but their success has been limited because of the extent of present needs. The Empresa de Comercializacao Agricola at present owns about 240 stations for direct purchase and has 65 brigades. However, the majority of the stations and the brigades lack adequate equipment and the flow of products is delivered with great difficulty. Additionally, the existing network is insufficient and should be extended, principally in the districts where production potentials exist, but an inability to purchase the necessary equipment prevents an increase in the commercial food supply.

To overcome these difficulties once and for all it will be necessary gradually to develop a continuous and integrated programme of consolidation of the cooperative movement, extending the network of permanent stations and the operational capacity of the distributing enterprises and enlarging the commercial retail network.

The present project is intended to support the development of this programme and, at the same time, to implement temporary measures designed to give an immediate solution to the existing problems in the sphere of food marketing and of rural supply.

Project Description

The project is sub-divided into four components (sub-projects) whose principal characteristics are as follows:

(a) Equipping of Purchase Brigades

The purchase brigades have been shown to be an excellent emergency solution, as a temporary model during the interval between the point where no adequate marketing mechanism exists and the point of the installation of a commercial retailing unit. Progressively, the brigade will hand over to the permanent marketing network and the equipment will be passed to the permanent stations and other entities.

The sub-project relates to the re-equipment of the 65 existing stations and the creation of 46 new units to cover two specific areas:

- (i) purchase brigades which will act in pilot districts with a high potential for producing agricultural surpluses and where concentrated action might develop significantly the family/cooperative sector in such a way as to expand the marketed production.
- (ii) purchase brigades which will act where the inadequacy of the present marketing structures is evident, to reinforce the purchase of surpluses and the sale of basic products, as a preliminary step to the installation of permanent stations and permanent shops.

For the operation of these brigades, the idea is to create a permanent base from which they will reach the most distant places. It will be necessary to count on the following basic equipment for each brigade:

- 1 light vehicle 4 x 4 (1,5 ton)
- 2 scales
- 1 calculating machine
- 2 cash registers
- various materials

The equipment of the brigades with light vehicles will allow them to get to the areas which are at present out of reach for the heavy fleet of the enterprise and will allow the best use of equipment for long distance haulage.

According to the identified requirements, the sub-project will be implemented within the following equipment and operational scheme of the purchase brigades:

Loc-ality	Number of Brigades to equip								
	Pilot Distr.Areas			Other Distr.Areas			Total Distr.Areas		
Cabo Delgado	-	3	3	8	3	11	8	6	14
Tete	1	-	1	-	-	-	1	-	1
Niassa	-	5	5	7	4	11	7	9	16
Nampula	4	9	13	5	9	14	9	18	27
Zambezia	17	5	22	-	4	4	17	9	26
Manica	-	2	2	-	3	3	-	5	5
Sofala	-	2	2	-	3	3	-	5	5
Inhambane	-	5	5	-	5	5	-	10	10
Gaza	-	3	3	-	4	4	-	7	7
Total in Country	22	34	56	20	35	55	42	69	111

The equipping of each purchase brigade will cost, at present prices, US\$ 17.000. The total cost of the project, excluding the part covered by the Mozambique Government, reaches US\$ 1 887 000 of which, according to the implementation programme above, US\$ 952 000 corresponds to 1983 and US\$ 935 000 to 1984.

(b) Extension and Equipping of a Permanent Retail Network

The sub-project seeks to meet the need to increase the permanent commercial retail network through the creation of new units and the strengthening of existing ones. To reinforce the present capacity, immediate intervention in the eleven pilot districts and in the other priority areas of the country is proposed. Simultaneously the creation of a base for the expansion and regularisation of commercial activities in the rural sector is anticipated.

The sub-project contemplates the fitting out, with simple commercial equipment, of the cooperatives, the enterprises' permanent stations, the already existing permanent shops and the additional units which are being created during the coming agricultural campaign.

A concentration of forces in the provinces of Cabo Delgado, Niassa, Zambezia and Tete is planned, both because of the importance of these provinces in terms of commercial agricultural production and because of the size of the population which has not been reached sufficiently by the present permanent commercial network.

During the life of the sub-project (1983-84) it is proposed to fit out a total of 497 units, of which 345 in the eleven pilot districts and 52 in the remaining priority areas of the country.

With the exception of some electrical generators, which will be installed in a few special places, the equipment of each unit is simple, including scales, cash registers, calculating machines, liquid meters and various other items of low value. On average the cost for each unit will be US\$2,500. The total cost of the sub-project is US\$1 242 500.

(c) Study of the Transport Needs of the Commercial Agricultural Enterprises

This sub-project has as its purpose the elaboration and implementation of an investment plan for the extension and reorganisation of the private transport fleet of the commercial agricultural enterprises.

The study should include the following principle aspects:

- (i) the dimension and capacity of the fleet, specifying the different types of vehicles to be used and their distribution;
- (ii) the definition of a maintenance scheme, specifying the types of maintenance necessary (preventive, major maintenance and repairs), the location of the maintenance units and the technical equipment, spareparts and personnel necessary for the operation of the network as well as the technical assistance required including for the training of personnel;
- (iii) the proposal of an alternative solution for the organisation and management of the fleet.

It is anticipated that the study to be implemented in 1983 will require a 22 m/m consultancy with a total cost estimated at US\$ 122 000.

(d) Study of the Storage of Agricultural Products

The main objective of this sub-project is to make a global and integrated analysis of the production, marketing, consumption and processing of food which could serve as a basis for the elaboration of a policy for investments in stores.

Due to the lack of technical and economic studies on production, transport, processing and consumption necessary for the implementation of a storage network the present sub-project is of basic importance for the formulation of a solid investment policy in this field.

The study will cover the whole territory of the People's Republic of Mozambique in relation to the volume, conditions and distribution of commercial production. It will also try to optimise the storage network investment in terms of location, capacity, type of construction and technology of the different components. These features should be defined according to national development necessities and the anticipated integration of the regional transport and marketing network.

The study will include the following main products: rice, maize, sorghum, groundnuts, sunflower, sesame, beans, cassava, coconut and soyabean. In relation to each of these products it will be necessary to analyse the different aspects relating to production, consumption, transport and storage, regarding the present conditions and the development plans for each sector.

With this analysis as a base, the study should provide the following elements:

- (i) a study of present and projected inflows with the different production and consumption alternatives as a base, taking into account their geographical distribution and the different production and consumption organisations involved and describing the internal circuits of each region, including the inter-district and inter-provincial flows and the inter-regional circuits;
- (ii) an analysis of the routes and the transport means which should be used according to the circuits and the quantities indicated in the former item, distinguishing between transport of exclusively agricultural products (principal concentration or first stage of concentration) and transport which can be used for other types of products (inter-district and inter-provincial movement). For the first type of transport a primary plan should be elaborated, including a definition of the capacity of the fleet, an analysis of its operational costs and a formulation of proposals for other improvements and supplementary works. For the second type of transport the study should propose global solutions which should be analysed from a multi-sectoral point of view.
- (iii) an elaboration of a general construction plan for a network of storehouses for the whole circuit, from production to consumption and the corresponding analysis of its technical-economic viability.

Four major groups should be considered:

- primary or rural storage at producer level
- places of concentration
- transit storehouses
- storage at industrial level

Specific Master Plans should be elaborated for the primary storage and the places of concentration and the transit storehouses except for the harbour installations.

It is anticipated that the study will have a duration of approximately 15 man/months and its estimated cost is US\$ 300 000.

Indicative Project Cost

The total cost of the project is US\$ 3 551 500 with the following distribution by component:

	US\$
Equipping of Purchase Brigades	1 887 000
Extension & Equipping of a Permanent Retail Network	1 242 500
Study of the Transport Needs of the Commercial Agricultural Enterprises	122 000
Study of the Storage of Agricultural Products	300 000

Regional Framework

The project integrates a complete set of measures which aim to increase the internal food supply within the regional strategy of Food Security contributing to import reduction and creating supplementary conditions for the achievement of food self sufficiency at regional and national level.

NPRI 3

5. Reduction of Post-Production Losses - Mozambique

Geographical coverage:	national
Duration:	1983/85
Cost:	US\$ 520 000

Objectives

Within the context of a national effort aimed at expanding food production, the project is designed to achieve the following principal objectives:

- (a) to contribute to providing a solution, at national level, to the problem of post-production losses;
- (b) to produce efficient methods, economical and secure, for the prevention of post-production losses;
- (c) to train personnel, in the relevant structure at all levels, in methods to prevent post-production losses.

Justification

The losses taking place during and after harvest represent a considerable proportion of production in many production units, developing programmes and projects in Mozambique. Consequently their reduction would significantly increase internal food availability. Minimising post-production losses is one of the strategic objectives which the country has set for the present decade.

Considering the dimension and characteristics of the country, the fulfilment of this proposal requires a coordinating effort specific and continuous, which will make it possible to analyse and implement adequate solutions to the typical problems of the different agro-climatic regions and of the different production, storage and processing systems. It is extremely difficult to achieve this in a consistent way without the creation of specialised institutional and technical mechanisms which allow the integration of the many aspects involved in the problem and permit joint action to be implemented at the different levels and sectors of the food production, marketing and processing systems.

Within this context, the project has two main aspects:

- (a) the establishment of a National Programme for the Prevention of Post-Production Losses;
- (b) the creation and development of a Technical Unit, adjacent to the National Institute of Agronomy Research of the Ministry of Agriculture, which will be in charge of implementing the different activities included in the Programme.

This Unit will operate in close cooperation with the programmes and projects linked to the expansion of food production.

Project Description

The project proposes to establish, within the Department of Plant Protection of the National Institute of Agronomy Research (INIA), a section for the Prevention of Post-Production Losses. This section will be the technical instrument to achieve the objectives of the aforementioned National Programme.

The technical team of the project will be composed of an international specialist with experience in practical investigation and capacitation in the field of post-production losses, two associate experts certified or graduated in agricultural or biological sciences, two national technicians with similar qualifications and two laboratory technicians.

The work plan for this section will be elaborated annually based on the priorities established by the Ministry of Agriculture and the requests received from other structures, programmes and projects.

In general terms, the activities of the project will cover the following principal aspects:

- (a) to gather and disseminate up-to-date information on post-production losses;
- (b) to work in close cooperation with institutions, programmes and projects involved in the prevention of losses, with emphasis on field work;
- (c) to monitor and evaluate current methods of insect control;
- (d) to assist the projects, programmes and institutions requesting help on an ad-hoc basis;
- (e) to provide for the in-service training of future Mozambican specialists in post-production techniques and the training of personnel from related programmes, projects and institutions;
- (f) to coordinate activities in the sphere of prevention of post-production losses.

The activities of the section will be directed especially to the most important agricultural production areas: the Northern provinces and the Limpopo Valley. Initially, these activities will be implemented in the laboratory of INIA, Maputo as a base. As soon as possible, and at all events during the second year of the project, a sub-centre will be created at Nampula, probably together with the Malema Experimental Station.

Indicative Cost

The cost of the project, excluding the components covered by the Mozambique Government, is US\$ 520 000 distributed in the following way:

	US\$
(a) International personnel	215 000
(b) Vehicles	40 000
(c) Capital equipment	108 000
(d) Expendable equipment	21 000
(e) Travel	79 000
(f) Extension Work	9 000
(g) Scholarships	20 000
(h) Contingencies	28 000
	<hr/>
Total	520 000
	<hr/>

Regional Framework

The project constitutes the national component of the Regional Programme for the Prevention of Post-Production Losses.

NPRI 4

6. An Early Warning System - Mozambique *

Geographical coverage:	national
Duration:	1983/84
Indicative cost:	US\$ 876 000

Objective

The prime objective of the project is to create an early warning system capable of providing information well in advance on the state and development of agricultural production so that crises can be detected promptly and remedial action taken in good time.

Justification

Considering its technological and socio-economic characteristics, the production of food in the People's Republic of Mozambique is extremely vulnerable to the changes in meteorological conditions. For this reason, production varies considerably according to the weather, with sharp decreases when the climatic conditions are bad as has been the case in recent years in some regions, either suffering from long drought periods or from flooding. These phenomena, besides their social consequences and production losses, create serious problems for balancing food supplies and force the country into emergency imports, sometimes at unfavourable conditions.

The possibility of forecasting and preventing irregularities in production, and therefore in domestic supplies, resulting from such phenomena is therefore of enormous importance as an instrument for production planning and the stabilising of domestic food supplies.

The country has already conducted some primary surveys on resources and agro-climatological conditions in several productive regions which, added to other data, may constitute a starting point for an early warning system. The project intends to complement and develop this already existing national capacity.

Project Description

The project will be based in the Ministry of Agriculture (INIA) and will involve the participation of several institutions including the National Planning Commission, Ministry of Internal Trade, Ministry of External Trade and Ministry of Communications, Transport and Civil Aviation (Meteorological Directorate). The project will involve the creation of a Committee on which these bodies will be represented and a technical group, formed by international specialists in rural economy and rural meteorology, will constitute, together with their national counterparts, the Secretariat of this Committee. This Committee should gradually be transformed into the Early Warning Unit - the long term objective of the project.

* see pages 8 and 23

In the first stage, the development of the early warning system will include the following activities:

- (a) the analysis of rainfall and other available meteorological data per agro-ecological zones in collaboration with the Project MOZ/75/011 - Land and Water Use Planning;
- (b) the systematic gathering of qualifying information related to other factors which have influence on the conditions and development of production;
- (c) the rapid processing of procurement and sales data, and its comparison with previous years to enable progressively more accurate forecasts of purchases to be made;
- (d) the organisation and carrying out of courses, seminars and other training activities as well as the provision of scholarships for national staff involved in the project;
- (e) the issuing of periodic progress reports on crop conditions, production forecasts and food supply and the elaboration of technical documents on other aspects as requested by the Government;
- (f) support for the development of the conditions and institutional mechanisms necessary for the eventual establishment of the Early Warning Unit in the Ministry of Agriculture;
- (g) the delivery to SADCC of periodic reports on the national food situation.

The project will, no doubt, require a second stage to consolidate and deepen the methodology of the system out of which will be established a national Early Warning Unit.

A prerequisite for the complete operation of the system is the organisation of regular crop surveys which will provide relevant information on areas sown, harvested areas and yields based on objective field measurement.

Subsequently, the emphasis in the second stage will be directed to the gathering of data in relation to cultivation and corresponding training activities.

Budget Estimation

Excluding the items covered by the contribution of the Mozambique Government the project costs will be, in the first stage, US\$ 875 850, including the following items:

	US\$
(a) staff	427 726
(b) travel	24 000
(c) recruitment	1 800
(d) general operating costs	107 215

	US\$
(e) expendable equipment	10 000
(f) capital equipment	126 000
(g) training	137 400
(h) project servicing costs	<u>41 709</u>
Total	<u>875 850</u>

Regional Framework

The project is the national component of the regional project Early Warning System.

NPRI 5

7: Establishment of a Network of Quarantine Stations - Mozambique

Duty stations: Maputo, Beira, Nacala, Quelimane,
Inhambane, Northern boundaries
and Umbeluzi

Duration: 1983/84

Cost: US\$ 750 000

Objectives

The project is part of a group of linked actions for the reconstruction and reinforcement of a national capacity for phitosanitary control of materials entering the country by road, sea or air. Its prime objective is the rapid re-establishment of a first prime line of defence against imported plant disease which can be particularly destructive in the present state of development of the country.

The first phase of the programme is to establish seven inspection stations at strategic locations in Mozambique with the necessary equipment and facilities for analysis, treatment, conservation and control of imported agricultural products by the different transport modes mentioned above.

Justification

Currently, the country does not have the minimum conditions to control effectively the entry of harmful plant materials. There is no equipment in the ports which can carry out the required entry inspection of imported products; nor are there adequate facilities for the isolation, analysis and conservation of the goods which must be controlled. The length of the national borders also makes it extremely difficult to prevent the movement of agricultural products. Currently there is no effective mechanism of vigilance, not even at the most important points of entry of goods.

In recent years this has led to the introduction of several diseases into the country with consequent damage to the national economy. Also, the lack of a mechanism of control has handicapped prevention of diseases in other countries of the region which border the People's Republic of Mozambique.

In these conditions, the re-establishment of the network of inspection stations and the adoption of suitable practices to detect and prevent the introduction and propagation of these diseases is urgently needed both for the People's Republic of Mozambique itself as well as for the other countries of the region.

Project Description

The project anticipates the installation of inspection stations in Maputo (covering the port and the airport), Beira, Nacala, Quelimane, Inhambane, Umbeluzi and at the border with Tanzania.

Maputo, Beira and Nacala constitute the main points of entry of imports. Nevertheless, other less important ports, such as Quelimane and Inhambane must be covered by the network of control as they also have international connections, although on a smaller scale. Along the Rovuma river, at the border with Tanzania, it may be necessary to establish between three and five stations. In the first instance, the project foresees the setting up of one inspection station in this zone, which is extremely important since, according to available information, diseases in the crop stored on each side of the river are different.

At this stage inspection will be excluded at railway points, whose definition requires a much more detailed evaluation. Only at Umbeluzi is the immediate introduction of inspection practices and supervision foreseen as well as the equipping of the station.

Each inspection station will be provided with the necessary means of transport (launches, vehicles), isolation rooms with airconditioning and dehumidifiers, sorting and re-bagging equipment with tumbling tables, facilities for fumigation and treatment of plants and seeds, and a small but well-equipped laboratory which will facilitate the required analyses without needing to transport the infected material out of the station.

Budget Estimation

The total cost of the investment will be approximately US\$ 750 000, including the following items:

	US\$
(a) 5 launches	150 000
(b) 7 vehicles - landrover/landcruiser	126 000
(c) 6 quarantine stores	210 000
(d) 7 sorting & re-bagging equipment	35 000
(e) 7 fumigation and treatment facilities for seeds & plants	161 000
(f) 6 laboratories & office facilities	66 000
Total	<u>748 000</u>

Regional Framework

The project is considered within a regional phytosanitary context, mainly focussed on the Maputo, Beira and Nacala ports which constitute points of circulation of vegetable material to be delivered to several countries of the region.

8. Establishment of Food Security Storage Facilities - Mozambique

Geographical coverage: national
Duration: 1983/84
Costs: US\$ 13 130 000

Objectives

The project's main objective is to establish a network of stores in order to create a food security stock to minimise agriculture crises and import delays.

Justification

The necessity for the People's Republic of Mozambique to establish food security stocks was recommended by the Food and Agricultural Organisation (FAO) in 1978. This need arises from frequent crop losses due to natural calamities and diseases.

The Food Security Programme formulated by FAO recommends the establishment of a stock of 60 000 tons to be stored separately from the regular stocks. The programme has also pointed out the necessity for creating storage facilities in Maputo, Beira and Nacala in view of the fact that these are the main ports and the most densely populated areas.

The project intends, therefore, to implement the FAO recommendations in this field, which is considered one of our most urgent priorities.

Project Description

This project has been divided into the following sub-projects:

(a) Construction of storage facilities for food security in Maputo

The feasibility study recommended that the storage for 35 000 tons advised by FAO should be divided into two. Due to the development of the milling industry, one of these storage units should be build in Matola and the other in Machava (suburbs of Maputo). The sub-project can be outlined as follows:

- (i) Silos for 20 000 tons capacity to be constructed at Matola

Main characteristics: reception and delivery by road and rail with mechanical system for loading and unloading the 18 cylindrical and 10 transversal silos. Necessary complementary works (side-tracks, drainage etc) are foreseen.

- (ii) Storehouses for grain or silos of 15 000 tons capacity to be constructed at Machava

Main characteristics: reception and delivery by road and rail with mechanical system for loading and unloading the silos. Complementary works will probably be necessary.

The choice between these possibilities will mainly depend on the costs of implementation and corresponding operational costs in each case.

A quotation for these projects has not yet been completed. A preliminary evaluation estimates the need for US\$6 000 000 for the silos at Matola and US\$ 4 000 000 for the installations at Machava. Included in these amounts are engineering and construction estimates as well as the supply and installation of equipment. In the estimate the costs of complementary works, necessary for the functioning of the units to be installed, are not included.

The global costs in foreign currency are distributed as follows:

	<u>Matola</u>	<u>Machava</u>	<u>Total</u>
	US\$	US\$	US\$
Engineering	420 000	280 000	700 000
Equipment	1 850 000	1 270 000	3 120 000
Construction	3 730 000	2 450 000	6 180 000
	<u>6 000 000</u>	<u>4 000 000</u>	<u>10 000 000</u>

(b) Construction of stores for food security reserves in the Nacala area

Following the FAO recommendations it is also planned to construct a storage unit for 10 000 tons in Nacala. Although Nampula was considered as a possible location for such a unit, Nacala was selected for the following reasons:

- (i) the necessity to install the unit close to the existing mill;
- (ii) the fact that the grain distributed to the north and to other areas is and will for a long time be imported through the Nacala port.

Considering FAO recommendations that food security programmes should not be limited only to port areas but extended to inland areas, it is planned that in the future Nacala will store wheat and units for maize will be constructed in other places.

The Nacala unit will be composed of silos constructed in concrete and divided into cells of 1 250 tons each. There will be facilities for reception by road and rail and mechanised systems for loading and unloading the silos.

A definite quotation for this project is not yet available. Nevertheless, based on known data it is estimated that the total cost in foreign currency will be US\$ 3 000 000 including the following items:

	US\$
Engineering	210 000
Equipment	930 000
Construction	1 860 000

(c) Study of an extension to the storage network of food security reserves

The present food security programme is based on the import of grain through the Nacala, Beira and Maputo ports to meet the needs of the urban population.

It is necessary to extend the programme to the rural areas most affected by natural calamities and hunger. The location of the main production areas of the country as well as the means of transport connecting both kinds of areas must also be analysed.

The proposed study is to formulate a complementary food security network identifying the additional requirements and defining the capacity of the installations to be built and their location as well as the corresponding technical characteristics.

The estimated cost of the study is US\$ 130 000 corresponding to 16 months consultancy.

Indicative Cost

The total cost estimation of the project investment, excluding the part to be financed by the Mozambique Government, is US\$ 13 130 000 according to the following specifications:

	US\$
Sub-project - Maputo	10 000 000
Sub-project - Nacala	3 000 000
Study	130 000

Regional Framework

The project is consistent with the objectives and priorities of the Regional Food Security Programme and its development will contribute to the reinforcement of the prevention system against food crises in the whole region.

9. Interim Regional Grain Reserve - Zimbabwe

Introduction

Food Security is critical to the independent states of Southern Africa:

- (a) to meet the basic human need for food;
- (b) to provide a buoyant agrarian sector;
- (c) to reduce dependence on the Republic of South Africa as a food supplier;
- (d) to reduce the heavy drain of foreign exchange caused by importing at high cost from outside the region.

Objective

The proposal is that Zimbabwe, as the state whose portfolio is Regional Food Security, should hold a grain reserve which is destined purely for SADCC countries. This would mean the setting aside of 250 000 tonnes of maize that could otherwise be exported elsewhere, for the wellbeing and safety of the regional members. The requirement is for overseas donors to finance the stock-holding of such a reserve of grain.

Background and Justification

The region is generally an importer of foodstuff and is attempting to reduce dependence, particularly, but not only, on South Africa as a food supplier. This means that if a country within the region has the ability to produce food surplus to its own needs it should be encouraged to continue doing so in order to maximise the self sufficiency of the region. It would reduce the higher cost of importing from distant sources. The speed of delivery to areas of need within the region would also be greatly improved.

The figure of 250 000 tonnes is based on recent experience. Since June 1981 more than 200 000 tonnes of Zimbabwean maize has been distributed to SADCC countries by the World Food Programme.

Financing the stock-holding of a reserve of 250 000 tonnes would impose a heavy burden on Zimbabwe. The proposal for donor aid as suggested would help to reduce the problem.

Currently maize is being sold by Zimbabwe to export markets within the region at a significant loss compounded by the cost of handling and storage. As a result Zimbabwe is already obliged to take measures designed to reduce the level of maize production and to encourage producers to divert their activities to the production of other crops. If Zimbabwe is to continue as a producer of substantial food surpluses the country's farmers must be encouraged to at least maintain present levels of production. This proposal is aimed at that end.

The cost/tonne of financing, handling and storing maize in Zimbabwe is Z\$35. Therefore the annual storage and handling costs for 250 000 tonnes amount to Z\$8 750 000.

Summary

The proposal is thus:

- (a) 250 000 tonnes to be held in a grain reserve purely for the requirements of SADCC countries;
- (b) financing of the stock-holding in Zimbabwe at Z\$35/tonne giving a total aid requirement of Z\$8 750 000;
- (c) the project to cover the period 1 April 1983 to 31 March 1984 and to be reviewed thereafter;
- (d) the project to be identified as regional aid.

NPRI 8

10. Improvement of Food Storage Capacity - Lesotho

Background

Food production in our region is being undertaken currently against a background of decreasing levels of production world wide, and in our region in particular, caused by, among other things, unfavourable climatic conditions. This is aggravated by the virtual non-existence of strategic grain reserves. At the top of the global agenda for food is, at this point, the desire to achieve food security. SADCC, in the emphasis that it gives to food security, bears testimony to this fact. What needs to be underlined, however, is that, added to the desire to provide adequate food supplies to the people of the region, is the desire to achieve a measure of independence in food supply.

The value of regional coordination and cooperation on these issues can only be realised if it is used to complement and give impetus to the national programmes. This presupposes therefore, the existence of national programmes aimed at addressing the issue of food security. Lesotho for its part proposes to complement the regional effort by creating within itself storage capacity.

In an attempt to arrest the declining trends in basic food production, Lesotho embarked upon a food self sufficiency project aimed at reaching the optimum levels of production. The project has realised fairly substantial increases in production, which increases have served to illustrate the inadequacy of existing storage facilities. This means that not only is Lesotho inadequate in the storage of security reserves, but also in the storage of produce from the field.

Proposal

Against this background, and as a contribution to the solution of the regional food security disequilibrium, Lesotho proposes to increase its storage to serve two complementary ends:

- (a) to provide storage for produce from the field, and in that manner limit, to an extent, post-production losses;
- (b) to provide greater capacity for the storage of security reserves.

The total donor funding sought for this project has been estimated at US\$ 6 000 000.

11. Construction of Storage Facilities in Rural Areas - Zambia

Introduction

Expanded food production is one of the most critical areas of food security. Zambia has taken a number of determined and practical measures to accelerate food production especially in her major staple food, maize.

The following are the material incentives offered by the Zambian Government to encourage farmers to boost food production:

- (a) Farmers are given a 50 percent straight line accelerated depreciation on all their farm machinery, equipment and implements;
- (b) Farmers are given a reduction of the tax rate from 25 percent to 15 percent on income arising from agricultural operations;
- (c) The producer prices for major agricultural commodities are revised upwards annually, to make the farmer realise his profit. For example, next year's price of maize will be K18.30 from this year's producer price of K16;
- (d) A bonus of foreign remittance of K0.50 is offered on an extra 90 kg bag marketed in excess of 5 000 bags of maize, 2 000 bags of wheat and 1 000 bags of soyabeans.

Farmers have been responding positively to the above material incentives given to them by the Zambian Government. Last year, 1981, 7.7 million bags of maize were marketed by farmers to official marketing agencies. And had it not been for this year's critical shortage of rain which was experienced in all SADCC countries, Zambia would have purchased more than 8 million bags of maize.

Out of the 7.7 million bags of maize, about 70 percent of it came from rural peasant farmers. But although the share of peasant farmers in the overall maize production has significantly increased in the last few years, storage facilities and capacities for maize and fertiliser inputs have never increased. In fact, storage capacities facilities in rural areas have been drastically reduced in the last few years.

Present Storage Facilities in Zambia

The present storage maize capacities in Zambia are about 8.23 million bags. Of this amount, 1.23 million bags are concrete silos, and 7 million bags are concrete slabs covered with tarpaulins. All silos are concentrated along the line of rail and all concrete slabs are either along the line of rail or at provincial centres. Storage of maize in rural areas is very crude and very deplorable and this results in higher losses of maize.

At present a few donor countries are constructing very few slabs in rural areas but this is far from being satisfactory.

Proposal

It is proposed that a number of storage facilities with enough storage capacities be constructed in Northern, Northwestern, Eastern and Southern Provinces. These storage facilities should be constructed in rural areas. The exact number required of these storage facilities and the rural areas concerned are currently being identified by the people in the Planning Division of the Ministry of Agriculture and Water Development. This factual information will be ready by the end of this year, 1982.

NPRI 10

D. INFORMATION PAPER ON THE FOOD SITUATION IN THE REGION*

- Angola - Food shortages continue in Luanda and other parts of the country owing to poor crops. Conflict in South and a General Economic deterioration limit country's ability to import needed food supplies. FAO/WFP Emergency Food Assistance consisting of 9,432 tonnes of maize and 707 tonnes of edible fats for war displaced persons in Southern areas and 10,000 tonnes cereals for drought victims is in operation. Internal distribution of relief aid is hampered by inadequate transport facilities. UNDR0 is co-ordinating UN system relief Assistance.
- Botswana - 1982 Maize/Sorghum production is expected to be even lower than the 16,000 tonnes estimated earlier owing to high post-harvest losses. Crop was reduced by late rains and drought from 54,000 tonnes in 1981. Total cereal import requirements for 1982/83 are estimated at about 155,000 tonnes versus normal imports of 110,000 tonnes.
- Lesotho - Total cereal production in 1982 was less than below average 1981 harvest. Crops were planted late owing to drought conditions in October-November 1981. Dry spell in January and early frost in April 1982 caused substantial damage. Total summer cereal production in 1982 is estimated at 135,000 tonnes, or about 20 percent below drought affected crop harvested in 1981. Larger cereal imports will be needed to meet consumption requirements.

* This paper, which is included for information only, is based solely on FAO data as of 15 September 1982.

Malawi

- Despite temporary drought in late 1981, production of maize in 1982 is estimated to have increased as compared to 1981 by seven percent to 1.55 million tonnes. Increased reflects larger acreage planted in response to higher producer prices offered by Government. Crop is expected to meet 1982/83 consumption requirements and to allow some increase in strategic grain reserve. Normal wheat imports of about 20,000 tonnes will continue to be required in 1982/83.

Mozambique

- Overall food situation remains serious. In drought areas of Nampula and Cabo Delgado food situation has temporarily eased owing to late rains which allowed some food production and to food aid arrival but tight situation is expected from October to May 1983 unless additional aid is received. FAO/WFP EMERGENCY FOOD ASSISTANCE of 10,000 tonnes of maize reached northern port of Nacala by the end-August. 350 tonnes sorghum and maize seeds, valued at US \$250,000 have also been provided by FAO for sowing in November.

Food shortages continue in major cities and rationing of basic food is still in operation. Drought which affected 1982 crops in Southern Provinces has continued affecting in particular livestock. Normal crop yields are reported in North Western and Central Regions. Government purchases of domestic cereals are larger this year reflecting increased farm gate prices and improved marketing campaign. However Transport situation in Central and Southern Regions has deteriorated following increased insurgent activity. Drought has reduced major foreign exchange earner cashew nut harvest by 50 percent and therefore ability to import food commercially is limited. Government has received larger quantities of food aid this year but more is required to fill supply deficit.

Swaziland

Early season drought followed by poor and hailstorms reduced coarse grain output by about 40 percent compared with a normal year. A reduction of about 50 percent is also reported for cotton crop. Cereal import requirements are estimated to increase by some 40,000 tonnes in

- 1982/83. Serious food shortages are expected in several areas. Government has appealed to donors for assistance. FAO/WFP EMERGENCY FOOD ASSISTANCE to farmers seriously affected by drought was approved on 5 August.

Tanzania

- Current food situation is satisfactory reflecting arrival on the market of newly harvested crops and of cereal imports but outlook for rest of marketing season remains uncertain. Although total production is estimated to be higher than in 1981, purchases of maize from farmers by Government marketing agency are expected to be only ten percent higher than last year. This reflects the fact that farmers are likely to rebuild stocks following two drought years and in view of anticipated marketing difficulties. Therefore, it is expected that cereal imports will continue to be required in 1982/83, mainly to meet urban demand, but a precise assessment of needs is not yet available.

Zambia

- An FAO-LED multidonor mission has confirmed severe reduction in 1982 maize crop owing to drought. Official estimate of 1982 marketable maize production remains unchanged at 459,000 tonnes compared to 700,000 tonnes required by Government agency for sales mainly in urban markets. Maize import deficit for 1982/83 is therefore about 240,000 tonnes. In addition, situation in drought affected areas is aggravated by increasing number of refugees from neighbouring countries who require special food relief assistance.

Due to broad range of estimates of deficit, multi-donor mission recommended a review in September when purchasing campaign will have progressed sufficiently to afford a more precise estimate of import requirements. Meanwhile, it is suggested that donors begin food aid decision process for December 1982-May 1983 supply period.

Zimbabwe

- Despite sharp drop in maize production owing to drought, domestic maize supply situation for 1982/83 remains favourable thanks to large carryover stocks from 1981/82. Sizable quantity of maize will be available for export. Wheat crop has been affected by shortage of irrigation water and is now officially estimated at 175,000 tonnes against 195,000 tonnes in 1981.

- Drought still prevails in Matabeleland Province and parts of Victoria, Midlands and Manicaland Provinces. Peasant families whose principal occupation is livestock production have been directly affected by drought, depleted grazing and water resources. According to a Government report 600 sites are without water and almost three million people are affected. Government is implementing a water distribution programme in worst affected areas. Government social services department is providing relief food for those people without purchasing power. Sales of cattle to Government Cold Storage Commission are being encouraged.

(Foodcrops and Shortages - 15 September 1982 FAO)

In September 1982 the FAO issued the following summary of the situation and prospects for food supplies and crops in the nine SADCC countries

FOOD SUPPLIES AND CROPS - SUMMARY OF SITUATION AND PROSPECTS

COUNTRY	Abnormal food Shortages			Estimated Foodcrop Production and Prospects				
	Current year (1)	Next year (2)	Crop (3)	Overall Conditions	Rainfall	Plantings	Harvest Progress	Crop Index (4)
ANGOLA		X	Coarse grains (1982)	Unfavourable	Normal	Delayed	Completed	-
POTSWANA		X	Coarse grains (1982)	Unfavourable	Below Normal	Reduces	Completed	40
LESOTHO	X		Coarse grains (1982)	Unfavourable	Below Normal	Delayed	Completed	80
MALAWI			Maize (1982)	Normal	Below Normal	Increased	Completed	107
MOZAMBIQUE		X	Cereals (1982)	Unfavourable	Irregular	-	Completed	-
SWAZILAND		X	Maize (1982)	Unfavourable	Below Normal	Delayed	Completed	60
TANZANIA		X	Coarse grains (1982) main	Normal	Normal	Normal	Completed	-
ZAMBIA		X	Maize (1982)	Unfavourable	Below Normal	Increased	Completed	65
ZIMBABWE		X	Maize (1982)	Unfavourable	"	Reduced	"	53
			Wheat (1982)	Below Normal	"	"	"	90

(1) = Marketing year 1981/82 (or Jan. - Dec. 1982) unless otherwise stated.

(2) = Marketing year 1982/83 (or Jan. - Dec. 1983) unless otherwise stated.

(3) = Year of harvest (or bulk of harvest) indicated in brackets.

(4) = As percent of previous year's harvest.

(Foodcrops and Shortages 10 September 1982 FAO)

SECTION TWO - ANIMAL DISEASE CONTROL

A. SUMMARY OF APPROVED PROJECTS* (ADC)

Tsetse Eradication - (1) Northwestern Botswana
(2) Southwestern Zambia

The smallest tsetse fly belt in Africa includes the Okavango delta in Botswana, the Caprivi, southeastern Angola and southwestern Zambia. Since 1972 a study of the efficacy and safety of the aerial method of tsetse fly control using ultralow volume endosulphan droplets has been carried out in Botswana. It has been proved technically that tsetse fly can be eradicated safely with minimum damage to non-target species using endosulphan. The purpose of the project is the eradication of the fly from this tsetse fly belt. The total of donor funding sought is P6.2 million for (1) Northwestern Botswana and K2.28 million for (2) Southwestern Zambia. The project was originally presented to the Blantyre Conference. (ADC 1 see page 91, ADC 2 see page 107)

Regional Meat Inspector Training School - Lobatse, Botswana

Three members of SADCC are fresh meat exporting countries - Botswana, Swaziland and Zimbabwe. The three countries depend on external institutions for training of meat inspectors. The number of places offered to our students in foreign institutions is not adequate for our basic manpower needs in this discipline. The Government of Botswana has therefore decided to establish a meat inspector training school at Lobatse to train not only Botswana students but students from other countries in the region. The project is supported by FAO and DANIDA. The latter has offered to finance running costs of the project but funds are needed for the capital costs. The total donor funding sought is P2.6 million. The project was originally presented to the Blantyre Conference. (ADC 3 see page 114)

Establishment of a Zoonosis Centre in Zambia

This project was approved in principle for SADCC Blantyre but was not costed. The project seeks financial and technical support for the development of a SADCC Centre for Zoonosis (SCZ) for: the surveillance of zoonosis; to serve as a SADCC reference centre; to serve as a standards institute for biologicals; to serve as a quality control centre; and, to promote research and training programmes for the control and eradication of major zoonosis affecting the development of SADCC Member States. The total donor funding sought is US\$5.17 million. (ADC 4 see page 120)

* Of the projects presented to the Blantyre Conference, November 1981, the following have been funded and are either being implemented or are completed: Feasibility Study on Regional Foot & Mouth Control & General Vaccine Production; Botswana/Zimbabwe Border Fence - Vakaranga/Basuto Border Fence; Eradication of Foot & Mouth Disease along the Botswana/Zimbabwe border; and, Tsetse Training Complex, Zimbabwe

Regional Programme for East Coast Fever Immunisation

This project relates to the above project ADC 5. East Coast Fever is a tick-borne disease which results in the death of many cattle in East and certain parts of Central Africa. At the moment there is no treatment and no vaccine. The project is designed to produce a vaccine to combat the disease. The countries affected are Malawi, Mozambique, Tanzania and Zambia. The total donor funding sought is US\$1.2 million. (ADC 5 see page 134)

Tick & Tick-borne Disease Centre - Malawi

In most of the SADCC countries tick-borne diseases are the most important factor limiting development of livestock. It is therefore proposed that a centre be established in Malawi for research into a solution to this disease problem. The total donor funding sought is US\$14.2 million. The project was originally presented to the Blantyre Conference. (ADC 6 see page 141)

Foot & Mouth Disease Control - Malawi/Tanzania/Zambia borders

This project is designed to control and prevent the spread of Foot & Mouth Disease from some northern parts of Tanzania to southwestern Tanzania, northern Zambia and northern Malawi. The total donor funding sought is US\$1.3 million. (ADC 7 see page 155)

Foot & Mouth Disease Control - Southern Malawi

The Foot & Mouth Disease threat to Malawi in the South is separate to that in the North. There is therefore need to control and prevent Foot & Mouth Disease outbreaks in the southern part of Malawi independently of the northern threat. The total donor funding sought is US\$1.3 million. (ADC 8 see page 187)

Regional Foot & Mouth Vaccine Bank

Speed and efficacy of vaccine is essential in Foot & Mouth Disease control. This project is designed to establish a stock of vaccine that will be released to Member Countries at short notice without going through long processes of acquiring funds and foreign exchange. Outbreaks can thereby be contained quickly. This will be cheaper than controlling large scale outbreaks. The total donor funding sought is US\$7.2 million. (ADC 9 see page 194)

Integrated Animal Disease Control - Tanzania

This project is designed to control animal diseases in southern Tanzania bordering with Malawi and Zambia. The project will establish an infrastructure for the control of a number of animal diseases. The sharing of facilities will reduce costs. The total donor funding sought is US\$4 230 000. (ADC 10 see page 199)

Control/Eradication of Rinderpest in Tanzania

Rinderpest is probably the greatest threat to our animal industries and wildlife. The late 19th century pandemic in Central and Southern Africa nearly decimated the domestic and wildlife population. An African Project JP15⁽¹⁾ almost eliminated the disease which is now reappearing in West, North and East Africa. Outbreaks have already occurred in Tanzania in wildlife. It is therefore essential that this disease be eliminated before it breaks through to susceptible herds in other SADCC countries. The SADCC Veterinary Sub-Committee considers this the single most important and urgent project at the moment. The total donor funding sought is US\$11 million. (ADC 11 see page 234)

Equipment of the Biological Substance Laboratory in Mozambique

This project is designed to strengthen the biological substance laboratory to produce various vaccines and sera used in the control and diagnosis of animal diseases. The total donor funding sought is US\$2.7 million. (ADC 12 see page 248)

Animal Disease Reference Laboratory in Zimbabwe

In the past and at the moment many SADCC countries depend on either developed countries or South Africa for diagnosis and research in certain major animal diseases. This project will extend the diagnostic and research facilities of the Central Laboratory in Harare to the level of a reference laboratory for certain diseases in SADCC. The total donor funding sought is US\$2.5 million. (ADC 13 see page 251)

(1) This refers to a joint OAU/FAO project which was started in the mid-1960s and completed in the mid-1970s.

B. PROJECTS

1. Tsetse Eradication - Northwestern Botswana

Synopsis

Funds totalling P6.2 million are needed for eradication of the tsetse fly which infects the Okavango Delta, parts of the Kwando River front and along the Savuti Channel. The process to eliminate the fly from Botswana will involve the Ultra Low Value (U.L.V.) applications of endosulphan from the air over a two-year period. The eradication programme will rid Botswana of sleeping sickness and allow resource development to continue and accelerate in the Okavango.

Background

The tsetse fly problem in Botswana arises from the central south African infected area which affects southwest Zambia, southeast Angola, the eastern part of the Caprivi Strip (Namibia) and north-western Botswana. It has had a severe impact in all of these countries but the greatest territorial expansion recently is probably in Angola, while the greatest economic impact is in Zambia and Botswana. (See Map 1).

In Botswana the problem currently involves infestations associated with the Kwando/Chobe river system and a much larger area based in the delta of the Okavango river. The two infestations are linked by a relatively narrow neck on the Selinda Spillway and by another drainage system (Kwando) running north-east from the northern limb of the delta.

The tsetse fly has been causing difficulties in Botswana for many years. The first proven cases of trypanosomiasis in humans in northern Botswana were found in two police officers who visited Western Chobe in 1934. Following this finding, and a further 4 cases in 1938, two surveys were made. The first, carried out in 1939-40 by MacKichan, was a clinical examination of 20,000 people for the presence of trypanosomiasis. Nine proven cases were found. The second survey, carried out in 1941-43, was an entomological survey by Macavley who recommended the formation of a tsetse fly control unit.

In 1942-43 a major epidemic was said to have occurred in Ngamiland though exact records do not exist. Some reports indicate as many as 828 cases and 223 deaths during the two year period. The Maun hospital was taken over in 1945 by the Government and low numbers of cases were reported up to 1956. The sharp decline in cases of trypanosomiasis was likely due to people moving away from fly-infested areas.

From 1957 increasingly larger numbers of cases were diagnosed. Peak numbers of cases reported occurred in 1960-100 cases, 1966-105 cases, and 1971-272 cases. Since 1972 there has been a gradual reduction in cases of sleeping sickness with 13 in 1977, 5 in 1978 and 21 last year. Almost certainly this has been a direct result of the control measures now being employed which are the only major factors (variables) that have changed in recent years

Tsetse fly control (TFC) began with the formation of the TFC Unit under the office of the governor (DC) in 1943. It became the responsibility of the Veterinary Department in 1966. In the beginning, control methods ranged from fencing to control of game movement to shooting of game. However, the fly continued to spread. Bush clearing and ring barking of trees was intensified in heavily infested areas. Results were negligible.

In the early 1960's it was decided to try insecticides and this became the major control measure used. However, ground spraying is an expensive proposition and only controls the problem locally and to push the fly back into the swamp was found to be very difficult. Since trials of aerial insecticide spraying had been done in other African countries for some time it was decided to start such trials in Ngamiland. These commenced in 1972 using the knock down insecticide Endosulphan. The first control operation was on the Maun front in 1973.

Trials have been proceeding yearly since 1973 gradually refining the techniques and undertaking extensive Entomological investigations. The trials are an integral part of an aerial control programme. The spraying is carried out in the winter (July-October) at night (when cold inversion carries the insecticide downwards) and at a level of about 50 feet above ground. The area to be covered is marked out by ground cleared lines and by using Doppler and ultra low frequency radio guidance the pilot can tell when he has reached the end of the plot and must turn round onto another sweep. Swathes are at 300 metre intervals. To eradicate the flies in the trial areas it was found necessary to spray 5 times at intervals of about 15-16 days, depending on temperature and humidity readings: By this means pupae which are in the ground at the time of the first spray are caught by the second or subsequent rounds before they are able to reproduce.

The combined ground spraying and aerial control programme now in force has reclaimed substantial areas of valuable land resource amounting to some 4 600 km² on the West Bank of the Okavango and 1 600 km² on the Maun front. In the Chobe area, some 4 000 km² is cleared of fly and protected by current methods (see Map 2). Thus the tsetse control activity has made possible a deployment of cattle and people into large areas that would be closed to humans and livestock without the tsetse control program. MacLennan estimated in 1976* that 94,000 head of cattle were grazing and watering at places which would, in the absence of tsetse control, be infested with tsetse fly (See Map 3).

To substitute tsetse control with trypanoprophylaxis would involve nearly 500,000 treatments which is assuming that 5 treatments per year would be sufficient. Furthermore, long term use of the drug is cumulative and toxic causing liver damage and other problems. Thus, while prophylaxis control is justified in shortrun emergencies, it should not be considered for the longer term.

* A Review of Anti Tsetse Activities in Botswana
K.J.R MacLennan, Sept-Oct 1976.

Because of the infiltration of flies into protected areas and movement of cattle into unprotected areas or areas partially protected, curative treatments (Berenil) are available on request and for the past ten years these requests have been at the following rates:

	1972 - 3237	1976 - NA
	1973 - 597	1977 - 3870
1970 - NA	1974 - 5241	1978 - 3716
1971 - 7179	1975 - 2277	1979 - 1073

Note: while the bulk of treatments would be against trypanosomiasis, the prophylactic is also used to treat redwater and anaplasmosis.

The major disadvantage of the current programme is that the cleared areas are reinvaded very quickly. Thus, complete eradication of the fly would be the best solution. The Division of Tsetse Fly Control has been developing a technique capable of eliminating the fly from a given area with minimum effect on the environment. The technique to eliminate the fly has now been perfected and a great deal of effort has been put into the study of possible adverse effects of spraying. Officers of several disciplines from the Centre for Overseas Pest Research in London have studied non target insects, birds and fish. Their general observations are that, at the concentration of endosulphan used, no long term effect on the environment will occur and that short term effects are minimal and completely reversible. Thus, the Department of Veterinary Services is now in a position to begin the eradication programme.

Plan of Operation

The tsetse fly eradication programme will consist of a two year operation. The first year will involve the clearing of the Kwando area and a portion of the Caprivi Strip by aerial spraying. Overflying part of the Caprivi is necessary to prevent reinvasion and to establish a proper barrier between the Caprivi fly belt and the Ikavango. The area to be cleared of the fly during the first year is approximately 7 200 km². (See Map 4).

The second year will involve the clearance of the Salinda spillway and the Okavango delta and will overfly part of the Kwando area sprayed during the first year as a safety measure to control possible reinvasion between the two operations. The section to be treated will cover a total of 28 000 km² and will be divided into two operational areas. (See Map 4).

As soon as the Kwando area is cleared during the first year a barrier will be established along the Caprivi border. (See Map 5). This border patrol operation will involve a ground spraying programme along a 60 km section the Caprivi/Botswana border.

Closely associated with the tsetse eradication programme is the construction of the game fence around the perimeter of the delta. This fence will be built under Phase II of the Veterinary Cordon Fence Project which involves the construction of a 750 km game fence across northern Botswana. The delta perimeter fence is planned to be finished by the time tsetse eradication has been accomplished. The fence will serve to prevent livestock from entering the wildlife management area of the delta and protect livestock from contact with buffalo and other wild carriers of foot and mouth disease.

Technical Review

The Chief Tsetse Officer and Senior Field Officer currently controls the aircraft when spraying operations are under way and the Tsetse Officer (Entomologist) carries out dissections and other forms of assessment, assisted by two assistant field officers. Two flights of two aircraft will operate simultaneously during the second year of the programme which will require two teams of two controllers (minimum) for each team. During a four aircraft operation the current team would be stretched beyond reasonable limits and a backup of two further experienced personnel would be desirable. These could probably be recruited from COPR staff or their trainees as most of the ongoing programmes in Botswana will be concluded by the first application of insecticides.

On vehicles needs, the current departmental fleet of seven 4x4 7 tonners is rapidly deteriorating and at least six new vehicles will be required in the first year. If these seven vehicles are in reliable functional order, additional requirements will be three more 4x4 7 tonners for hauling fuel and insecticide. Ideal equipment would be two Mercedes Unimogs plus trailers and one 4x4 7 tonner.

On the light vehicle side, the current fleet of four Land Cruisers is in reasonable condition but inadequate in numbers. Supervision of aircraft and ground liaison will require a minimum of three vehicles continuously in the field, plus those of the officers supervising fly rounds assessments, etc. Additionally, one visiting expert is expected for drift studies and general observation of operations.

Therefore, a minimum of two extra 1 1/2 ton vehicles is required. These should be diesel vehicles for operation in wet conditions and maximum reliability and range and should be of the station wagon type which can be equipped with all radio and signalling equipment and will be used as a permanent base for four months at a time.

Existing marine equipment includes 2x16 foot aluminium boats, 1x48 hp. Mariner outboard motor, and 2x33 hp. Johnson outboards that are obsolete. There will be a requirement for further boats and engines in the delta as follows: one stationed at Shakawe, one

stationed at Mboma (N'Gocha river), and two stationed at Maun (Boro River and Xaxwe). Additional needs include 2x16 foot boats, 6x25 hp. outboard engines and 1x40/50 hp. outboards. Thus, there will be total requirement for four boats and eight engines. Each boat carries a back-up engine.

Two mobile and one base/mobile radio stations will be required. Radio sets now on hand are unsatisfactory for vehicle mounting. Therefore 3 sets must be purchased.

Financial Analysis

A - Eradication Project Costs	P6,200,000
B - Current Annual Control Program Costs	P1,052,000
C - Annual Cost to Control Reinfestation	P 233,000

A. Eradication Programme Costs

1. Endosulphan

(a) area covered

1st year	7 200 km ²
2nd year	28 000 km ²
	<hr/>
	35 200 km ²

(b) applications

1 @ 15 gm/km ²	=	528 000 gms
+ @ 12 gm/km ²	=	1 689 600 gms
		<hr/>
		2 217 600 gms

(c) 2 217 600 grams in 35% solution makes 700 000 litres required.

1st year - 140 000 litres @ P4,25 litre	P 595 000
2nd year - 560 000 litres @ P4,25 litre	P2 380 000
	<hr/>
TOTAL	P2 975 000

2. Flying

(a) 1st year - Kwando (7 200 km²)

(i) The spray runs -

162 runs @ 100km/run	
82 runs @ 40km/run	
Assuming spraying speed 300km/hr	

(ii) Sorties:

Spray runs 4x100km	=	80 minutes
Ferrying (average) 130km	=	26 minutes
Manoeuvring	=	20 minutes
		<hr/>

126 minutes = 2,10 hrs

Total sorties @ 4 runs			
per sorties	= 41 sorties	=	<u>86,01 hrs</u>
Spray runs 10 x 40 km	= 80 minutes		
Ferrying 60 km	= 12 minutes		
Manoeuvring	= 50 minutes		
			<hr/>
	142 minutes	=	<u>2,36 hrs</u>

Total sorties @ 10 runs			
per sortie	= 3 sorties	=	<u>19,00 hrs</u>
Total flying time per cycle	=	<u>105,00 hrs</u>	
Total time for five cycles	=	<u>525,00 hrs</u>	
@ P650/hour	=	<u>P341 250</u>	

(b) 2nd year - Okavango/solinda (28 000 km²)

The operational area is divided into two parts:

Area A	14 500 sq km
Area B	13 500 sq km

(i) Area A 14 500 - Outline 90 km
Spray runs 188 km
 244 runs @ 188 km

Sorties

Spray runs 2 x 188 km	=	76 minutes
Ferrying (40 km)	=	8 minutes
Manoeuvring	=	20 minutes
		<hr/>
	104 minutes	= 1,73 hrs

Total sorties @ 2 runs per sortie - 22 sorties = 211 hrs

(ii) Area B 13 500 sq km - Outline 75 km
 Spray runs average 183 km = 202 runs @ 183 km

Sorties:-

Spray runs 2 x 183 km	=	74 minutes
Ferrying (110 km)	=	22 minutes
Manoeuvring	=	20 minutes
		<hr/>
	116 minutes	= 1,93 hrs

Total sorties @ 2 runs per sorties - 101 = 195 hrs

Total time for Areas A and B - 496 hrs

Total time for 5 cycles = 2 030 hrs

Cost at P650/hr = P1 319 500

(c)	Total flying costs	
	Year 1	P 341 250
	Year 2	P 1 319 500
		<hr/>
		P 1 660 750

3. Miscellaneous Costs:

(a) Building and Camps:

Semi-permanent camps to be built at Savuti and Gomare. Showers, toilets, sleeping and cooking facilities for Pilots and Department Staff (reed huts, thatched roof, etc.). P5 000

(b) Manpower:

Majority of work can be handled by Departmental staff, however, additional labour will be required as follows:-

Cut-lines:

1981 Kwando:

90 km cut-line and one major bridge over Savuti channel. Airstrip will require clearing and grading.

1650 man-days Casual Labour @ P4,10 = P6 765

1982 Okavango:

80 km of cut-line to be cleared. Rest of operation to be controlled from Tsau/shakawe road which will require measuring and pegging. Upgrading of Gomare airstrip and construction of camp.

2 200 man-days @ P4,10 = P9 020

(c) Total miscellaneous costs = P20 785

4. Vehicles and Transport

(a) Heavy Vehicles

2 Unimogs with trailers	P80 000
1 4x4 7 tonner	20 000
	<hr/>
	P100 000

(b) Light Vehicles

2 1-1/2 ton (diesel)	<u>P30 000</u>
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(c) Boats and Engines

2 x 16' boats (aluminium)	P 5 000
6 x 75hp outboard engines	<u>P 6 000</u>
1 x 40/50hp outboard engines	<u>P 1 500</u>

(d) Total Boats and Engines P12 500

5.	Maintenance, parts and fuel	<u>P15 000</u>	
6.	Radios	<u>P 8 000</u>	
7.	<u>Total Costs</u>		
	<u>Costs in 1st year:</u>		
	Flying	P 341 250	
	Endosulphan (20% of total)	595 000	
	Buildings and camps	5 000	
	Labour	6 765	
	Vehicles - Heavy P100 000		
	Light 30 000		
		<u>130 000</u>	
	Boats and Engines	12 500	
	Maintenance and running of Boats	7 500	
	Radios	8 000	
	Contingency	221 120	
		<u>P1 327 135</u>	
	<u>Costs in 2nd year:</u>		
	Flying	P1 660 750	
	Endosulphan (80% of total)	2 380 000	
	Labour	9 020	
	Maintenance and running of Boats	7 500	
	Contingency	811 454	
		<u>811 454</u>	
	<u>Total Estimated Cost of Project</u>	<u>P6 195 859</u>	

Note: The costing of the two major items, i.e. flying and endosulphan, are dependent on the petroleum prices and if any major increases in these costs occur before the project is implemented then these figures could be below the actual requirement. A larger than normal contingencies element has therefore been included.

B. Current Annual T.F.C. Budget (1980/81)

1.	Salaries		
	Permanent Staff	P 68 500	
	Industrial and Casual	280 000	
		<u>348 500</u>	
2.	Travelling and Transport		21 000

		b/£ 369 500
3.	Aerial Spraying and Insecticides	573 000
4.	Maintenance	
	Boat	12 000
	Building	3 000
	Incidenta	5 000
		<hr/> 20 000
5.	General Expenses	10 000
6.	Running expenses for 12 vehicles	
	7 x 5 tonner (20 000 km @ 47t)	65 800
	5 x 5 Landcruisers (20 000 km @ 33t)	32 500
7.	Total Budget	P1 070 800

C. T.F.C. Annual Budget After Eradication

1. Salaries

(a) Chief Tsetse Officer (S5)	P13 272
- Local Allowance	360
(b) 1 Senior Field Officer (T2)	8 925
1 Senior Field Officer (T3)	6 384
5 Assistant Field Officer (T5)	18 900
(c) Industrial Class	
33 men @ P4,80 (G3)	48 090
3 drivers @ P5,70 (G2)	5 191
2 storemen @ P5,70 (G2)	3 461
4 guards @ P4,80 (G3)	5 829
Allowances	15 120
(d) Total	<hr/> P125 532

2.	Insecticides 10 000 litres Dieldrin @ 250	P 25 000
3.	Sprayers 24 @ P50 over 3 years	400
4.	Maintenance of Boats and Oil	1 360
5.	Vehicle Running Costs	
	3 4x4 7 ton (20 000 km @ 55t)	33 000
	4 4x4 Landcruisers (20 000 km @ 33t)	26 400
		<hr/> 211 692
6.	10% Contingencies	21 169
7.	Total Budget	<hr/> <hr/> P 232 861

Social and Economic Analysis

The eradication of the tsetse fly from Botswana would have considerable impact, particularly upon the people living in northwestern Botswana on the perimeter of the Okavango Delta and Chobe river. It would eliminate sleeping sickness and permit a freedom of movement they have never experienced.

The elimination of the fly would maintain and expand the area of land usable for agricultural purposes in two ways. First, it would extend to some degree the area currently kept free of the fly by the Tsetse Control Unit. This would provide grazing for a total of 100 000 or more cattle. The value of grazing for this number of cattle at current commercial grazing rates is nearly P2,5 million annually. Secondly, it would maintain the current level, and perhaps expand slightly, the land suitable for cultivation in this area. While this is not quantifiable at this time, the land area made available for cultivation by the Tsetse Control Program amounts to several thousand hectares. It is clearly established that eradication of tsetse fly will bring a considerable amount of longer term savings as compared with continuous control. For example, the estimated cost of eradication is equivalent to P6,2 million. Annual costs to maintain the current level of control is about P1 million. Annual costs to maintain the current level of control is about P1 million. At constant prices, estimated annual costs to maintain a fly-free situation when the eradication programme is finished total about P230 000. The approximate P800 000 difference between maintenance costs now and after eradication means that the P6,2 million cost of the eradication will be paid out in about 8-10 years after the programme is completed. Thus, from a long term cost standpoint, the eradication programme is very favorable to the Government.

Wildlife development inside the fence will provide primarily for greater economic exploitation of wildlife in cattle free zones. In these areas greater emphasis will be given to development of tourism and controlled hunting made possible by the elimination of the fly.

Land and water development planning outside the fence will be required to ensure the rational use of these resources for the greatest benefit to the people of the area.

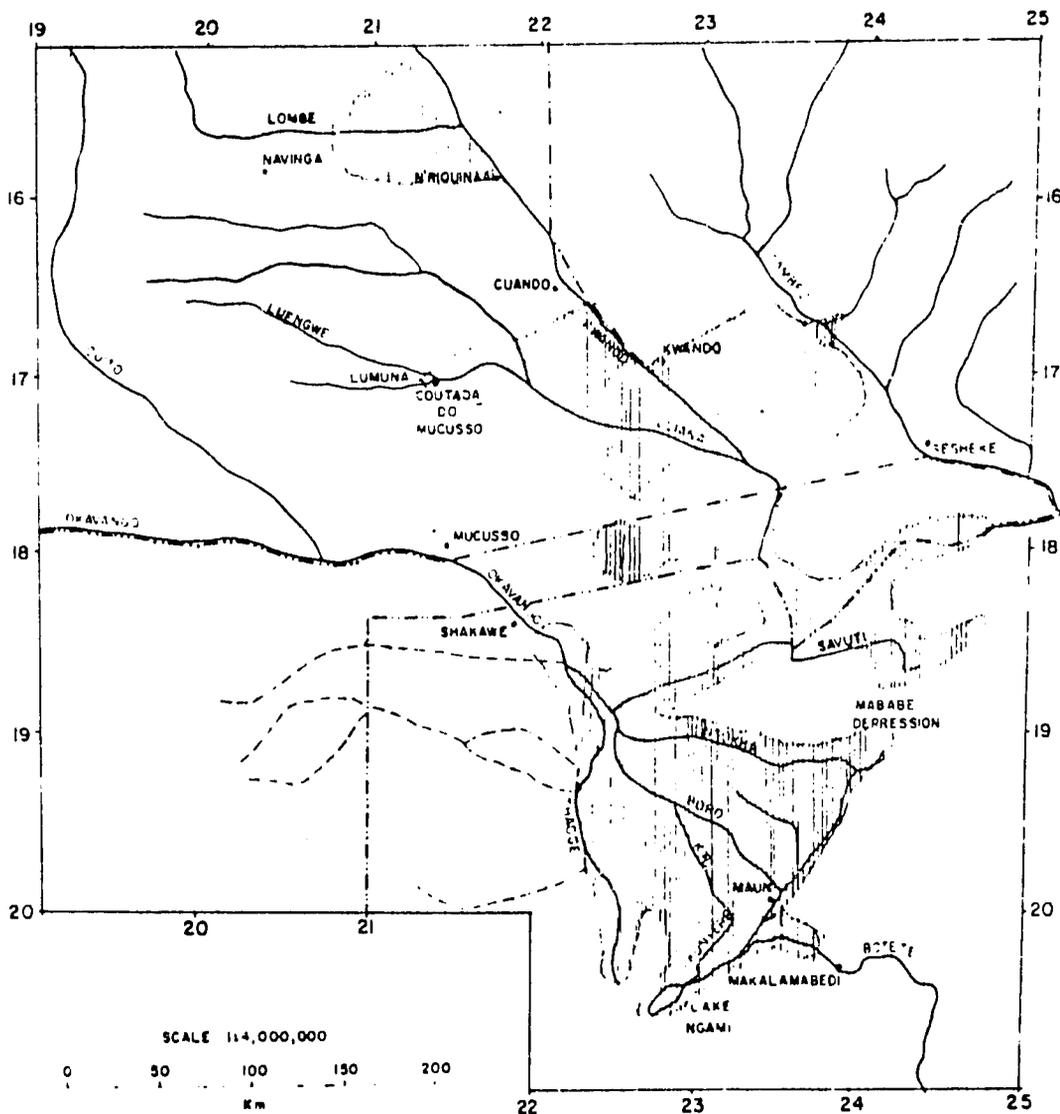
While the construction of the game fence around the Delta is not part of the tsetse eradication project, it has an important role to play in the development of the area following the eradication of the fly. It will tend to contain wildlife within the swamps area and to the area where wildlife development is to take place and keep out of cultivated areas where they could damage crops. However its main function will be, as mentioned earlier, to separate cattle from buffalo and other wild carriers of foot and mouth disease. It has been clearly established, as evidenced by the outbreak at Tsau in 1979, that cattle/buffalo contact is a major source of foot and mouth infection in the area.

The losses to Botswana's cattle industry since the initial outbreak of foot and mouth disease in 1977 are well known. Northern producers have been particularly hard hit as they have been unable to market cattle, other than locally, since November 1977. Financial losses due to lost or delayed sales in Ngamiland alone are probably approaching P10 million. This lack of cattle sales has had a devastating impact on the entire economy of a region dependent on cattle revenue as a major source of money.

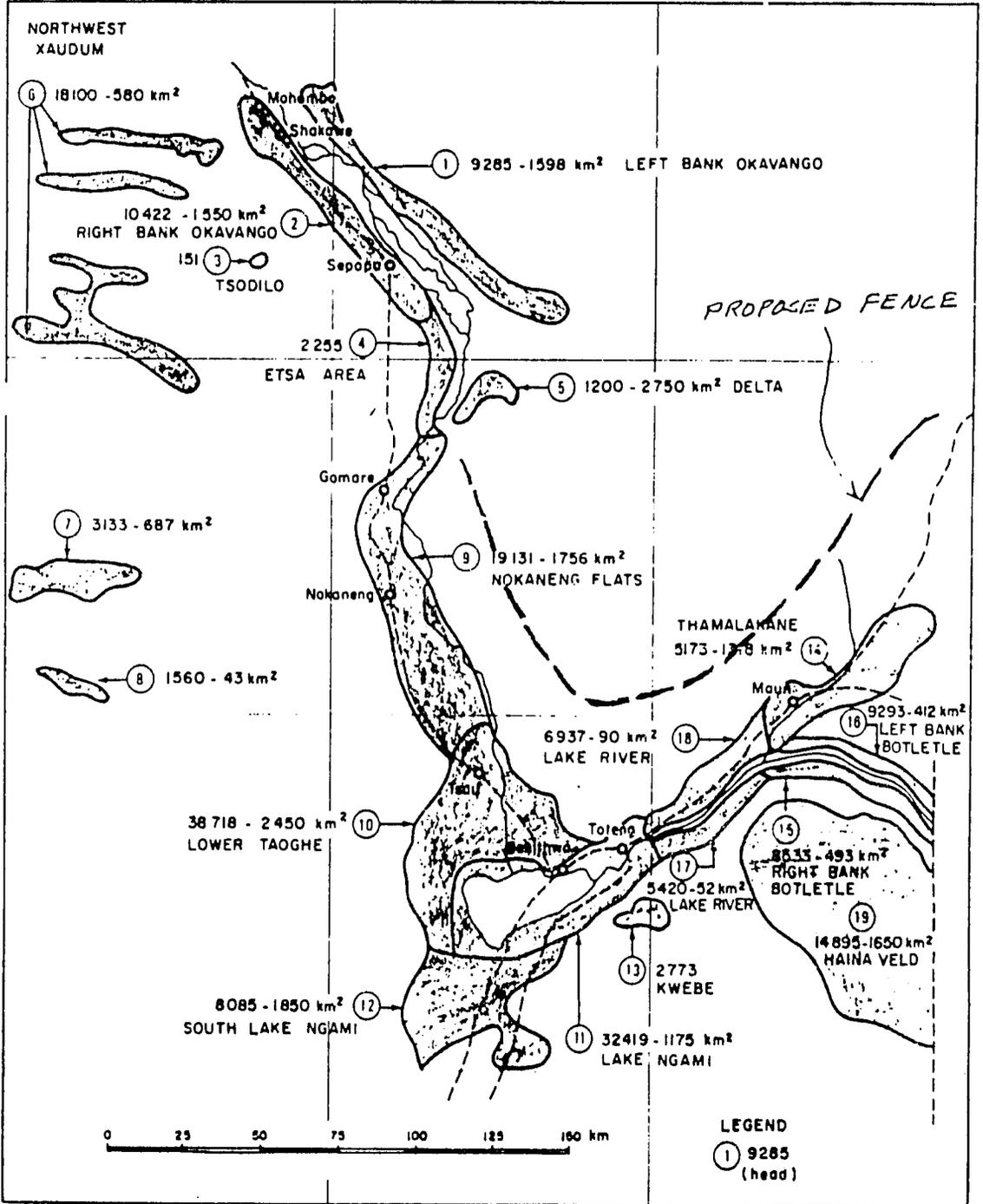
Related Projects

- A. During or shortly following the eradication programme a land and water development project will involve a study of available resources and the development of a plan and some infrastructural inputs for the use of these resources to increase crop and live-stock production around the Okavango. A second phase of land use planning will involve developing of a plan for the Chobe District.
- B. AH 04 - Veterinary cordon fences - Phase II of this project includes the construction of a buffalo fence running from east of Gomare around the perimeter of the Okavango Delta and on across northern Botswana to Basutas near the Zimbabwe border. A double cordon fence will be constructed along the border from Basutas to Vakaranga.
- C. AH 06 - Norther abattoirs Construction of a cannery at Maun and an abattoir at Francistown will improve the marketing situation for northern Botswana cattle producers and allow a higher offtake. Such facilities will also relieve the stress on the Lobatse plant during seasonally high or drought induced marketings.

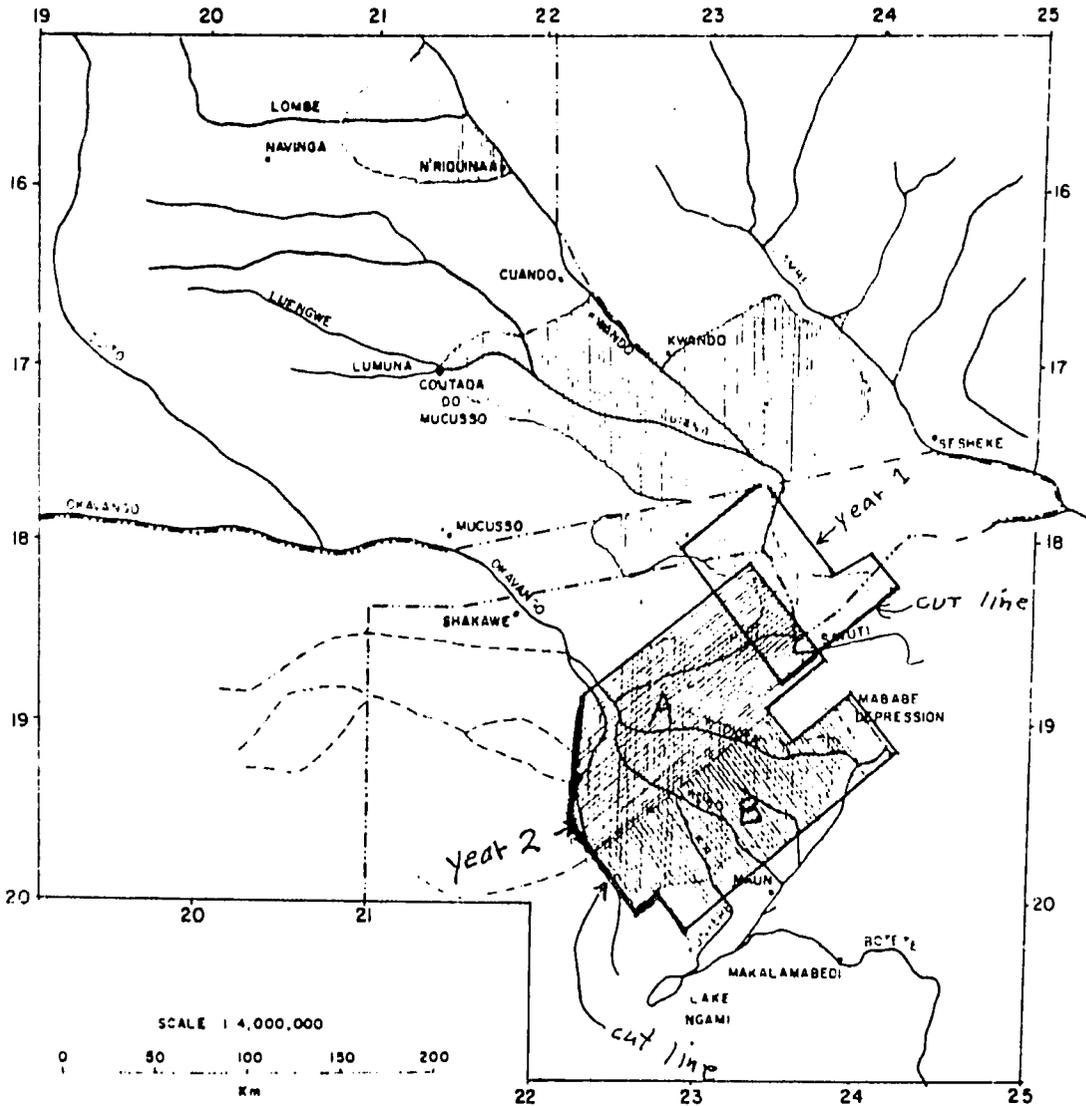
Map 1 APPROXIMATE DISTRIBUTION OF TSETSE FLY INFESTATION BEFORE CONTROL MEASURES WERE TAKEN



Map 3 ESTIMATED CATTLE DISTRIBUTION - 1976

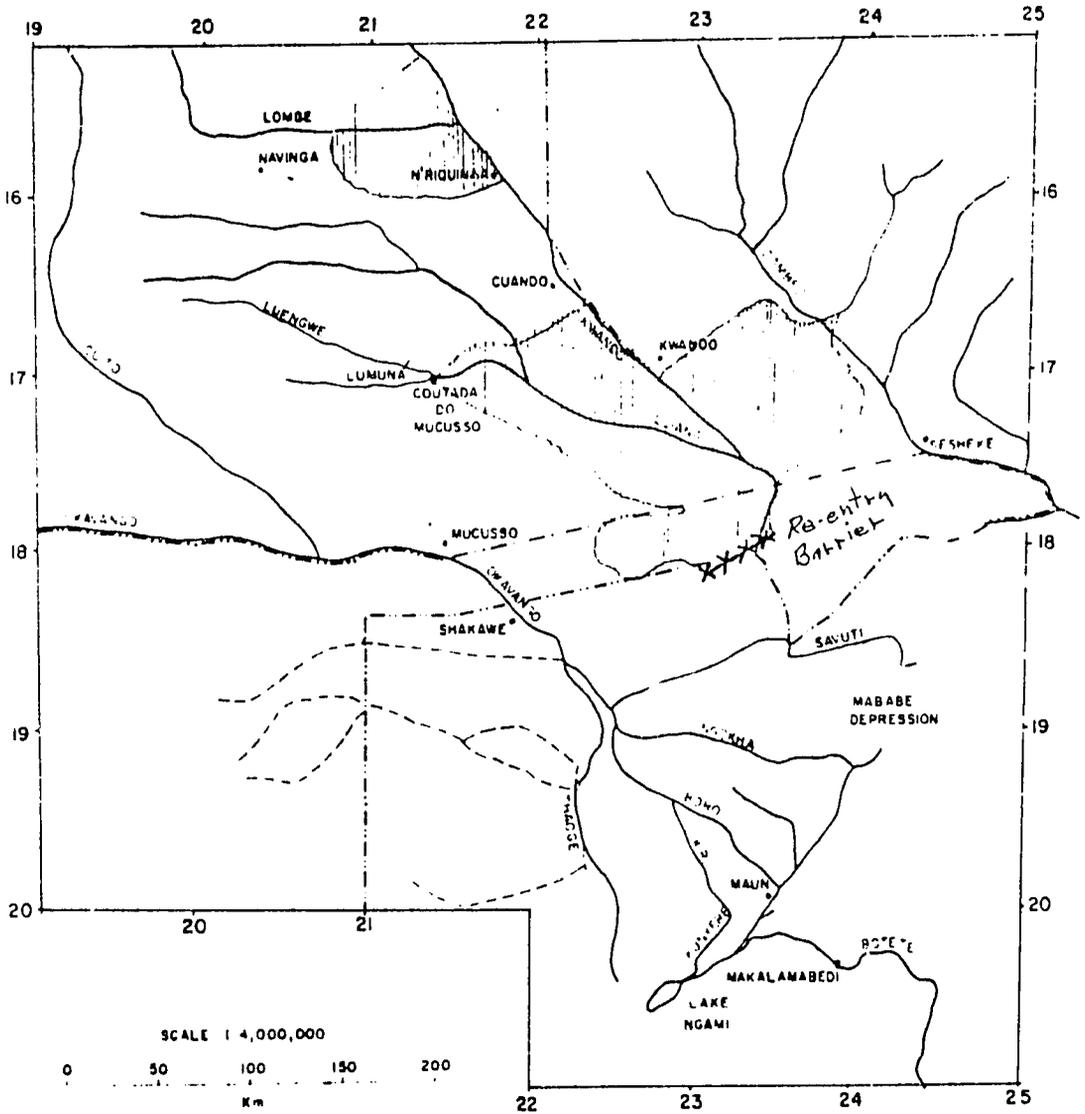


Map 4 IRRADIATION PROGRAM



D 76 / 10 / 80
DLU/KP

Map 5 CONTROL AREA AFTER IRRADIATION



2. Tsetse Eradication - Southwestern Zambia

INTRODUCTION

In South West Zambia (Western Province) there is an infestation of tsetse flies (*Glossina morsitans centralis*) covering an area of about 9000 km². This infestation appeared to cross the Kwando River in 1953. By the mid 1960's the infestation had spread North and East and was posing a considerable threat to one of the Zambia's major cattle producing areas. Various plans were formulated to contain the spread of the fly including aerial spraying and construction of a holding line consisting of game control and bush clearing measures. The main spraying operations are summarised in Table 1.

Table 1:

Summary of Aerial Spraying
Programme in South West Zambia

Year	Area Sprayed (Km ²)	Comments
1968	1600	Remained fly free until at least 1975.
1970	2500	Reinvasion noted after two years due to insufficient follow up
1975	3400	Fly free for 1 year after which monitoring was disrupted. Now believed to be reinfested.

In 1972 part of the area was declared a National Park. This severely limited the extent to which control measures could be carried out. Consequently the Department of Veterinary and Tsetse Control Services was forced to try and defend a fly line of about 150 km.

This became an impossible task as costs escalated and the fly was not necessarily being held on natural boundaries. By 1975 fly had crossed the east bank of the Zambezi River but further spread was temporarily contained by aerial spraying.

Since 1975 there has been a complete breakdown of the tsetse and trypanosomiasis situation caused by the effects of liberation wars in the area. A considerable financial input is required to bring the situation back to a reasonable control situation or eradicate the tsetse challenge altogether. Until a firm commitment is made on the future of tsetse control operations a plan to create a Cattle Development Area (CDA) in the area has been temporarily suspended.

An improvement in the security situation occurred in December 1980. One major camp was reopened and limited fly monitoring took place.

REGIONAL TSETSE SITUATION

It is known that the tsetse infestation in Zambia is contiguous with those in Angola, Namibia (Caprivi Strip) and south along the Kwando River to Botswana. It would therefore be logical for any country combating their part of this infestation to work with their neighbours to ensure complete eradication. This would prevent the threat of reinfestation and possible recurrent costs of holding fly.

Botswana have already made their intentions clear in that they intend to eradicate their part of this infestation and possibly the section in the Caprivi-Strip as well. To prevent reinfestation they would like all possible fly sources eliminated. Zambia has made a proposal for complete eradication of her part of the fly belt in the Third National Development Plan (1979-1983).

The Zambian Government has accepted the proposal but no funds have been guaranteed. The Angolan Commitment to tsetse and trypanosomiasis control in the area was not known at the time of writing.

JUSTIFICATION

Botswana have made their own justifications for eradicating the fly from their own country up to the border. They have expressed concern about reinfestation from those parts of the fly belt in neighbouring countries and the recurrent expense of holding fly on the international border. If neighbouring countries could cooperate the fly in the area could be eradicated completely.

Within Zambia the same fly belt which is being eradicated in Botswana is an immediate threat to an important cattle rearing area. There are 190,000 cattle under a tsetse/trypanosomiasis challenge at present. The fly front is currently out of control and cannot be held with the present financial resources in the department. Consequently the number of cattle at risk will increase as the fly front continues to expand. A considerable number of cattle deaths in the area have been attributed to trypanosomiasis. Continued prophylactic cover is not desirable. If it was the difficult communication in the area would make it virtually impossible to maintain.

Cattle rearing is the only livelihood of this part of Zambia. Arable farming is virtually impossible on the Kalahari sand soils of the area. The loss of grazing lands by tsetse invasion could cause considerable social problems locally. These would eventually have greater economic implication as the Western Province is a major beef supplier to the nation. The plan to create a CDA here have already been mentioned. A major constraint to its implementation is inadequate tsetse control measures. If the constraint of tsetse was removed the creation of the CDA could have considerable local and national benefits.

Complete eradication of this fly belt in Zambia and Botswana is technically possible. Complete eradication would reduce the almost impossible defence of an extensive fly front to a narrow strip on the Angolan border. This border has extensive natural barriers to fly movement created by the swamps of the Kwando River. The defence of this border could ever be eliminated if Angola could be brought into the Project. If this is not possible Zambia's resources should not be stretched to monitor this small front as existing staff could be deployed. Zambia does not have the resources to defend the present fly front. Botswana does not cherish the idea of a recurrent defensive project. Thus complete eradication of the Botswana/Zambia fly belt is essential.

ZAMBIAN RESOURCES

Excluding the experience and expertise at the National Headquarters, Zambia does have an established presence of tsetse trypanosomiasis control personnel in the area under discussion. This includes a Provincial Administrative Office at Mongu (154 km north of the area by road - 109 km tarred and 45 km dirt), a major tsetse field station 1000 m airstrip at Kanja (adjacent to spray block), a sub-station at Sinjembela and numerous camps from which survey patrols can radiate. Veterinary camps are situated throughout the cattle rearing areas affected by the fly. Veterinary Laboratory facilities exist in Mongu. The area has been severely disrupted by liberation wars but staff are present and fly rounds could be started in a small way at once. Much of the tsetse infrastructure (roads and camps) are in bad state of repair. If complete eradication is to be carried out only temporary accommodation will be erected for survey and other staff.

OPERATING SCHEDULE AND TECHNIQUES

The precise extent of fly distribution in Zambia is not known due to an enforced period of inactivity. Extensive surveys must be mounted to determine this. These will normally be manned fly rounds using existing staff.

Eradication of the fly will be by aerial spraying. The fixed wing sequential aerial spraying technique will be used. Both Botswana and Zambia have had considerable experience of this technique so that no retraining of any kind will be necessary.

One major difference between spraying techniques in the two countries is that Botswana fly during the night when conditions are ideal for aerial spraying. In Zambia the Department of Civil Aviation have not yet agreed to allow night flying in Zambia for aerial spraying and seem reluctant to change their attitude. Thus spraying in Zambia will normally be restricted to 1½ hours before sundown and about 1½ hours after sun rise.

The climatic conditions which normally prevail during flying periods in Zambia have not been conducive to increase the swathe width beyond 200m. Thus one aircraft can normally spray little more than 160 km² in a 24 hour period. This is often less if inversion is late to fall or rises early. One aircraft is unlikely to do more than 1000 km² in a cycle which allows pilots and aircraft an adequate rest between cycles.

Zambia's dry season normally lasts from May to mid November. Theoretically two blocks could be sprayed in a year. The cold season lasts from mid May - end July which biologically has not been found an ideal time for aerial spraying against the fly. Thus it is only likely that one block of 3000 km² (with up to 3 aircraft) will be possible in present conditions.

Follow up surveys and fly monitoring would continue. This will normally be manned fly rounds. Although vehicle mounted electric traps have been used fairly successfully in Botswana for this, Zambia has never had a vehicle or fuel to spare for constant use on such a Project.

Furthermore the sandy nature of the area severely shortens the life of land rovers. Temporary survey/monitoring camps would be established using portable metal huts.

The operating schedule would be:-

Year 1	Surveys to define fly perimeter
Year 2	Aerial spraying (3000 km ²) Post spray monitoring
Year 3	Aerial Spraying (3000 km ² inc. overlap) Post spray monitoring
Year 4	Aerial Spraying (up to 3000 km ² inc. overlap) Post spray monitoring
Year 5-7	Post spray monitoring

ESTIMATES

(Prices in Zambian Kwacha at 1st March, 1981;
K1.00 = £0.53 or US \$1.2

(N.B. Permanent staff salaries are not included).

A. Surveys (1 year)

1 Landrover diesel 109 PU	15,000 (i)
1 4 x 4 Truck " " "	45,000 (i)
2 MF 135 Tractors/Trailers	44,000 (i)
Fuel " " " " "	10,640
Survey Allowances " "	33,120
Camp Equipment " " "	5,000
Refurbish old camps " "	90,000 (ii)
	<u>242,760 (iii)</u>

NOTES:

- (i) The cost is for a new vehicle over one year. It is expected that each vehicle should have a 3 year life and be used on other duties after the initial survey.
- (ii) Destroyed and abandoned camps to be replaced by portable metal huts. These huts should have a life of at least five years.
- (iii) Assuming cost of vehicles and huts written over a longer period, cost for one year of survey should be reduced to K101,427.

B. Spraying (Maximum 9000 km²).

(Assumes dayling flying and only 1 block sprayed per year in warm season of mid August - end October).

Spraying 9000 km ² @ K120 km ²	1,080,000.00
Insecticide 40,000 lts.	
25% endosulphan @ K3.00/litre	712,800.00
Ground marking " " "	135,000.00
	<u>1,927,800.00</u>

C. Post Spray Monitoring

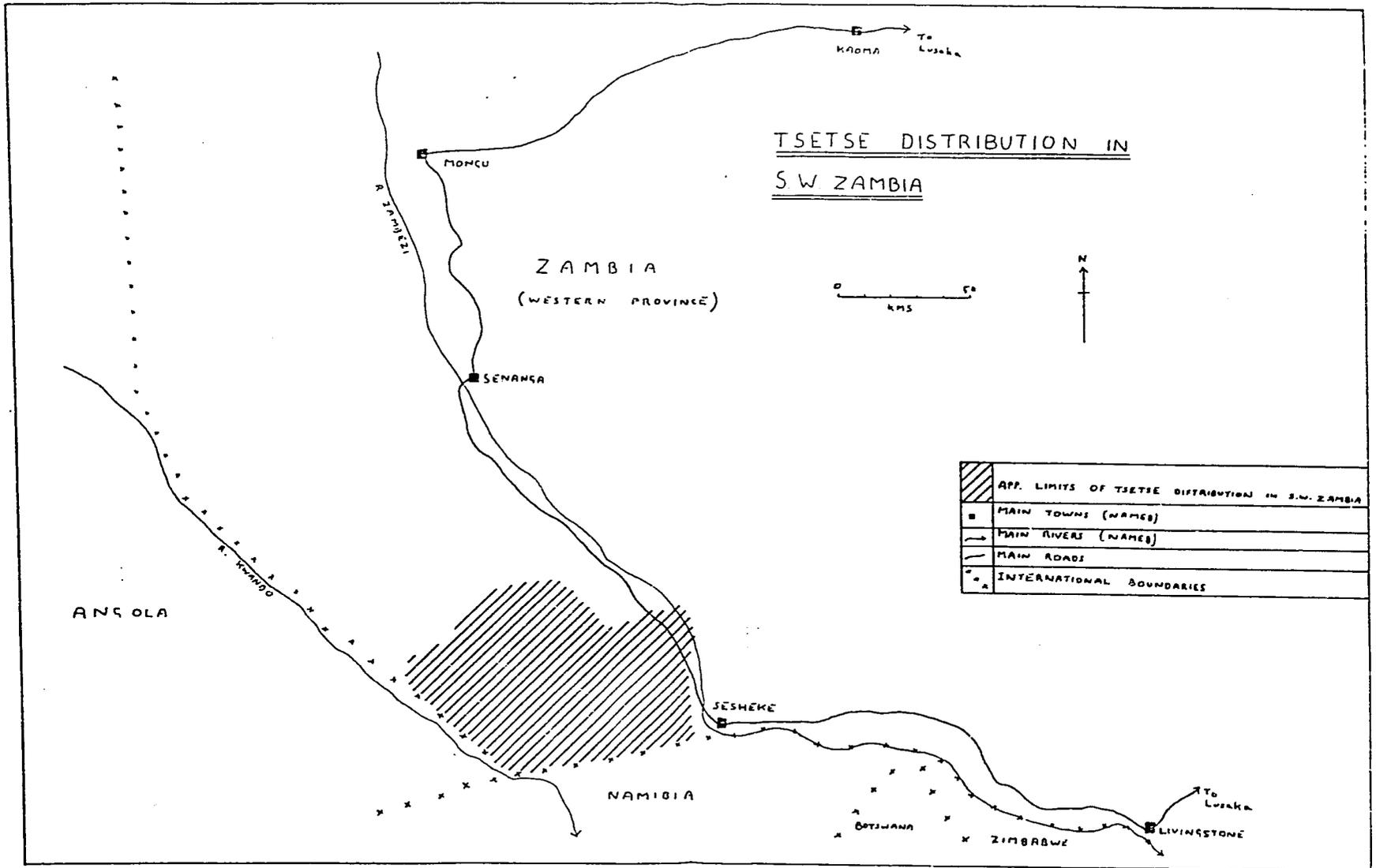
(Assuming existing staff in use)

Purchase of additional portable metal huts	25,000
1 Landrover 109 diesel/PU " " " "	15,000
Fuel (6 years) " " " " " "	70,000
	<u>110,000</u>

ENVIRONMENTAL IMPLICATIONS

An area of about 4500 km² within the spray block is a national park. The spraying of this area will cause an outcry from the environmentalists. Sufficient work has been done in Botswana to show that the spraying technique proposed will have a minimal effect on the environment other than the removal of tsetse. However, those implicated with the management of the National Park may require an additional monitoring component to be written into Project. It is felt that sufficient manpower resources are available in Zambia to do this but additional funds will be required for transport and running costs.

ADC 2



TSETSE DISTRIBUTION IN
S W ZAMBIA

ZAMBIA
(WESTERN PROVINCE)

	APP. LIMITS OF TSETSE DISTRIBUTION IN S.W. ZAMBIA
	MAIN TOWNS (NAMES)
	MAIN RIVERS (NAMES)
	MAIN ROADS
	INTERNATIONAL BOUNDARIES

3. Regional Meat Inspector Training School - Lobatse

Synopsis

This project is a sequel to the FAO/OAU Mission of May-June 1977 on the need and feasibility of establishing regional training centres for livestock production and slaughterhouse personnel in English-speaking African countries. The Mission recommended among other things the establishment of a Regional Training Centre for Meat Inspectors and Slaughterhouse Personnel in Botswana. This Centre will be built in Lobatse in the vicinity of the Botswana Meat Commission, the country's export abattoir. This Memorandum requests P 2 535 000 for the capital investment cost of the buildings. FAO/DANIDA have already pledged US\$ 3 761 000 running expenses for the first six years.

Background

Regional Need for the Centre

During the 1960s a Regional Training Centre for Meat Inspection was built in Ache River in Nairobi, Kenya which was administered by DANIDA. This was handed over to the Kenya Government in 1976 and is now used mainly as a national training centre. The Kenya Government offers a few places each year to foreign students and in the past Botswana has been able to get only two places for each of the six month courses. When DANIDA ran the centre the students took the external examination for British Public Health Inspectors which is an internationally recognised qualification for meat inspectors. Since the take-over by the Kenya Government, the students take an internal examination set by Nairobi University.

During 1977 FAO and OAU sent a Mission under the International Meat Development Scheme to study the need and feasibility of establishing regional training centres for livestock production and slaughterhouse personnel in English-speaking African countries. Their report LMDS/77/2 is available.

This Mission recommended among others:

- a regional centre for the training of meat inspectors and slaughterhouse personnel be established;
- the regional centre should be located at the Botswana Meat Commission Abattoir in Lobatse.

In October of 1978 a follow-up mission was commissioned. Their report is available. Lastly in January 1980 a further consultancy was launched, which was assigned to prepare a project document for DANIDA. The draft project memorandum is not available yet however extracts from the consultants work are.

Training of slaughterhouse personnel and meat inspectors is essential if the general hygiene and quality of work in slaughterhouses is to reach the level necessary to ensure better acceptability of meat for export and international consumption.

The present total demand for meat inspectors in the region exceeds 400 per annum and the possibilities for training in each country separately to meet its own demand do not exist. Trained slaughterhouse personnel of various categories are required for operation of approximately 30 industrial slaughterhouses in the recipient countries and for steadily increasing number of improved local slaughterhouses.

National Need for the Centre

At present there are 28 posts of meat inspectors and graders in Botswana (who require meat inspection as basic training) on the establishment at BMC, twelve of which are held by ex-patriates. This establishment will have to be increased by 1982 by at least 10 to cope with the new main abattoir, the proposed Maun cannery and the pet food factory in Lobatse. A further twenty will be required by 1984 to staff the proposed northern abattoir in Francistown. Thus, at least 42 Inspectors will be needed to fill and localise the cadre. This assumes that no one leaves the service in that time.

There are also under preparation, new meat inspection regulations to apply to local slaughtering facilities and it is estimated that at least 8 more inspectors will be needed for this service. A service which at present does not exist.

Botswana's need for this centre cannot be overemphasised. Without it, (or if it is not built soon) extensive ex-patriate recruitment will be needed to cope with commitments in the next 3-4 years.

Plan of Operation

It is proposed to build the centre at a site in Lobatse adjacent to the Botswana Meat Commission, one of the largest export abattoirs in the region. This site was chosen so that trainees could have access to the BMC for demonstration purposes on international meat inspection and grading. The centre will be built when funds are available by contract with the Dalglush and Lindsay group as architects as they have already prepared drawings for the project on the instructions of the FAO consultant.

A hostel designed to take up to 40 students, with two students per room, will be built on site. The hostel's design is such that extensions, in the future, can easily be added. Furthermore, a teaching and administrative block, comprising a simple unit, two classrooms, a laboratory and offices for teaching and administrative staff will also be built on site. An abattoir especially designed to cope both with the local requirements of the Lobatse Township to meet its own demand and requirements for a teaching facility for slaughterhouse personnel will also be constructed on site. The object of the facility is to provide a first class local abattoir to replace the present Township one, which is located within the BMC premises. It is proposed to use the normal kill from the new abattoir for teaching purposes, as well as using the BMC within the precincts of the Department of Veterinary Services Meat Inspection and Grading Floor for demonstration purposes. A house for the bursar will also be provided on site. No provision for housing is made for any other staff.

Courses to be Run

Meat Inspectors

It is proposed that two courses a year be held with about 20 participants in each course. The teaching time will be divided almost equally between lectures and practical work. This practical work will take place in BMC for which management has already given approval.

A project manager, employed by FAO, will be responsible for the operation of the Centre. A Project Steering Committee comprising Government and FAO officials will be established to provide a regular forum for discussion on the Centre's functions.

The following training course will be implemented:

- (1) regional and national courses for meat inspectors (national courses in countries where adequate facilities for practical training exist);
- (2) courses for different categories of slaughterhouse personnel, viz:
 - (a) regional course for instructors destined to be responsible for national courses in killing floor operations;
 - (b) regional course for foremen in killing floor operations;
 - (c) regional course for teams of workers from industrial slaughterhouses;
 - (d) regional course for foremen in cutting and pre-packing;
 - (e) regional course for foremen in operation and maintenance of chilling and freezing facilities;
 - (f) regional course for production managers.

Additional courses may be initiated if and when the need arises.

- (3) regional seminar on measures to improve the meat industry.

In addition the Centre will offer advice in connection with development of the meat industry and organisation of meat inspection services to the extent requested by Governments of the recipient countries.

The courses, which will be of a duration of 3-5 months, will be practice oriented.

A minimum of two courses for meat inspectors and two for slaughterhouse personnel will be held annually when the Centre becomes fully operational.

The number of participants per course will be approximately 20.

The entrance qualification for the courses on meat inspection will be a Certificate in Animal Health. A final examination leading to the Royal Society of Health Certificates in Meat Inspection will be held.

The entrance qualification for the regional courses for slaughterhouse personnel will be school certificate preferably combined with practical experience of work in a slaughterhouse.

For practical training of meat inspectors a well operated slaughterhouse with a sufficient throughput of animals is essential. The Botswana Meat Commission export abattoir fulfils this requirement.

Slaughterhouse Personnel

For training of slaughterhouse personnel a training slaughterhouse is necessary in order to avoid that training is subordinated to commercial considerations. The training slaughterhouse will be provided by the project together with buildings for students' accommodation, administration and theoretical training.

There will also be two courses a year for about 20 participants in each course.

The details of this course have not yet been finalised but this programme will be varied to provide the type of training required for each group.

An evaluation of the project should be carried out after the first two years of full operation.

Semi-annual progress reports and a terminal report will be submitted to the FAO for transmission to the donor and recipient countries.

Staff Housing

Provision is made for a small house of the grade recommended for a bursar to be built on site. Housing has not been included for the teaching staff as it is assumed that Botswana Housing Corporation houses will be available in Lobatse for them.

Costings

A. Capital Costs

The consultant architects employed by FAO for the design phase of the project costed the building and furniture at P1 500 000 at 1980 prices. Since the project is likely to begin in 1982, a cost escalation of 30% per year must be added giving P 2 535 000.

This project will therefore require P 2535 000 to build a Meat/Training Centre in Lobatse. This centre will supply training facilities for the region and any other English-speaking countries.

B. Running Costs

A detailed breakdown of the cost of running the project is available.

Economic and Social Analysis

The main purpose of this project is to improve through theoretical as well as practical training, demonstration and advice, the competence of personnel employed in the meat industry, with a view to improving meat inspection services, and slaughtering and processing techniques. Slaughtering in Africa is generally carried out under often unsatisfactory technical and hygienic conditions except in a few industrial slaughterhouses, the main constraint being the lack of trained manpower. This manpower problem will further be exacerbated by the ever increasing determined efforts by most African countries to expand livestock production, particularly of beef and mutton, either to meet the growing internal demand or to produce for export and thereby increasing needed foreign exchange earnings.

For Botswana in particular and to some extent Swaziland and perhaps Zimbabwe, proper training of meat inspectors and graders for the export abattoirs is essential so that international meat hygiene standards can be maintained if continued access to the world export markets is to be sustained. Furthermore the present situation where most of these positions are ex-patriate held should be reversed and localisation programmes pursued. This has not been possible in the past and indeed the localisation programme of this technical cadre has been slow, mainly due to the lack of training facilities. The planned expansion of the Botswana export abattoir into three units will require a further increase in the numbers of meat inspectors required, further increasing the shortfall in the supply-demand relationship. This means therefore that there will be high demands for places by Botswana for the early courses.

Relationship to Other Projects

Related projects seek to improve the economic conditions of livestock producers through control of foot and mouth disease.

(1) AG 06 - Expansion of Slaughtering and Processing Facilities

This project will provide a more certain market situation for Northern Botswana cattle producers and ease the strain of seasonally large or drought-induced supplies of slaughter cattle to the Botswana Meat Commission in Lobatse. An abattoir will be constructed in Francistown and an abattoir/canning factory in Maun.

(2) AH 01 - Foot and Mouth Disease Vaccine Production

This project provides funds for the construction of a foot and mouth disease vaccine production factory and will produce high quality vaccine for Botswana and other African countries.

(3) AH 02 - Foot and Mouth Disease Control

Supplementary funds are provided to control foot and mouth disease such as buying vaccine, provision of pickets at quarantine camps, emergency fence repairs and transport for veterinary services.

(4) AH 07 - Improvement to Quarantine Camps

Most work involves increasing the carrying capacity, housing and sanitation facilities.

(5) AH 12 - Improvement of Disease Control

This project largely involves construction, improvement and smallstock proofing and cordon fences.

6. AH 04 - Veterinary Cordon Fences

Phase I involved the construction of cordon fences along the Zimbabwe Botswana border from Vakaranga to Basuto and a 90km section between Sherwood Ranch and Palapye. Phase II will include the construction of a buffalo fence running from east of Gomare, around the perimeter of the Okavango delta and on across Northern Botswana to Basuto near the Zimbabwe border. A double cordon fence will be constructed along the border from Basuto to Vakaranga. There will also be construction of additional cordon fences to increase the number of foot and mouth buffer zones.

7. AH 09 - Botswana Veterinary Diagnostic Laboratory

The project will improve the animal disease diagnostic capacity by providing funds for the construction and equipping of a modern veterinary laboratory in the country.

ADC 3

4. Establishment of a Zoonosis Centre in Zambia

BACKGROUND & JUSTIFICATION

Definition

Zoonoses have been defined by a WHO expert panel as:- those diseases and infections which are naturally transmitted between various vertebrate hosts and men. As a group, they have been categorised into:-

- (a) direct zoonoses, transmitted directly from animal to man or vice versa as, for example, rabies, anthrax, tuberculosis, salmonellosis;
- (b) cyclozoonoses, requiring more than one vertebrate host to complete the developmental cycle needed for transmission, for example, hydatidosis, trypanosomiasis, Q-Fever; and
- (c) saprozoonoses which require both invertebrate and vertebrate hosts in the process of transmission, for example, botulism.

All these situations apply to varying degrees in the general Africa region and the ultimate understanding of the exact magnitude has obvious contributions to the attainment of "Health for all by the year 2000".

It can be noted that the definition does not cover "infestations" that do not necessarily result in classical disease. These include bites by "clean" ectoparasites - which may result into mild or severe irritation such as those caused by tick, flea, or wild animal bites. These agents are commonly harboured by various domestic or wild animals and are responsible for indirect or direct transmission of many important zoonoses or anthroozoonoses. Bites per se are a nuisance which could have a socioeconomic effect, and may predispose to secondary infections.

Actual and Potential Significance of Zoonoses in the SADCC Region

Characteristic of most developing countries in general, and the Africa region in particular, the SADCC community is highly dependent on its rural economy. This means reliance on domestic and wild animal resources, partly as a source of food and, to a greater extent, as a source of draft power, social status and security. These

animals are a real or potential reservoir of infections which impose a particularly serious burden of ill health on the vast majority of people who live in rural areas and earn their livelihood through animal farming and other forms of agriculture. It is estimated in some countries that this high-risk group comprises up to 90% of the population. A major complicating factor is that the close animal-man association in Africa occurs in populations often living under unhygienic living conditions.

A major target of zoonoses is children in whom protein calorie malnutrition is exacerbated along with the associated increased susceptibility to various viral, bacterial and mycotic infections. Further, the impact on the source of already scarce animal protein through affecting food producing animals - cannot be over-emphasized. This dual significance of zoonoses requires particular attention in the SADCC region. Serious losses, in millions of U.S. dollars worth of high quality protein, occur through rejection of meat, fish, poultry and other animal products on aesthetic or other grounds. This situation interferes with the prospects of food exports as potential alternative sources of foreign exchange.

Self-reliance in agricultural production in the various SADCC member states had been given major priority. Even where the economy has relied mostly on the mining industry, countries have chosen to intensify agricultural production.

In order to maximally benefit from these efforts, zoonoses like hydatidosis, cysticercosis, brucellosis, trichinellosis and a host of other documented infections or potential zoonoses in the Africa region must be controlled, and hopefully, ultimately, eradicated.

The trapping of wildlife for human consumption is common in Africa. This raises the question of real or potential zoonotic parasites among the rural population, forest workers, pastoralists and many others.

The dependency of urban populations on the rural economy means that invariably city dwellers are equally affected by the rural health situation, particularly under epidemic conditions. Recently an expert panel recognised the paucity of detailed data on the true importance of zoonoses on a world-wide country-by-country basis. Until such a systematic study is accomplished, concrete assessment of the impact of zoonoses on animal and human health is not possible. This is entirely in line with the decision of SADCC countries to establish a zoonoses centre which would, among other things, generate base-line data to be used for determining the most cost-effective approach of controlling these human diseases which are best controlled through a joint medico-veterinary effort by first controlling the disease in the primary animal host.

The Complexity of Zoonoses

The multifactorial nature of the causes of prevalence of zoonoses means that a multi-disciplinary approach to their control be adopted to consider:-

The Ecology: This influences human - animal - vector interaction and, therefore, underlies direct and indirect transmission of disease in either direction. Modifications of the ecosystem through industrial and other technological developments invariably has an impact on the trend of zoonoses - both old and newly emerging ones. Human activities, for example, dam construction and irrigation schemes (Lake Kabora-Bassa and Kariba) may increase the danger of parasite related zoonoses e.g. Schistosomiasis which is endemic in the SADCC region. Foci of trichinellosis and toxoplasmosis emerge when wild animals are preserved under semidomestic environments of following clearing of forest for human settlement. Epidemiologists and ecologists must work hand in hand in order to control situations like this.

Effect of Human Settlement

The changing fauna in urban areas can be divided into:-

- (a) companion animals
- (b) synanthropic animals
- (c) food producing animals
- (d) wild and semi-wild animals.

Category (c) and (d) particularly apply to SADCC countries.

Human Behaviour and Food Habits

In one community in East Africa, with many similarities to the SADCC environment, it has been demonstrated that the prevalence of Hydatidosis is influenced by human behavioural patterns which increase the risks of infection by zoonoses. In that community, dead humans are exposed to hyenas and dogs which perpetuate the transmission cycle. Examples from other parts of Africa show that animal excreta are incorporated into various remedies and, as such, promote transmission of animals diseases to man.

Consumption of raw milk, or partially cooked or preserved meat, is a common practice in Africa, including the SADCC region. Similarly, consumption of meat from cattle or animals that die on their own is widely practised. These practises expose the population to direct zoonoses such as tuberculosis, anthrax, trichinosis, cysticercosis. Further, raw milk, some of which is drunk directly from the cow or goat, gives rise to diseases like brucellosis, Q-Fever, tuberculosis and diarrhoeal diseases.

Tourism is a major foreign exchange source in the SADCC region. The creation of tourist and recreation resorts also modifies the transmission pattern of many diseases e.g. trypanosomiasis and various helminth infections, malaria and food borne diseases. Thus, there is need for improved methodology to cope with disease problems resulting from such an expanded tourist programme.

Environmental Pollution

Under this category are aspects of sewage disposal, soil pollution by large establishments of animal breeding centres and animal waste and improper carcass disposal.

O B J E C T I V E S

The objective of the Centre will be as follows:-

- (i) initially, take stock of the veterinary public health problems of the SADCC region;
- (ii) formulate SADCC public health programmes for the control of zoonoses in the region;
- (iii) carry out field surveys and coordinate comparative studies of epidemic (a) non-infectious diseases of animals in which there may be environmental or other influences common to man and animals: (b) infectious diseases readily transmissible to man;
- (iv) carry out and coordinate studies of public health related problems of other animal industries including the safe disposal of animal waste;
- (v) carry out coordinated studies on public health aspects of production, processing and marketing of foods of animal origin;
- (vi) determine the dangers to man of biting, toxic, verminous and other dangerous animal products and propose methods of controlling them;
- (vii) act as a SADCC reference centre for zoonoses occurring in the region. This would entail the identification of zoonotic pathogens which are currently being sent outside the region for identification;
- (viii) act as a standards institute for biological preparations manufactured in the region. Under this function, the institute would screen regionally produced vaccines like rabies, Brucella and other vaccines that would be produced in the SADCC region in future in order to ensure that such preparations conform to the required standards and norms;

- (ix) monitor veterinary public health programmes by carrying out field antibody profile assessments needed in the vaccination programmes like the one being planned for the eradication of rabies in the region; and
- (x) act as a centre where students in the field of veterinary public health can specialise in the field of diagnosis and control of zoonoses of regional concern.

Zambia as a Host of the SADCC Centre for Zoonosis

The complexity of the zoonosis problem as summarised above requires that, in choosing the site of a Zoonosis Centre, logistical (strategic) and scientific considerations override in order to launch the tackling of the zoonotic problem in the SADCC region as soon and as effectively as possible.

Historical Background

In 1974, the World Health Assembly recommended the creation of multidisciplinary centres for biomedical research and training. In agreement with the Zambian Government, the World Health Organisation selected Ndola as the site for the first of such centres to serve the Africa region. Thus, the Tropical Disease Research Centre was created in 1975 and has been funded by the UNDP/WORLD BANK/WHO Special Programme for Research and Training in Tropical Diseases since 1976. The Centre has since expanded into an international institution maintaining its financial and technical support through the original donors and the Government of the Republic of Zambia. Such a set-up forms a nucleus for the establishment of SADCC Centre for Zoonoses.

Location of the Centre

Fig 1 shows the Location of the centre in relation to the major relevant research and teaching institutions; and in the context of the SADCC member states. The Zambian institutions and ministries are mainly located in the Lusaka area. By virtue of the multidisciplinary nature of the TDRC objectives, the centre has already established links with The National Council for Scientific Research, the University of Zambia, the Directorate of Veterinary and Tsetse Control and the Ministry of Health. These links would form the international backbone and wide medium of communication and collaboration in various fields of

specialization within Zambia and throughout the counterpart institutions and ministries in the entire SADC region.

E S T I M A T E SCapital OutlayHousing

Due to the nonavailability of housing, it is estimated that 6 senior staff and 10 junior staff houses will be required. The average cost of the senior staff houses is 50,000 US Dollars each and 20,000 US Dollars each for the junior staff houses.

Laboratories

Laboratories, animal houses, quarantine works and administration block is estimated at a total of 8,333 M² at 300 US Dollars per M².

Civil Works

Civil works will comprise of main civil engineering consultancies, drawings, site preparations and the laying down of infrastructure like roads, electricity and water supply.

Equipment

Laboratory equipment will entail purchasing the required equipment which is expected to cost 1,500,000 US Dollars.

Transport

Six vehicles, including one heavy duty lorry, will be required. The utility vehicles are expected to cost 20,000 US Dollars each while the lorry is expected to cost 50,000 US Dollars.

Recurrent Costs

Salaries

The salaries are estimated at 15,000 US Dollars each per year for the 10 senior staff and 7,000 US Dollars each per year for the 15 juniors and technical staff. Allowances, e.g. outfit allowances, housing allowances for the unhoused staff, and consultancies is estimated at 145,000 US Dollars, giving a total of 400,000 US Dollars.

SADCC ZOOONOSIS CENTRE - ESTIMATED COST U.S. DOLLARSESTIMATED CAPITAL COST

Housing	500,000.00
Laboratories, animal house quarantine, workshops and administration	2,500,000.00
Civil work + standby generator	200,000.00
	<u>3,200,000.00</u>
Add 10% contingencies	320,000.00
Sub Total	<u>3,520,000.00</u>
Equipment/Furniture	1,500,000.00
Transport	150,000.00
GRAND TOTAL	<u>5,170,000.00</u>

ESTIMATED RECURRENT COSTS

Salaries/Allowances Consultancies	400,000.00
Chemicals, Reagents etc.	50,000.00
Fuel and Lubricants (6 vehicles)	30,000.00
Workshops	20,000.00
Service Charges	10,000.00
Insurance	600,000.00
Travelling on duty	12,000.00
Administration + Library Expenses	35,000.00
First year total	<u>1,157,000.00</u>

ADC 4

	Rabies	SWINE Erysipelas	Glanders	Q Fever	Rift Valley Fever	Leptospirosis	toxoplasmosis
Tanzania	+			?	?	?	?
Malawi	+	+		?	?	?	?
Zambia	+			?	+	?	?
Mozambique	+			?	+	?	?
Angola	+			?	?	?	?
Zimbabwe	+	+		?	+	?	?
Botswana	+	+		?	?	?	?
Lesotho	+	+		?	?	?	?
Swaziland	+	+		?	?	?	?
Namibia	+	+		?	?	?	?

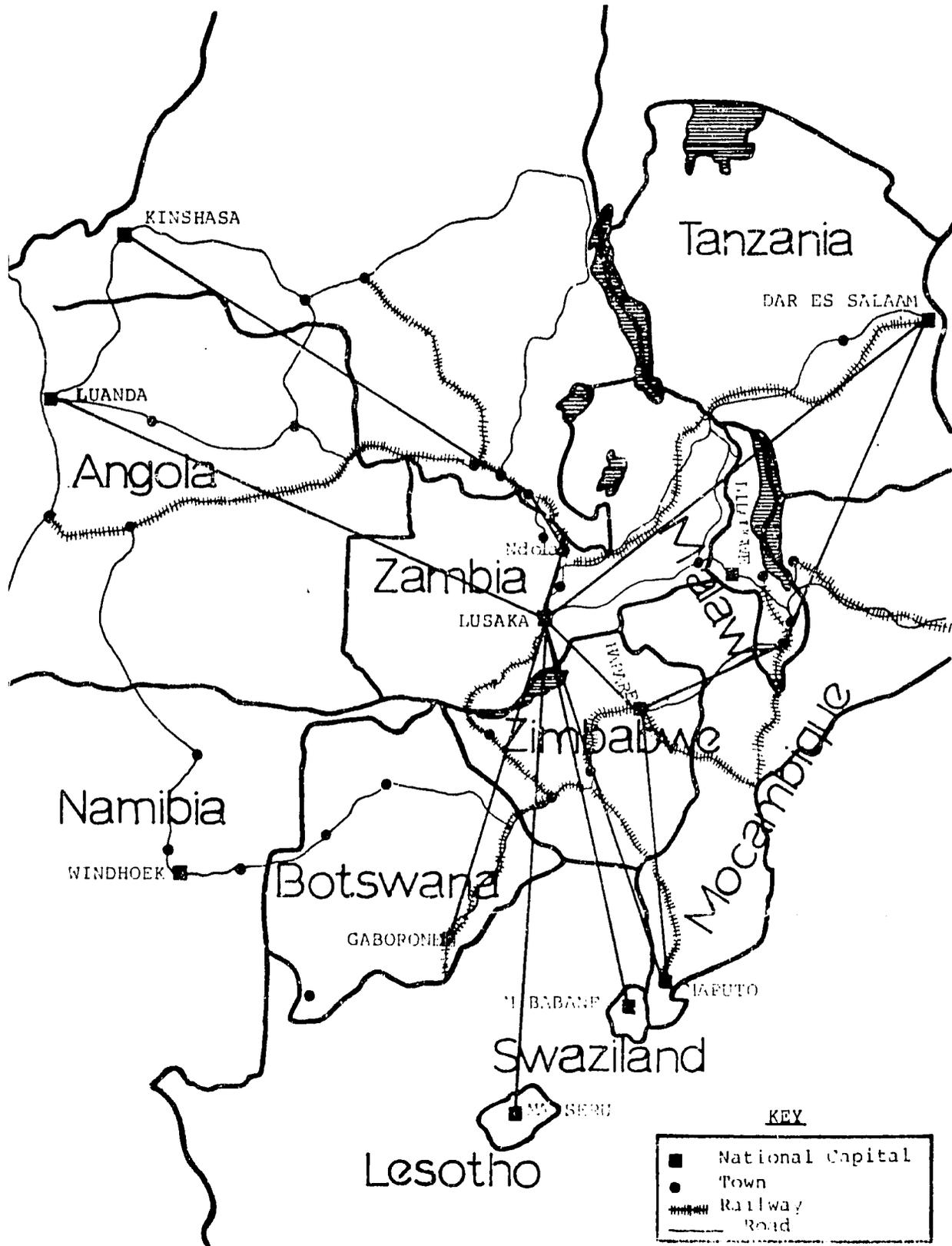
Key ? = Likely but not documented: some unpublished clinical evidence in animals

+ = Documented.

	Psittacosis	Ornithosis	Anthrax	Botulism	Salmonellosis	Tuberculosis	Actinomycosis
Tanzania	?	?	+	?	?	+	+
Malawi	?	?	+	?	?	+	?
Zambia	?	?	+	+	+	+	+
Mozambique	?	?	+	+	+	+	+
Angola	?	?	+	+	+	+	+
Zimbabwe	?	?	+	+	+	+	+
Botswana	?	?	+	+	+	?	+
Lesotho	?	?	+	?	?	?	+
Swaziland	?	?	+	+	+	+	+
Namibia	?	?	+	+	+	?	+

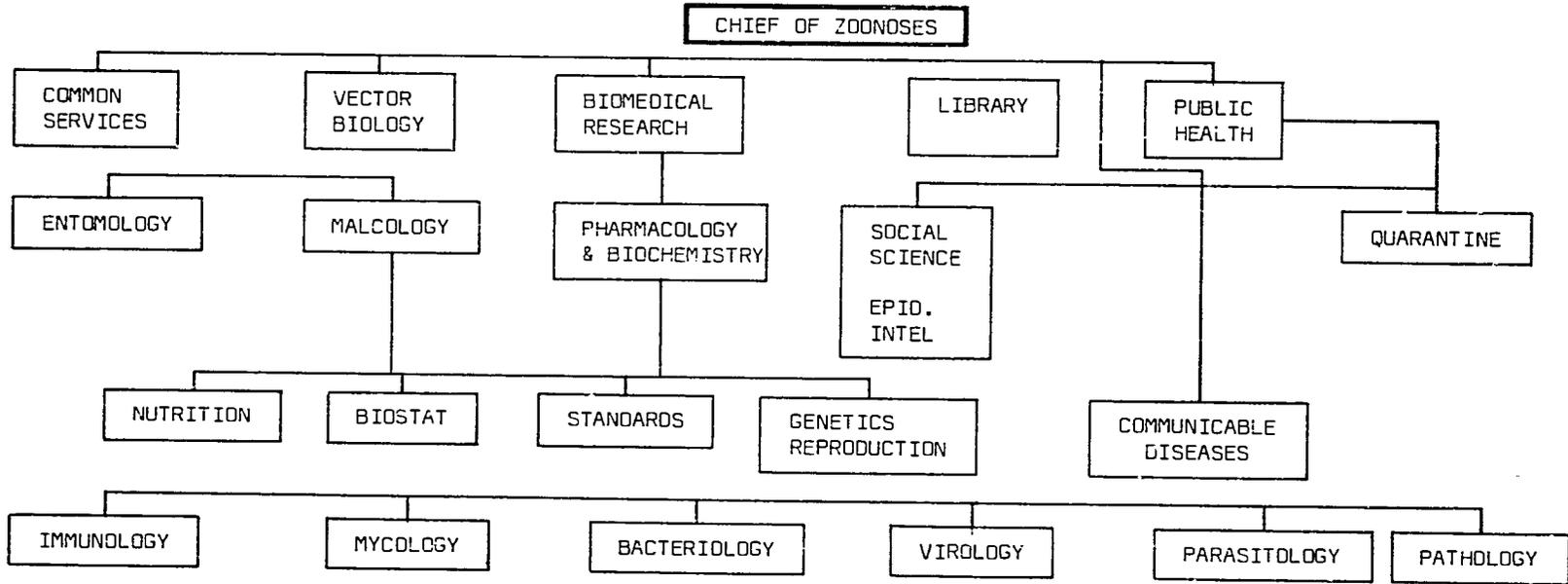
	Brucellosis	Trypanosomiasis	Cysticercosis	Hydatidosis	Trichinosis	Ascariasis
Tanzania	+	+	+	+	+	+
Malawi	+	+	+	+	+	+
Zambia	+	+	+	+	+	+
Mozambique	+	?	+	+	+	+
Angola	+	?	+	+	+	+
Zimbabwe	+	+	+	+	+	+
Botswana	+	?	+	+	+	+
Lesotho	+	?	+	+	+	+
Swaziland	+	?	+	+	+	+
Namibia	+	?	+	+	+	+

Strategic location of Zambia for a SADCC Zoonosis Centre



Appendix 3:

SCIENTIFIC STAFF* & LABORATORY ORGANISATION



*ADMINISTRATION ABSORBED IN TDRC

5. Regional Programme for East Coast Fever Immunisation

Responsible country:- Malawi
 Duration:- approximately 5½ years
 Financial summary:-

Category	1983/84	84/85	85/86	86/87	87/88	88/89	Total
	-----US\$ ('000)-----						
Buildings & Construction	12.0	2853.3	600.0	-	-	-	3465.3
Vehicles	-	46.6	33.6	-	-	-	80.2
Equipment	25.0	186.0	231.0	40.0	-	-	482.0
Salaries & Wages	19.2	276.9	276.9	276.9	291.0	291.0	1431.9
Other Operating costs	59.8	410.8	638.6	460.6	366.1	307.6	2243.5
Total Base Cost	116.0	3773.6	1780.1	777.5	651.1	598.6	7702.8
<u>Contingencies</u>							
Physical (5% simple)	5.8	188.7	89.0	38.9	32.9	29.9	385.2
Price (15% compound)	18.3	1267.9	971.9	612.3	690.0	823.3	4383.7
Total Contingencies	24.1	1456.6	1060.9	651.2	722.9	853.2	4768.9
Total Costs	140.1	5230.2	2841.0	1428.7	1380.0	1451.8	12471.8

Background

East Coast Fever, caused by T. parva, is at present the most important disease which inhibits livestock development programmes in large parts of East and Central Africa. A method of immunisation ("infection and treatment") has been developed by the FAO/UNDP project RAF/67/077 at EAVRO, Muguga, Kenya and has been successfully tested in a large-scale field trial at Pugu in Tanzania.

The regional project was terminated in December 1976 having achieved its objective with the success of the large-scale ECF immunisation field at Pugu, Tanzania in collaboration with URT/72/009. Other projects concerned with ticks and tick-borne diseases in the region have come to rely on RAF/67/077 for expertise and materials (stabilates) for immunisation against ECF. In fact certain projects have been planned with the expectation of continuing supplies of such materials for immunisation against ECF.

Malawi, through the DANIDA project "Bilateral Central Veterinary Laboratory" which supported the Central Veterinary Laboratory and the FAO/TCP project 6/MLW/01/T, has already received support to establish a programme to control East Coast Fever through the development of the infection and treatment method of immunisation carried out at Muguga in Kenya; to date three strains have been isolated and cross immunity trials are in progress.

It is obvious that these efforts in many countries which are supported by international and bilateral projects, must not be prejudiced by withdrawal of the expertise and other support which was provided by RAF/67/077. It was proposed, therefore, that a regional project be set up in Malawi which would meet support for field implementation of East Coast Fever immunisation.

The regional project is suggested because the setting up of several national projects to prepare, test and distribute stabilates for ECF immunisation would involve unnecessary duplication of effort and expense.

However, before a regional project for ECF immunisation could be brought to fruition, much preliminary work, viz: isolation, purification, bulk preparation of stabilates (national and Muguga cocktail strains), purchase of equipment, provision of laboratory and animal accommodation and cross immunity trials, need to be carried out in one country, in this case, Malawi. Further the contractual and financial arrangements for a regional project require much time and effort. For these reasons and recognising that the work of the first 3 years had to be aimed primarily at Malawi's requirements for ECF immunisation, the project GCP/MLW/018/DEN to end in 1983 was written as a national project with limited provisions for regional inputs.

Malawi, with a land area of some 94 276 km², supports a population of approximately 6.2 million, giving the relatively high average density of 63.1 head per square kilometre. The economy is based mainly on the agricultural output of 885 000 smallholdings with an average size of 1.2 ha producing subsistence food crops of maize, rice, cassava, pulses and vegetables and cash crops of tobacco, groundnuts, cotton, maize, rice and other minor crops such as wheat, coffee and tea. The GNP in 1980 was estimated at US\$250 per capita.

The cattle industry is based on a national herd of 900 000 head, 96.5 percent of which are indigenous short-horned Zebu cattle kept under traditional systems of management in the villages. In addition to the indigenous cattle, there are about 1.200 dairy cows (mainly $\frac{1}{2}$ breed Friesian x Zebu) on smallholdings in the milk shed areas surrounding Blantyre and Lilongwe; their average production is 400 gallons per lactation. There are also at least 1 100 high grade dairy cows on estates near Blantyre.

One of the major constraints to the continued expansion of beef and milk production is the incidence of tick-borne diseases, the most serious of which is East Coast Fever. These diseases not only cause mortality but also lower productivity. It is estimated that the annual mortality amongst village herds is about 15 percent. Laboratory records have indicated that, between 1973 and 1976 30 percent of this mortality was due to East Coast Fever and that this increased to 40 percent in the early months of 1977. The country is therefore losing, from East Coast Fever alone, some 39 000 animals per year, equivalent to 6 100 tons of edible meat and sufficient to raise the per capita consumption by 2.7 lbs per annum.

Although tick-borne disease are enzootic throughout the country, East Coast Fever appears to be concentrated in the Central and Northern Regions. However, the vector tick, *R. appendiculatus*, is known to be present in the Southern Region and the introduction of this disease into an area populated by 230 000 head of fully susceptible cattle is a constant and essentially dangerous threat.

The other countries of the region, Tanzania, Zambia and Mozambique, have larger cattle populations than Malawi and most of which are in ECF enzootic areas. As the losses from ECF are more or less similar from country to country, and all countries rate this disease as the most important constraint to development of their cattle industries, total losses can be roughly estimated to be more or less (1.3 million) based on the Malawi figures. (ECF is also present in Zaire and Angola but the number of cattle exposed is not known.) When upgrading with exotic blood is undertaken higher losses are encountered and the economic importance of the disease is even greater.

It should be recognised that in East Africa the primary reason for control of ticks by dipping or spraying is to control the vector of ECF, Rhipicephalus appendiculatus to such an extent that the transmission of this disease becomes impossible. To achieve this, cattle in some regions have to be dipped as frequently as twice per week and not less than once in other regions. This is an expensive and tedious undertaking which if not done perfectly may even make the situation more serious, e.g. the incidence of ECF may be increased, persistent populations of acaricide resistant ticks may be established and discredit of dipping in the eyes of the cattle owners may occur. The introduction of an ECF immunisation procedure would in the first instance give protection to improved stock and when applied on a larger scale to indigenous cattle reduce the dependence on expensive dipping programmes.

As part of the background to this project it should be pointed out that OAU/STRC passed a resolution in September 1976 which recommended the establishment of regional centres in Africa for training and applied research on ticks and tick-borne diseases. These centres would cover aspects of tick control (dip management, acaricide chemistry, acaricide resistance testing, etc) and tick-borne disease control (epizootiology, immunisation of ECF, heartwater, babesiosis, etc). The OAU, with the collaboration of FAO, identified the Central Veterinary Laboratory, Lilongwe, as their centre for East and Central Africa.

With this background in mind a project proposal was developed by the Ministry of Agriculture in Malawi and official representatives of FAO and DANIDA, with the object of initiating a programme for ECF immunisation. This programme supplied materials and expertise to carry out the necessary cross immunity trials, (e.g. cocktail immunes have been challenged with 3 of 4 Malawi strains and vice-versa) to establish the infection and treatment method for immunisation against ECF in Malawi and, according to demand and financing, a limited input to other countries is expected. As far as possible and professionally acceptable the mixture of stabilates produced in East Africa known as the "Muguga cocktail" or components thereof are being used for the initial cross immunity trials at the Central Veterinary Laboratory in Lilongwe, Malawi. In this way it is hoped to avoid costly and time consuming work on the preparation of new "cocktails" for each of the participating countries.

Finally, it is hoped that the centre proposed by OAU/STRC for tick and tick-borne diseases will grow naturally from this project. (See Project ADC 6)

Objectives

The Ministry of Agriculture in Malawi has formulated this project and attaches high priority to it.

(a) Long-term objectives

To control East Coast Fever in countries of East and Central Africa by immunisation of susceptible stock and thereby accelerate the improvement of the livestock industries. A foundation for a regional centre for tick and tick-borne diseases will be laid at the same time.

(b) Short-term objectives

- (i) To produce cryopreserved bulk stabilates of the appropriate strains of Theileria for use in immunising cattle against ECF.
- (ii) Based on findings in Malawi under a previous project funded by the Danish Government:
 - apply the correct dose of each stabilate;
 - continue assessment of the efficacy of long acting tetracyclines;
 - apply the established methods of transportation of materials under field conditions and continue to improve them;
- (iii) Utilise the most appropriate combination of strains for immunisation of cattle as to be established by a Danish funded project in Malawi by the infection and treatment method.
- (iv) Carry out field trials in the region to test the selected combination of strains before field application.
- (v) If tick-borne diseases other than ECF such as heartwater babesiosis or anaplasmosis are shown to cause mortality in ECF immunised cattle in the field challenge experiments, consider the possibility of applying existing methods of immunisation against these diseases.

Related Projects

This project will continue and expand work on ECF initiated by the previous bilateral project in Malawi and assisted by an FAO/TCP project on disease control.

Further the introduction of effective ECF immunisation of cattle will have direct relevant to several multilateral and bilateral aid projects in Malawi in the livestock sector. These include:

- (a) Beef development programmes
- (b) Disease control - the project supports, among other things, dip tank construction and renovation

- (c) Dairy development programme
- (d) Livestock investments in Malawi by the National Rural Development Programme (NRDP) especially in areas of disease control.

On a regional basis the project will assist and support activities of national projects in several countries of SADCC where ECF is enzootic.

Work Plan

The project headquarters would be located in Lilongwe. The following work plan is envisaged and in some cases the work is continuous.

1983/84

- Project becomes effective
- Recruit Project Manager, Assistant Project Manager and also the Senior Protozoologist and Veterinary Research Officer. These to be in post for about 3 man/months each
- Order drugs, acaricides etc

1984/85

- Procurement of vehicles and farm equipment
- Some vehicles to be produced in 1985/86
- Erect buildings and staff houses and other construction
- Order supplies, furniture & equipment
- Install ordered equipment
- All staff at Project headquarters in post
- Construction of yards
- In-service training & overseas training of Veterinary Research Officers

+ Work on:

- Producing bulk stabilates cocktail components and titrate bulk stabilates, chemoprophylaxis cocktail components, isolate regional strain of T. Parva, cross immunity trials
- Produce intermediate stabilates & regional strains
- Isolate regional strains of T. Parva (in existing tick-proof pens)
- Selection and purchase of cattle for cross immunity trials
- Immunisation of groups of susceptible cattle against cocktail strains or regional strains of T. Parva
- Cross immunity trials - assess the results and determine immunisation procedure to be followed in the region. The Ministry of Agriculture, officials of the region and donor to review progress of work

1985/86

- Initial Field Challenge Trials immunised by the method chosen for the region
- Progress reports
- Construction work

1988/89

- Project ends - however, in 1987/88 the project to be reviewed, terminal reports to be prepared and the need judged for a second project phase

Personnel

The following key posts would be required on technical assistance (TA) from the donor:

- (a) Project Manager - a veterinarian with wide experience of East Coast Fever (ECF) and research administration. Responsible for the overall execution of the project.
- (b) Assistant Project Manager - a veterinarian with working experience and knowledge of the immunisation against ECF. He would deputise the Project Manager.
- (c) Senior Protozoologist - technically to be responsible for carrying out all the activities in the work plan concerned with handling of strains of T. Parva, identification, stabilate production etc. He would be aided by:
- (d) Protozoologist - would also assist in training.

6. Tick & Tick-borne Disease Centre - Malawi

- Estimated Costs:- see page 142
- Planning Duration:- 6 months plus two preparatory months when the Project Manager and his assistant are at post
- Financial Details:- see page 142
- Background & Purpose:- see background paper for Project 5 - Regional Programme for East Coast Fever Immunisation
- Description & Work Plan:- see page 147
- Supporting material for Work Plan:- see page 151

Assumptions:-

- (a) New 1,000 acres site
- (b) Continuation of existing National Project GCP/MLW/018/DEN - lines of research
- (c) New laboratories and new facilities
- (d) Field laboratories to be attached to existing national diagnostic Central Veterinary Laboratories
- (e) Eventually the centre should develop into a tick and tick-borne diseases centre for the region

Reporting:-

Progress of the project will be reported to the participating Governments and to the donor as detailed on page 150.

The Governments involved shall agree to the dissemination of information such as descriptions of the project and its objectives and results, for the purpose of educating public opinion.

DONOR CONTRIBUTION

COUNTRY:- MALAWI

PROJECT TITLE:- TICK & TICK-BORNE DISEASE CENTRE

CODE	m/m	TOTALS	m/m	1983	m/m	1984	m/m	1985	m/m	1986	m/m	1987	m/m	1988
10. PROJECT PERSONNEL (a) (HQ)														
01. Project Manager (D1)	62	320,200	2	10,200	12	62,000	12	62,000	12	62,000	12	62,000	12	62,000
02. Asst. Project Manager (P5)	62	279,000	2	9,000	12	54,000	12	54,000	12	54,000	12	54,000	12	54,000
03. Sen. Protozoologist (P5)	60	270,000	-	-	12	54,000	12	54,000	12	54,000	12	54,000	12	54,000
04. Protozoologist (P4)	60	237,000	-	-	12	47,400	12	47,400	12	47,400	12	47,400	12	47,400
05. Vet. Research Officer (P5)	60	237,000	-	-	12	47,400	12	47,400	12	47,400	12	47,400	12	47,400
06. (6) Vet Res. Officer (P2)	360	960,000	-	-	72	192,000	72	192,000	72	192,000	72	192,000	72	192,000
07. (3) Sen. Lab. Tech.(Trainee)(P3)	180	630,000	-	-	36	126,000	36	126,000	36	126,000	36	126,000	36	126,000
08. Farm Manager (P3)	60	210,000	-	-	12	42,000	12	42,000	12	42,000	12	42,000	12	42,000
09. (6) Technical Assistants (G6)	360	108,000	-	-	72	21,600	72	21,600	72	21,600	72	21,600	72	21,600
10. Admin. Officer (P1)	60	160,000	-	-	12	32,000	12	32,000	12	32,000	12	32,000	12	32,000
11. Asst. Admin. Officer (G5)	60	20,000	-	-	12	4,000	12	4,000	12	4,000	12	4,000	12	4,000
12. (2) Stenographers (G4)	120	30,000	-	-	24	6,000	24	6,000	24	6,000	24	6,000	24	6,000
13. Typist (G2)	60	7,500	-	-	12	1,500	12	1,500	12	1,500	12	1,500	12	1,500
14. Messenger	60	3,000	-	-	12	600	12	600	12	600	12	600	12	600
15. (2) Cleaners	120	3,000	-	-	24	600	24	600	24	600	24	600	24	600
16. (12) Animal Attendants	720	18,000	-	-	144	3,600	144	3,600	144	3,600	144	3,600	144	3,600
17. (7) Drivers	420	52,500	-	-	84	10,500	84	10,500	84	10,500	84	10,500	84	10,500
18. (20) Labourers	1200	30,000	-	-	240	6,000	240	6,000	240	6,000	240	6,000	240	6,000
19. Casual Labour	-	30,000	-	-	-	6,000	-	6,000	-	6,000	-	6,000	-	6,000
SUB TOTAL		3,605,200		19,200		717,200								
(Field Laboratories)														
21. Laboratory Assistants	216	194,400	-	-	-	-	-	-	72	64,800	72	64,800	72	64,800
22. 6 Typists	216	27,000	-	-	-	-	-	-	72	9,000	72	9,000	72	9,000
23. (6) Messengers/Cleaners	216	10,800	-	-	-	-	-	-	72	3,600	72	3,600	72	3,600
24. (6) Drivers	216	27,000	-	-	-	-	-	-	72	9,000	72	9,000	72	9,000
SUB TOTAL		259,200		-		-		-		86,400		86,400		86,400
COMPONENT TOTAL		3,864,400		19,200		717,200		717,200		803,600		803,600		803,600

N.B. The 6 V.R.O. (Trainee) will be attached to Headquarters.

CODE	m/m Total	m/m 1983	m/m 1984	m/m 1985	m/m 1986	m/m 1987	m/m 1988
20. OFFICIAL DUTY							
TRAVEL							
Component Total	95,000	5,000	20,000	20,000	25,000	15,000	10,000
30. CONTRACTED SERVICES							
01. Reports	30,000		1,000	10,000	1,000	5,000	13,000
02. Review Mission	48,000		-	-	-	48,000	-
COMPONENT TOTAL	78,000		1,000	10,000	1,000	53,000	13,000
40. GENERAL OPERATING EXPENSES							
01. Maintenance	341,000	1,000	60,000	80,000	80,000	80,000	40,000
02. Miscellaneous	173,000	3,000	30,000	32,000	34,000	36,000	38,000
03. Hospitality	4,000		1,000	500	500	1,500	500
	518,000	4,000	91,000	112,500	114,500	117,500	78,500

CODE	m/m Total	m/m 1983	m/m 1984	m/m 1985	m/m 1986	m/m 1987	m/m 1988
50. SUPPLIES AND MATERIALS							
01. Vehicles Operation & Maintenance	180,000	5,000	25,000	30,000	35,000	40,000	45,000
02. Office Equipment & Furniture	50,000	20,000	20,000	10,000	-	-	-
03. Services and Utilities (Water, electricity, gas, stationery, telephone, etc.)	91,500	5,000	10,000	15,000	20,000	20,500	21,000
04. Transport, Customs Clearance, Insurance	24,000	2,000	4,400	4,400	4,400	4,400	4,400
05. Revolving Fund for Cattle Purchase	300,000	-	120,000	180,000	-	-	-
06. Grazing 1,000 Acres at \$150/ Acre	150,000	-	60,000	30,000	30,000	30,000	-
07. Supplementary Cattle Feed-Hay and Concentrates	640,000	-	80,000	180,000	180,000	120,000	80,000
08. Reagents	100,500	500	20,000	20,000	20,000	20,000	20,000
09. Acaricides	25,000	500	5,000	5,000	5,000	5,000	4,500
10. Antibiotics and Drugs	50,000	1,000	9,500	12,500	12,500	10,000	4,500
11. Liquid Nitrogen	145,000	10,000	20,000	25,000	30,000	30,000	30,000
COMPONENT TOTAL	1,756,000	44,000	373,900	511,900	336,900	219,900	209,400

CODE	TOTAL \$	1983	1984	1985	1986	1987	1988
60. EQUIPMENT							
01. Office Equipment	45,000	-	20,000	15,000	10,000	-	-
02. Vehicles	226,000	-	136,000	90,000	-	-	-
03. Tick Rooms and Tick Building	20,000	-	20,000	-	-	-	-
04. Liquid Nitrogen Containers	16,000	-	10,000	6,000	-	-	-
05. Microscopes	172,000	-	22,000	150,000	-	-	-
06. Spray Race & Weigh Scales	24,000	-	20,000	4,000	-	-	-
07. Freezer & Refrigerators	60,000	15,000	15,000	15,000	15,000	5,000	-
08. Laboratory Equipment	110,000	10,000	40,000	40,000	15,000	-	-
09. Farm Equipment	60,000	-	55,000	5,000	-	-	-
COMPONENT TOTAL	733,000	25,000	338,000	325,000	40,000	5,000	-
70. PREMISES							
01. Laboratory Buildings	1,600,000	-	1,000,000	600,000	-	-	-
02. Tick Proof Pens	80,000	-	80,000	-	-	-	-
03. Cattle Yards & Accommodation	950,000	-	950,000	-	-	-	-
04. Fencing & Water Supplies (75m at \$ 1,500/m)	112,500	-	112,500	-	-	-	-
05. Electrification	2,800	-	2,800	-	-	-	-
06. Land Acquisition (1,000 Acres at \$50/Hactre)	20,000	20,000	-	-	-	-	-
07. Staff Housing	968,000	-	968,000	-	-	-	-
08. Services (including PVH charges)	400,000	1,000	79,800	79,800	79,800	79,800	79,800
COMPONENT TOTAL	4,133,300	21,000	3,193,100	679,800	79,800	79,800	79,800

CODE	TOTAL \$	1983	1984	1985	1986	1987	1988
80. TRAINING							
(12 x 12 months i44 m/m)							
01. Subsistence Allowance							
144 m/m x \$ 1,000	144,000	-	48,000	48,000	48,000	-	-
02. TRAVEL 12 x \$ 800	9,600	-	3,200	3,200	3,200	-	-
COMPONENT TOTAL	153,600	-	51,200	51,200	51,200	-	-
<u>SUB TOTAL</u>	11,331,300	119,200	4,794,400	2,427,600	1,452,000	1,293,800	1,194,300
90. PROJECT							
SERVICING 14%	1,586,282	16,688	671,216	339,864	203,280	181,132	167,202
SUB TOTAL	12,917,682	135,888	5,465,616	2,767,464	1,655,280	1,474,932	1,361,502
10% Special Factor/annum	-	-	546,561.6	276,746.4	165,528	147,493.2	136,150.2
GRAND TOTAL	14,133,161.4	135,888	6,012,177.6	3,044,210.4	1,820,808	1,622,425.2	1,497,652.2

WORK PLAN

The Project Headquarters will be located in Lilongwe. The activities of the project, their duration and starting dates are as follows:-

<u>I. Project Inputs</u>	<u>Starting Date</u>	<u>Duration</u>
<u>A. Recruitment of Personnel</u>		
1. Identify and recruit Project Manager and Assistant Project Manager	August 1983	3 months
2. Identify and recruit Senior Protozoologist and Protozoologist	October 1983	3 months
3. Identify and recruit Veterinary Research Officers and Veterinary Research Officer (Trainees)	October 1983	3 months
4. Identify and recruit Laboratory Technicians	October 1983	3 months
5. Identify and recruit Administrative Officer and Assistant Administrative Officer	November 1983	2 months
6. Identify and recruit Consultants to review and assess project progress	July 1986	3 months
<u>B. Procurement of Equipment & Supplies</u>		
1. Order and receive vehicles & trailer	November 1983	6 months
2. Order and receive equipment for tick room and tick buildings	November 1983	6 months
3. Order and receive Liquid nitrogen containers	November 1983	6 months
4. Order and receive spraying race and weigh scales	November 1983	6 months
5. Order and receive laboratory equipment (microscopes, freezers and refrigerators, etc.)	November 1983	Continuous
6. Order and receive laboratory reagents	November 1983	Continuous

	<u>Starting Date</u>	<u>Duration</u>
7. Order & receive antibiotics & drugs	November 1983	Continuous
8. Order & receive antibiotics & drugs	November 1983	Continuous
9. Order & receive liquid nitrogen	November 1983	Continuous
C. <u>Sub-Contracts</u>		
1. Prepare plans & specifications of new building	November 1983	1 month
2. Make necessary contractual arrangements for construction of new buildings	December 1983	1 month
3. Construction & termination of new buildings	January 1984	6 months
4. Building completed	June 1984	
5. Preparation of plans for new tick proof pens	November 1983	1 month
6. Arrange for construction of tick proof pens	December 1983	4 months
7. Tick proof pens construction terminated	March 1984	
8. Arrange for installation of spray dips and scales	January 1984	1 month
9. Installation spray dips and scales	February 1984	1 month
10. Arrange for construction of yards and fencing necessary for experimental animal accommodation	November 1983	1 month
11. Termination yards and fencing for experimental animal accommodation	April 1984	
12. Establish Field Labs in each country	June 1984	12 months
D. <u>Arrangements for Training</u>		
1. Determine training programme	January 1984	6 months
2. Arrange fellowships	July 1984	Continuous
II. <u>Project Activities</u>		
1. Establish project headquarters in Lilongwe	November 1983	2 months

	<u>Starting Date</u>	<u>Duration</u>
2. Define and initiate work programme of Protozoologists	January 1984	Continuous
3. Define and initiate work programme of the Veterinary Research Officer	January 1984	Continuous
4. Establish the routine laboratory methodology to support activities (2) & (3)	January 1984	Continuous
5. In-service training of Trainee staff (professional & technical) in field and laboratory techniques	January 1984	Continuous
6. Produce bulk stabilates cocktail components and tatrata bulk stabilates (in existing tick proof pens)	March 1984	4 months
7. Chemoprophylaxis cocktail components (in existing tick proof pens)	July 1984	2 months
8. Isolate Regional strains of <u>T. parva</u> (in existing tick proof pens)	March 1984	9 months
9. Produce intermediate stabilates Regional strains	August 1984	2 months
10. Selection (seriological) & purchase of cattle for cross immunity trials	July 1984	Continuous
11. Immunization of groups of susceptible cattle against cocktail strains or Regional strains of <u>T. parva</u>	September 1984	Continuous
12. Cross immunity trials	October 1984	Continuous
13. Assess the results of cross immunity trials and determine immunization procedure to be following in the Region	November 1985	1 month
14. Review mission to consider the project achievements and their implications for the second regional phase of the project	December 1987	3 weeks
15. Initiate field challenge trials immunized by the method chosen for the region	December 1985	6 months

	<u>Starting Date</u>	<u>Duration</u>
16. On basis of (13) & (15) above advise and assist participating Governments on wider application of ECF immunization in the region	June 1988	
17. Assist in the preparation for and participation in a Regional meeting to discuss the second phase (regional) of the ECF Immunization Project	March 1988	2 months

III. Reporting

1. Initial report detailing progress to date and the forward plan of work	March 1985	
2. Successive progress reports at 6 monthly intervals detailing progress, highlighting problems and indicating the forward plan of work		Continuous
3. Draft terminal report detailing results achieved with recommendations for follow-up action. A draft plan of operations for the second phase (regional, see activity (17) above) will be attached as an annex to this report	November 1988	
4. The project staff and consultants will prepare reports and/or project working documents as circumstances dictate, under the direction of the Project Manager		
5. The Review Mission will prepare a detailed report	December 1987	

(a) Personnel:-

The donor personnel to be assigned to the project will be as follows (only very senior staff considered)

(i) The Project Manager:-

The Project Manager will be a Veterinarian with expertise and experience in immunization against East Coast Fever and Research administration will be recruited two months before the recruitment of other personnel. He will be responsible for the overall execution of the project, for the detailed planning of the work programme, for general and financial administration of all inputs and for the custody of all equipment and supplies in accordance with laid down rules and regulations. He will be technically responsible for carrying out all the activities in the work plan concerned with his field expertise. He will be responsible for Co-ordinating and supervising the work of experts and consultants assigned to the project. He will be responsible in consultation with various participating governments for the selection of candidates for fellowships and for the preparation of their nomination forms. He will be assisted in the performance of his duties by an Assistant Project Manager.

(ii) Assistant Project Manager:-

The Assistant Project Manager will be a Veterinarian with working knowledge in the immunization against East Coast Fever plus relevant experience in the same. He will assist the Project Manager in the performance of his duties and deputies in his absence. He will under the direction of the Project Manager undertake any other duties delegated to him. He will be recruited at the same time as the Project Manager.

(iii) Senior Protozoologist:-

The Senior Protozoologist will be technically responsible for carrying out all the activities in the work plan concerned with Laboratory handling of strains of Theileria (isolation, identification, stabilate production, cryopreservation, serological examination etc.). He will be aided by a protozoologist. Protozoologist will assist the senior protozoologist in carrying out the activities in the work plan concerned with Laboratory handling of Theileria strains. He will aid the senior protozoologist in training personnel.

(iv) Veterinary Research Officer:-

The Veterinary Research Officer will be a Veterinarian technically responsible for carrying out of all the activities in the work plan concerned with Veterinary supervision of experimental animals both in the laboratory and field. He will be concerned in particular with

selection and testing of animals being prepared for experimental studies; day to day supervision of animals on experiment; administration of treatments, immunization and other veterinary procedures to experimental animals and the routine collection of specimens from, clinical examination and when necessary post mortem examination of all animals under experiment. He will be required to keep full records of these procedures. He will be responsible for the inservice training of the V.R.O. (trainees) who will in turn help in his work.

(v) Veterinary Research Officer (Training Grade):-

The V.R.O.'s (Trainee) will be veterinarians who will be attached to the Headquarters for the first two years. They will on rotational basis be attached to the Veterinary Research Officer and Protozoologist and will assist in both Laboratory and field experiments.

It is envisaged that - amongst these would be selected candidates for the fellowships under the Training Component. In the 3rd year of operation when field Laboratories have been established these officers will be posted out to these Laboratories where they will perform duties Co-ordinated from the Headquarters. Such duties will include receipt, storage of stabilates carrying out any field trials and monitoring them under direction of Senior staff at Headquarters.

(vi) Farm Manager:-

He will be responsible to the Project Manager for: Development of the E.C.F. Project Immunization Project Farm, supervision of clearing and double fencing farm area to make it suitable for quarantine and holding area for experimental cattle, construction of cattle yards and handling facilities, establishment of pasture for stock feeding for experimental cattle; supervision of security arrangements on the farm; maintenance of pasture management and supervision of farm labour.

The Farm Manager will be an officer with wide experience and known capability and a high sense of responsibility will be essential for the post.

(vii) Senior Laboratory Technicians:-

The Senior Laboratory Technicians will be responsible for the routine application of laboratory techniques used in the study of theilerial isolates in the laboratories, serology, staining and their production in tick stabilates (maintenance of tick colony, etc.). They will assist the protozoologists and will be responsible for training of Laboratory Assistants in the laboratory techniques.

(viii) Administrative Officer:-

The Administrative Officer will be responsible, under the direction of the Project Manager for all the administrative and clerical activities of the project assisted by the Administrative Assistant.

(lx) Consultants:-

Up to 12 man months of specialist consultant services will be provided as required from time to time by the project.

(b) EQUIPMENT AND SUPPLIES

The following equipment and supplies will be provided by the donor under the project.

Vehicles:-

- 3 Personnel carrier vehicles (1 Peugeot 504
(2 other saloon cars.
- 10 Long wheel base 4 wheel drive field vehicles.
- 2 Tractors (Farm)
- 1 Trailer
- 1 Cattle transporter

(Included are spares to the value of 10% of purchase price).

Laboratory Equipment:-

Laboratory equipment to include refrigerators, Ultra low deep freezers, deep freezers, balances, centrifuges (bench and floor models) as well microhematocritz, temperature and humidity control for both tick rooms and tick buildings, Silverson grinders, thermographs, water deioniser and surgical equipment etc.

Liquid nitrogen:-

Equipment to include storage cylinders, transporters and a large transporter/storage unit.

Microscopes:-

Research microscopes equiped for fluorescence studies together; Binocular and bench stereo Microscopes.

Furniture and Office equipment:-

Furniture, Calculators, duplicator, photocopy machine, filing cabinets and other small office equipment.

Laboratory supplies:-

Reagents, glassware, drugs (particularly antibiotics and acaricides) liquid nitrogen and other consumable supplies for laboratory.

Yards, Fencing, Water & Electricity Supplies:-

Materials for construction of Yards and paddocks necessary for holding experimental animals, their water and electricity supply.

Training:-

Post-graduate and in service training of 6 Veterinary Research Officers i.e. 6 periods of 12 man months each.

Laboratory technicians training for 6 Laboratory Assistants i.e. 6 periods of 12 man months each.

ADC 6

7. Foot & Mouth Disease Control - Malawi/Tanzania/ Zambia Borders

INTRODUCTION

In the past the importance of foot and mouth disease was not recognised by livestock owners since the acute phase of the disease lasted only a short time and mortality was low. The control and eradication of "killer" diseases such as rinderpest took precedence. This trend has now changed, and although several highly developed countries have managed to eradicate the disease, they vigilantly continue to control and monitor all importation of suspect material from other FMD inflicted countries. This is because the disease remains a serious hazard to the productivity of animal populations throughout the world and, indirectly, to the well being of human populations dependent on them for food, motive power and clothing.

The situation in developing countries is different. With a developing cattle industry the first priority in disease control must be the major epizootic diseases with high mortality such as rinderpest, contagious pleuropneumonia, blackquarter and East Coast Fever (ECF). The economic importance of these diseases is obvious and sometimes catastrophic. Foot and Mouth Disease, on the other hand, does not cause high mortality generally being less than 5 percent in adult animals. While the losses it causes are less dramatic, they are nevertheless severe and its control is the next important factor in developing a viable cattle industry. This is why it has been found pertinent that a project proposal for the regional control of FMD be presented for possible funding in some of the SADCC countries.

The Region

The region to be involved includes the northern part of Malawi, the northern part of Zambia and the southwestern part of Tanzania. The area lies roughly between latitude 30° and 34° and longitude 8° and 12°.

Livestock Production

The estimated cattle population in this region is about 550 000 head of cattle, comprising mainly the Tanzania Short Horn Zebu (TSZ) and the Afrikander and Sanga cattle.

Most farmers in this region keep or aspire to keep cattle. A majority of cattle are in herds of less than 25 animals, but there are larger herds as well. The average herd size is about 20 head of cattle.

Apart from being a source of meat, a substantial number of livestock keepers milk their cattle (about 30%) even though these animals are poor milk producers.

The use of draught power is gaining momentum in the Tanzanian area using oxen. This has further been encouraged by the setting up of oxen training centres, though some farmers do train their own oxen.

Cattle Movements and Sales

Cattle sales through the official marketing channels within and between the areas are negligible. Presumably this is due to the small herd numbers owned by the farmers. There is, however, considerable uncontrollable movements of cattle between the three countries, thus enhancing the spread of livestock diseases.

Foot and Mouth Disease Situation in the Region

(a) Tanzania

This is a major hazard in livestock production and a constraint on international trade in livestock products. FMD is a notifiable disease in Tanzania. Cattle should be vaccinated before crossing district or regional boundaries and veterinary officers are empowered to establish quarantine areas and prevent the removal of cattle. But, as mentioned earlier, FMD in the traditional herd is often mild and considered of little significance because mortality is generally low.

In a survey carried out in 1979 over 40% of herds were found to be inflicted by FMD annually, involving types A, O SAT 1 and SAT 2.

Table 1 below shows isolations and serological evidence of FMD presence in the area.

Table 1

Area	Virus Isolations	Definite Serological Evidence	Suspicious Serological Evidence
Msilihofu	A	A,O, SAT I	SAT II
Lyele	-	A,O, SAT I	-
Msanzi	SAT I	A,O, SAT I & SAT II	-
Ulumi	O	A,O, SAT I	-
Mollo	A	-	-
Mtokiisa	-	O, SAT I & SAT II	-
Kipeta	-	A & O	-

Most cases involved a mild illness from which the animals recovered, but had significant effect on work oxen. It was found that 33% of oxen had been affected and lost an average of twenty one ploughing days each. The incidence of the disease is high at ploughing time, between December and March. It was found that 1% of the oxen were permanently affected, literally putting them out of work. No regular vaccination is done except in trade stock.

(b) Zambia

The latest FMD outbreak reported was in 1976 and it involved type O. It is, however, on record that SAT I and SAT II do occur in other parts of the country. There is no regular vaccination done in the Northern Province but FMD vaccine from Wellcome, Kenya, has once been used.

(c) Malawi

To date, Foot and Mouth Disease has been a problem in Karonga and the Lower Shire districts. The disease has repeatedly occurred in the referred two parts of Malawi. In Karonga outbreaks have occurred for over 20 years. It has been shown that each new outbreak was caused by fresh infection and the disease has been controlled in each outbreak by movement restrictions and vaccinations. For the first time, FMD outbreak was reported in the Lower Shire Valley in August 1973. The second outbreak was reported in 1976. Both of these outbreaks were successfully controlled by means of cattle movement restrictions and vaccinations.

The following were the years of the outbreaks and the various virus types.

Table 2

Area	Year	Months	Virus Type
Northern Region (Karonga)	1957	January & August	O
"	1959	September	SAT II
"	1962	September	O
"	1966	July	A
"	1970	November	SAT I
"	1975	September	SAT II
"	1981	August	A
Southern Region (Lower Shire Valley)	1973	August	A
"	1976	August	SAT III

Because of continuous traffic between the three neighbouring countries of the SADCC and in addition to the movement of people and livestock in the border areas, it has been difficult for these countries to prevent the disease entirely.

The Economic Aspects of the Disease

The economic losses caused by foot and mouth disease fall into two distinct categories: direct and indirect. The major direct losses are those sustained from reduced production of meat, milk and other products. Growth of beef animals is frequently inhibited for many months. In dairy cattle the udder is inflamed and sometimes permanently damaged, causing a considerable reduction or complete cessation of milk production and making subsequent sterily sometimes occur causing direct losses in breeding cattle. In other cases there are chronic joint infections and sub-fertility leading to long calving intervals, with resultant direct losses.

In addition to the direct losses in affected cattle, FMD causes indirect losses to other sectors of the livestock industry wherever it occurs. Tanzania is an example of a country with considerable potential for expansion of its beef industry but is completely cut off from the European beef market due to the high prevalence of FMD in the country. Abortions and subsequent sterility sometimes occur causing direct losses in breeding cattle and making subsequent lactations less productive than normal.

Assessment of the Economic Losses caused by FMD in Tanzania, Malawi and Zambia

This assessment will only deal with the situation in Tanzania and Malawi and is made using information collected from annual reports of Rukwa and Mbeya Regions as well as from a Survey Report on The Development of an Intensive Animal Disease Control Programme in Rukwa Region (Tyler, Kapinga and Magembe, 1980), delivered to the Tanzania Government in 1980, and some data obtained from Departments of Veterinary Services of Malawi and Zambia.

The production systems used and the productivity parameters vary throughout the region. They are, however, more or less similar within the districts (Sumbawanga in Rukwa; Mbozi, Ileje, Rungwe and Kyela in Mbeya Region) which border Kyela and Ileje Districts of Tanzania respectively. Mbala, Isoka and Nakonde districts of Zambia border Sumbawanga and Mbezi districts of Tanzania.

There are now moves to introduce improved cattle into these districts for milk production which are much more seriously affected by FMD than the traditional herd. The much larger losses incurred as a result of FMD by these animals are not taken into account because their number is at present relatively small (0.27%) (National Livestock Census 1978) and for Malawi about (0.38%). These losses are, however, bound to increase as more and more improved stock are introduced into the area, as is the trend now. Exotic cross breed cattle are particularly severely affected by FMD, which causes high calf mortality and frequently results in the premature culling of adults because the permanent effects of the diseases render them uneconomic.

The physical production losses due to FMD are calculated on the basis of the expected loss that would be suffered by an owner of each type of animal in any year. The types of animals considered include: cows, draught oxen, and young stock.

The losses caused by FMD in sheep and goats have not been quantified. While the effects of FMD are considered milder in sheep and goats than in bovines, the relatively small numbers of these animals (57,387 goats and 42,601 sheep) diminishes the losses due to FMD.

Table 3

Type of Animal	PARAMETER	Code	Unit	Sumbawanga	Mbozi	Rungwe	Kyela	Ileje	Karonga & Chitipa	Mbala, Isoka & Nakonde
COWS	Incidence of FMD	A	Proportion	0.40	0.40	0.40	0.40	0.40	0.40	0.40
	Mortality & Disposal after FMD	B	Proportion	0.013	0.013	0.013	0.013	0.013	0.013	0.013
	Average Value of Animal	C	Tsh.	3800	4200	4200	4000	4200	4000	3800
	Carcass Value of Animal	D	Tsh.	1740	1930	1930	1840	1930	1840	1740
	Average Calving Interval	E	Months	18.5	18.5	18.5	18.5	18.5		
	Average Lactation Yield	F	Litres	330	540	945	540	540	540	330
	Average Annual Yield	G	Litres	214	350	613	350	350	350	214
	Value of Milk	H	Tsh/Litre	4.00	4.00	5.00	6.00	6.00	6.00	4.00
	Part of Lactation lost after FMD	I	Proportion	0.15	0.15	0.15	0.15	0.15	0.15	0.15
	Delay in next conception after FMD	J	Months	3	3	3	3	3	3	3
	Abortion Rate after FMD	K	Proportion	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Calf Mortality Rate after FMD in dam	L	Proportion	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Value of Newborn Calf	M	Tsh.	300	400	600	400	600	400	300

Table 3 ctd.

Type of Animal	PARAMETER	Code	Unit	Sumbawanga	Mbozi	Rungwe	Kyela	Ileje	Karonga & Chitipa	Mhala, Isoka & Nakonde
DRAUGHT STOCK	Incidence of FMD	N	Proportion	0.29	-	-	-	-	0.29	0.29
	Mortality & disposal after FMD	O	Proportion	0.01	-	-	-	-	0.01	0.01
	Average Value of Animal	P	Tsh.	6500	-	-	-	-	6500	6500
	Carcass Value of Animal	R	Tsh.	2990	-	-	-	-	2990	2990
	Animals with permanent disability after FMD	S	Proportion	0.01	-	-	-	-	0.01	0.01
	Reduction in Value due to permanent disability	T	Tsh.	2700	-	-	-	-	2700	2700
	Duration of incapacitation after FMD	U	Days	21	-	-	-	-	21	21
	Cost of Hiring Replacement	V	Tshs.	35	-	-	-	-	35	35
YOUNG STOCK	Incidence of FMD	Q	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
	Value of weaned Animal	W	Tshs.	1500	1500	2000	1500	2000	1500	1500
	Mortality & Disposal after FMD	X	Proportion	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	Average delay in reaching maturity	Y	Days	90	90	90	90	90	90	90
	Cost of Maintaining Animal	Z	Tsh./Day	1.50	1.50	1.50	1.50	1.50	1.50	1.50

Losses Due to FMD in Cows(a) Loss due to Mortality and Premature Disposal

Mortality from FMD is rare, but it can rise to quite high levels in some conditions. It is not unusual for the productive capability of the animal to be so damaged that it is uneconomic to keep it so that it must be slaughtered. In both of these cases the loss is taken to be the difference between the former value of the animal and the salvage value of the carcass. This quantity is multiplied by the incidence rate and the proportion of cases dying or being written off to obtain the expected loss per animal per year from this source, i.e.

$$A \times B \times (C - D)$$

(b) Direct Loss of Milk Production

FMD causes a direct loss of milk production in lactating animals. The size of the immediate reduction in yield is very variable, but typically there is a severe reduction for the first few days followed by a rise to a level considerably below the yield before the attack. For the purpose of this analysis, where a lactating animal is affected, it is considered that 15% of the lactation yield would normally be lost because of the direct effects of FMD on milk production. Thus, the expected economic loss due to direct loss of milk production for each animal in any year, will be the product of the disease incidence, the proportion of the lactation yield lost, the mean animal yield, and the price of the milk, i.e.

$$A \times (1 - B) \times I \times G \times H$$

(c) Indirect Loss of Milk due to Infertility

Fertility problems often follow foot and mouth disease. These may take the form of failure to conceive, or early abortion. The effect of this is to lengthen the calving interval, and so a smaller proportion of animals is in milk at any time, lowering the mean yield. The mean annual yield is the reciprocal of the calving interval in years multiplied by the lactation yield. Thus the formula for loss of milk value due to infertility is:

$$(12 - \frac{12}{(A \times (1 - B) \times J) + E}) \times F \times H$$

(d) Abortion

FMD can cause abortion, especially in animals in late pregnancy. Assuming that the mean time for abortion is $7\frac{1}{2}$ months from conception, and that there follows a six month delay in the next generation the lengthening of the calving index in abortion animals will be 13 and one third months. The value of the calf will also be lost. The formula for the expected loss per animal per year from abortion is therefore:

$$\left(\frac{12}{E} - \frac{12}{(A \times (1 - B) \times K \times 13,5) + E} \right) F \times H + A \times M \times K$$

(e) Calf Mortality

FMD can cause considerable mortality among suckling calves. This can be due to starvation caused by cessation of milk supply, or to cardiac lesions which are particularly severe in young calves. This mortality is assumed to affect calves up to the age of three months - after this time the losses are considered with young stock. Thus expected loss per cow per year due to calf mortality is:

$$\frac{3}{F} \times A \times M \times L$$

Losses Due to FMD in Draught Animals

(a) Loss due to Mortality and Premature Disposal

Where a draught animal dies, or is rendered economically useless because of FMD, the difference between the market value of the animal before the disease and the carcass value is taken to represent the loss, which is:

$$N \times O \times (P - R)$$

(b) Loss of Work due to Lameness

Though this is a very important source of loss caused by FMD, the true extent of the loss is difficult to quantify. In the worst case the cultivation which the animal would have done will be delayed, or left undone, so that a crop would be lost. This situation is not unusual because the disease is often most prevalent at cultivation times (November and December), apparently because of the increased animal movement during these periods. In the best circumstances a replacement animal, or a tractor could be hired to do the work. To avoid the remote possibility of over estimation the losses in crop production, as mentioned earlier on, are neglected. Only the cost of hiring a replacement animal for half of the period of incapacitation is included in this analysis:

$$0,5 \times N \times (1 - O) \times V \times U$$

(c) Loss due to Permanent Disability

Many draught animals suffering from FMD have their capacity for work permanently reduced. This may be because of foot damage, panting, cardiac damage or reduced heat tolerance. This affects the market value of the animal, and the fall in market value is assumed to represent the loss, hence:

$$N \times (1 - O) \times S \times T$$

Losses Due to FMD in Young Stock(a) Loss due to Mortality and Premature Disposal

Where a young animal dies or is prematurely culled because of the effects of FMD, the value of the animal at one year of age is assumed to represent the loss incurred. Thus the expected loss is given as:

$$X \times Q \times W$$

(b) Loss due to Delay in Reaching Maturity

Young animals suffering from FMD will be expected to suffer a loss of weight. This will delay the animal in reaching maturity. Even if compensatory growth occurs, feed conversion efficiency is likely to have deteriorated considerably. The loss is therefore the average length of the delay in reaching maturity in young stock affected by FMD multiplied by an estimate of the daily cost of keeping the animal, i.e.:

$$(1 - X) \times Z \times Q \times Y$$

Table 4

EXPECTED ANNUAL LOSSES PER BOVINE DUE TO FMD BY DISTRICT AND BY TYPE OF ANIMAL (TSHS)

Type of Animal	SOURCE OF LOSS	SUMBAWANGA	MBOZI	RUNGWE	KYELA	ILEJE	KARONGA & CHITIPA	MBALA, ISOKA & NARONDE
COWS	Mortality & Premature Disposal	10.70	11.80	11.20	11.30	11.20	11.20	10.70
	Direct Loss & Milk Production	50.70	82.90	181.50	124.35	124.35	124.35	50.70
	Indirect Loss of Milk Production due to infertility	13.20	21.60	47.25	32.40	32.40	32.40	13.20
	Abortion	202.60	331.55	580.20	331.55	331.55	331.55	202.60
	Calf Mortality	0.95	1.30	1.95	1.30	1.95	1.30	0.95
	Total Loss per Animal in Cows	278.15	449.15	822.70	500.80	501.55	500.80	278.15
DRAUGHT STOCK	Mortality & Premature Disposal	10.20	-	-	-	-	10.20	10.20
	Loss of Work due to Lameness	105.50	-	-	-	-	105.50	105.50
	Loss of Work due to permanent disability	7.75	-	-	-	-	7.75	7.75
	Total Loss per Animal in Draught Stock	123.45	-	-	-	-	123.45	123.45
YOUNG STOCK	Mortality and Premature Disposal	12.00	12.00	16.00	12.00	16.00	12.00	12.00
	Delay in Reaching Maturity	52.40	52.90	52.90	52.90	52.90	52.90	52.90
	Total Loss per animal in young stock	64.90	64.90	68.90	64.90	68.90	64.90	64.90

Total Losses Due to FMD in Bovines in Each District

The losses tabled above are multiplied by numbers of each class of stock in each district to give an estimate of the total loss due to FMD in bovines in each district and the total for the two regions.

The population estimates for each class of animal by district are taken from the results of the 1978 National Livestock Census. It should be noted that no allowance is made for any loss due to FMD in breeding males, and any loss of work from females affected by FMD is omitted from the analysis.

The total loss in the ten districts is Tshs.38,753,579.00 (US\$4 036 831.10). Further future losses must be expected to increase as the productive potential of livestock increases as more productive animals are introduced. Furthermore, the consequential losses will increase dramatically since as crop yields improve and more farmers make use of oxen for cultivation losses due to incapacitation of draught animals will increase. Indeed, many beneficial projects in the field of crop production and animal production will be made impractical or be severely hampered by the presence of Foot and Mouth Disease.

Table 5

TOTAL ESTIMATED ANNUAL LOSSES DUE TO FMD BOVINE IN MBEYA AND RUKWA
REGIONS BY DISTRICTS

DISTRICT	CLASS OF STOCK	LOSS (TSHS)
SUMBAWANYA	Cows (17324)	4,818,670,60
	Draught Stock (15% Total)	2,103,013,95
	Young Stock (8461)	549,118,90
MBOZI	Cows (25092)	6,979,339,80
	Draught Stock	
	Young Stock	699,622,00
RUNGWE	Cows (13858)	3,854,602,70
	Draught Stock	
	Young Stock	244,801,70
KYELA	Cows (6737)	437,231,30
	Draught Stock	
	Young Stock	145,895,20
ILEJE	Cows (4735)	326,241,50
	Draught Stock	
	Young Stock	102,040,90
KARONGA & CHITIPA DISTRICTS	Cows (18984)	9,507,187,20
	Draught Stock (100964)	1,320,174,30
	Young Stock (20878)	1,354,982,20
MBALA, ISOKA & NAKONDE DISTRICTS	Cows (16200)	4,506,030,00
	Draught Stock (10360)	1,278,942,00
	Young Stock (8100)	525,690,00
Total Loss (Tshs) =		38,753,579,00
Total Loss US\$ =		4,036,831,10

PROJECT FOR FOOT & MOUTH DISEASE CONTROL

(a) Methods of Control

There are several avenues to the control of Foot and Mouth Disease, viz. systematic vaccination, slaughter method or a combination of any or all of these methods.

The disease being enzootic in the area under consideration, systematic vaccination appears to be the method of first choice. Ring vaccination, however, can always be practised when there is a breakdown.

Systematic vaccination involves the compulsory vaccination of all cattle. The following criteria, among others, must be met for such a campaign to be successful.

- (i) Vaccination must be compulsory, systematic and controlled, so that as near possible 100% coverage of the bovine population is achieved.
- (ii) Vaccination must be repeated every four, six or twelve months depending on local circumstances. (In our case it is suggested that for the first two years vaccination should be repeated every four months, and later on twice a year.)
- (iii) Distribution of other susceptible species must be taken into account and the necessity of vaccinating them be considered.

In addition to this, all Zoosanitary aspects of the control of the disease must be applied.

(b) Requirements

1. Manpower - There will be a minimum of 20 teams in the area depending on the size of the district, of six people each.

Veterinary Officers	5
Senior Livestock Field Officers (Team Leaders)	20
Livestock Field Assistants	80
Drivers	17

2. Transport

4 WD vehicles Landrover	10
7 -ton lorries	7

3. Camping Equipment

Senior Tent	20
Junior Tent	20
Camp Beds	120
Camp Bed Mattresses	120
Camp Chairs	120
Camp Tables	120
Hurricane Lamps	120
Spares for Lamps	200

4. Base Equipment

Electric Refrigerators	10
Kerosene/Gas "	20

5. Field Equipment

Ice Boxes	20
Pressure Stoves	50
Saucepans	150
Jerry Cans	80
Empty Drums	80
Ear Punchers	150
Overalls	150
Gumboots	150
Sterilisers	40

Spades	20
Bush Knives	40
30cc Automatic Syringes Luer Lock	200
Spare Barrels for 30cc Syringes	1500
14G x $\frac{1}{2}$ " - $\frac{3}{4}$ " Luer Lock	
Hypodermic Needles	5000 dozen
First Aid Kits	20
6. <u>Vaccines</u>	
Quadrivalent Vaccine (Type A, O, SAT I & II)	600 000

(c) CostsI. RECURRENT EXPENDITURE - TANZANIA

1. <u>Salaries</u>	1ST YEAR - US\$	2ND YEAR - US\$	3RD YEAR - US\$
5 Veterinary Officers @ US\$.5,160	25,800	25,800	25,800
20 Senior Livestock Field Officer @ US\$2,760	55,200	55,200	55,200
80 Livestock Field Assistants @ US\$ 1,920	153,600	153,600	153,600
17 Drivers @ US\$ 1,200	20,400	20,400	20,400
SUB-TOTAL	255,000	255,000	255,000
2. <u>Allowances</u>			
5 Veterinary Officers @ US\$ 30 per day for 30 days	4,500	4,500	4,500
20 Senior Livestock Field Officers @ US\$ 15 for 90 days	27,000	27,000	27,000
97 Other staff @ US\$ 10 for 90 days	87,300	87,300	87,300
SUB-TOTAL	118,800	118,800	118,800

I RECURRENT EXPENDITURE - TANZANIA ctd

3. <u>Transport Running Costs</u>	1ST YEAR - US\$	2ND YEAR - US\$	3RD YEAR - US\$
(a) 10 4WD Vehicles at approximately 4km per litre for approximately 20,00 km per vehicle at US\$1,00 per litre - 5,000 x 20 x 1	50,000	50,000	50,000
(b) 7 lorries at approximately 5 km per litre for approximately 10,000 km each lorry at US\$0,60 - 2,000 litres x 7 0,6	8,400	8,400	8,400
(c) maintenance costs of 17 vehicles at approximately US\$0,50 per running km - 10 WD vehicles x 20,000 x 0,5) 7 lorries x 10,000 x 0,5)	135,000	135,000	135,000
SUB-TOTAL	193,400	193,400	193,400
4. <u>Running Costs of Refrigerators</u>			
10 Electric Refrigerators at US\$ p.m. per fridge	1,200	1,200	1,200
20 Kerosene refrigerators at US\$20 p.m. per fridge	4,800	4,800	4,800
SUB-TOTAL	6,000	6,000	6,000
5. <u>Purchase of Vaccine</u>			
600,000 doses per year at US\$ 1,5 per dose	900,000	900,000	900,000
TOTAL RECURRENT EXPENDITURE	1,354,400	1,354,400	1,354,400

II CAPITAL EXPENDITURE - TANZANIA

	1ST YEAR - US\$	2ND YEAR US\$	3RD YEAR - US\$
1. <u>Purchase of Vehicles</u>			
10 WD Vehicles @ US\$ 19,000	190,000	-	-
7-7 Ton Lorries @ US\$ 36,000	257,600	-	-
Purchase of spare parts for these vehicles		44,4000	-
2. <u>Purchase of Refrigerators</u>			
10 Electric Refrigerators @ US\$ 500	5,000	-	-
Kerosene Refrigerators @ US\$ 580	11,600	-	-
3. <u>Purchase of Field Equipment</u>			
20 Ice boxes @ US\$ 150	3,000	-	-
50 Pressure stoves @ US\$ 60	3,000	-	-
150 Sauce pans @ US\$ 35	5,250	-	-
80 Jerry Cans @ US\$ 20	1,600	-	-
80 Empty Drums US\$ 30	2,4000	-	-
150 Ear punchers @ US\$ 36	5,400	-	-
150 Overalls @ US\$ 50	7,500	-	-
150 Gum Boots @ US\$ 60 (assorted sizes)	9,000	-	-

II CAPITAL EXPENDITURE - TANZANIA ctd

40 Sterilizers @ US\$ 120	4,800	-	-
20 Spades @ US\$ 60	1,200		
40 Bush Knives @ US\$ 15	600		
20 First aid kits @ US\$ 200	4,000		
200 30cc Auto-syringes Luer Lock @ US\$ 30	6,000		
1500 30cc Spare barrels @ US\$ 2,5	3,750		3,750
5000 dozens 14G \times $\frac{1}{4}$ - $\frac{3}{4}$ Luer NLock Needles @ US\$ 6,000	30,000		30,000
Total Capital Expenditure	551,700	44,400	3,750
<u>Grand Total</u>			
Recurrent Expenditure	1,354,400	1,354,400	1,354,400
Capital Expenditure	551,700	44,400	3,750
	1,906,100	1,398,800	1,358,150

I RECURRENT EXPENDITURE - MALAWI

1. <u>Personal Emoluments (US\$)</u>	<u>YEAR 1</u>	<u>YEAR 2</u>	<u>YEAR 3</u>	<u>TOTAL</u>
1 Veterinary Officer	5257	5699	6269	17,225,0
1 Senior Technical Officer	3580	3938	4332	11,850,0
1 Technical Officer	2057	2231	2454	6,742,0
2 Senior Veterinary Assistants	3340	3674	4041,5	11,055,5
3 Veterinary SAssistants	2721,5	2900,5	3190,5	8,812,5
11 Veterinary Scouts	3014	3014	3315,5	9,343,5
1 Driver	577,5	605	665,5	1,848,0
 SUB-TOTAL	 20547	 22061,5	 24268	 66,876,5
 2. <u>Running Expenses</u>				
Transport and Travelling of staff	20077	29312,5	32244	81,643,5
Subsistence Allowances	2132,5	2346	2580,5	7,059,0
Overtime Allowances	460	506	556,5	1,522,5
Tools Materials	1250	1375	1512,5	4,137,5
 SUB-TOTAL	 23919,5	 33539,5	 36893,5	 94,352,6

I RECURRENT EXPENDITURE - MALAWI ctd

3. Special Expenditure

Drugs and Vaccines	99165	108860	119746	327771
SUB-TOTAL	99165	108860	119746	327771
Private Hire charges	1500	1250	-	2750
SUB-TOTAL	1500	1250	-	2750
TOTAL RECURRENT COSTS	145131,5	165711	180907,5	491750

II CAPITAL EXPENDITURE - MALAWI

(a) Buildings:

2 x DH6 House	39658	39658	-	79316
2 x PH4 Houses	19108	6369	-	25477
10 x Traditional Houses	6750	6750	-	13500
2 x Store Rooms & Units	27797	27797	-	55594
District Lab.				
SUB-TOTAL	93313	80574	-	173887

(b) Plant Vehicles

1 x Refrigerated LWB LandRover	14250	14250	-	28500
4 x Motorcycles	2796	930	-	3720
1 x Caravan	4500	-	-	4500
Sub-Total	21540	15180	-	36720

(c) Other Equipment

2 x Refrigerators	1976	1976	-	3952
Camping Equipment	4236	2118	-	6354
Protective clothing	2660	2660	-	5320
Branding Equipment	3177	1583	-	4765
Vaccination Equipment	4236	2113	-	6354
Sub-Total	16285	10460	-	26745

TOTAL CAPITAL COSTS	131,138	106,214	-	237,352
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GRAND TOTAL	276,269.5	271,925	180,907.5	729,102
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I RECURRENT EXPENDITURE - ZAMBIA

Vaccine:	180,000 doses of bivalent A and O (hopefully) at 60 U.S. cents from Botswana Vaccine Institute		US \$ 108,000
Repair of handling facilities, lump sum		US \$	1,250
Paraffin for refrigerators lump sum		US \$	1,250
Wages: 3 drivers at 120 per month for 6 months		US \$	2,160
2 handy men for repair of crush pens at 100 per month for 6 months		US \$	1,200
12 handy men for 6 vaccina- tion teams for 6 months		US \$	7,200
		US \$	10,560
Fuel: 3 vehicles at 2500km per month for 6 months at 6km/litre oil at 10%		US \$	7,500
		US \$	750
		US \$	8,250
Miscellaneous: Air freight for dispatch of serum samples, lump sum		US \$	2,000
Vehicle spares		US \$	4,000
Contingences		US \$	6,000
Subsistence: 3 livestock officers for 60 days at 16 per night		US \$	2,880
6 Veterinary Assistants for 60 days at 16 per night		US \$	5,760
3 Drivers for 60 days at 10 per night		US \$	1,800
		US \$	10,440
		US \$	10,440

I RECURRENT EXPENDITURE - ZAMBIA ctdSummary

	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>
Vaccine	108,000	108,000	108,000	108,000	108,000
Repair of handling facilities	1,250	1,250	1,250	1,250	1,250
Paraffin	1,250	1,250	1,250	1,250	1,250
Wages	10,560	10,560	10,560	10,560	10,560
Fuel	8,250	8,250	8,250	8,250	8,250
Miscellaneous	2,000	2,000	2,000	2,000	2,000
Vehicle spares	4,000	4,000	4,000	4,000	4,000
Contingences	6,000	6,000	6,000	6,000	6,000
Subsistance	10,440	10,440	10,440	10,440	10,440
<u>TOTAL</u>	<u>151,750</u>	<u>151,750</u>	<u>151,750</u>	<u>151,750</u>	<u>151,750</u>

II CAPITAL EXPENDITURE - ZAMBIA

Handling facilities		
25 crush pens between Mpulungu and Nakonde at 800 each	US. \$20,000	
25 electric prodders at 40 each	US. \$ 1,000	
	<u>\$21,000</u>	US. \$21,000
Equipment for vaccination		
6 portable paraffin refrigerators at 2000	US \$12,000	
18 cool boxes at 100	US \$ 1,800	
12 automatic syringes	US \$ 720	
Kettles and stoves	US \$ 1,200	
	<u>15,720</u>	US \$15,720
Camping equipment		
6 sets of camping equipment at 3500 each		US \$21,000
Transport		
3 x 4 wheel drive at 15,000		US \$45,000
	Total	<u>US\$102,720</u>

Summary

Capital Expenditure

Handling facilities	US \$ 21,000
Equipment for vaccination	US \$ 15,720
Camping equipment	US \$ 21,000
Transport	US \$ 45,000
	<u>US \$102,720</u>

CONSOLIDATED STATEMENT OF CAPITAL AND RECURRENT EXPENDITURE (US \$) - ZAMBIA

	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>
Initial Expenditure	102,720	-	-	-	-
Recurrent Expenditure	151,750	151,750	166,925	183,617	201,979
Add 10% to previous years expenditure to compensate for inflation	-	15,175	16,692	18,362	20,198
TOTAL	254,470	166,925	183,617	201,979	222,177

FOOT & MOUTH DISEASE CONTROL - MALAWI/TANZANIA/ZAMBIA BORDERS

TOTAL COST (US\$)

	<u>1983/84</u>	<u>1984/85</u>	<u>1985/86</u>	<u>1986/87</u>	<u>1987/88</u>	<u>1988/89</u>	<u>TOTAL</u>
CAPITAL INVESTMENT	785558	150614	241102	-	59580	7986	1244840
RECURRENT EXPENDITURE	1651281.5	1687036	1718924.5	1737386.5	1757484.5	1757484.5	10309597.50
TOTAL	2436839.5	1837650	1960026.5	1737386.5	1817064.5	1765470.5	11554437.50

ECONOMIC ANALYSIS OF THE PROPOSED FMD PROJECT

YEAR	Project		Cost		Total Loss (= Gross Benefit)	Present Worth 15%	Incremental Benefit (= Cash Flow)	Present Worth 15%	Present Worth 20%
	Capital	Recurrent	Gross	Present Worth 15%					
1.	785558	1651281,50	2436939,5	2120050,3	4036831,10	3512043,0	1599991,60	1391992,2	1332793,0
2.	150614	1687036,00	1937650,0	1589263,4	4036831,10	3051844,30	2199181,10	1662580,9	1526231,6
3.	241102	1718924,50	1960026,5	1289697,50	4036831,10	2656234,80	2076804,60	1366537,4	1202469,8
4.		1737386,50	1737386,5	993785,07	4036831,10	2309067,30	2299444,60	1315282,3	1108332,2
5.	59580*	1757484,50	1817064,5	903081,05	4036831,10	2006305,60	2219766,60	1103224,0	892346,17
6	7986	1757484,50	1765470,5	762683,25	4036831,10	1743911,00	2271360,60	981227,97	760905,80
TOTAL	1244840	10309597,50	11,554,437,50	7,458,560,30	24,220,986,60	15279405,40	12,666,548,0	7820844,5	6,823,078,5

* Include purchase of New L/Rover: Motorcycles for Malawi and spare parts for Tanzania

- (1) The benefit - cost Ratio = 2,05
- (2) Net Present Worth at 15% = 7,820,844,5
- (3) Internal Rate of Return = 156,7

Economic Analysis of the Proposed FMD Project

The benefits accruing to society from having Foot and Mouth or other diseases controlled can best be measured as the costs avoided by the absence of the disease. Any disease will generate costs to society arising from production losses involved, from the costs of necessary medical measures to aid recovery, and from the non-measurable, but often significant, costs in terms of paid and stress.

For the purpose of economic appraisal of this project only benefits accruing from avoiding production losses due to FMD are considered. Benefits due to increase in livestock numbers, increase in meat and milk production or crop production (due to increase of area cultivated) are not considered. As such, the appraisal is based on the base population as given by the 1978 National Livestock Census (Tanzania), the Revised Annual Livestock Census for 1980 (Malawi) and current cattle population figures for the Northern Region of Zambia obtained from Zambia. Losses and costs are discounted for six years at 15%.

The benefit-cost ratio, the net present worth and the internal rate of return, all indicate that the project is economically viable. Furthermore, if consequential benefits were to be included in the economic analysis, the social benefits from the project would be enormous, thus making it more attractive for investment.

8. Foot & Mouth Disease Control - Southern Malawi

Responsible country:- Malawi
 Duration:- 3 years
 Related projects:- Veterinary projects

Financial summary:-

Category	Notes*	1983/84	1984/85	1985/86	Total
		-----US\$-----			
Buildings	(a)	120,070	85,500	-	205,570
Vehicles	(b)	38,210	26,930	-	65,140
Other Equipment	(c)	16,200	11,030	-	27,230
Salaries & Wage & Wages	(d)	36,450	39,140	43,050	118,640
Running Expenses	(e)	42,430	59,500	65,450	167,380
Special Expenditure (Drugs & Vaccines)	(f)	175,920	193,120	212,430	581,470
Vehicle Hire Charges	(g)	2,660	2,220	-	4,880
Total Basic Cost		<u>431,940</u>	<u>417,440</u>	<u>320,930</u>	<u>1170,310</u>
<u>Contingencies:</u>					
Physical (5%)		21,600	23,720	16,050	61,370
Price (15% compound)		77,230	141,170	124,000	342,400
Total Contingencies		<u>98,830</u>	<u>164,890</u>	<u>140,050</u>	<u>403,770</u>
Total Cost		<u><u>530,770</u></u>	<u><u>582,330</u></u>	<u><u>460,980</u></u>	<u><u>1574,080</u></u>

* see appendix p 191

Project Target

To control Foot & Mouth Disease from entering Malawi over the southern border with Mozambique and the northern border with Tanzania by bi-annual vaccinations of cattle at risk thereby inducing a high degree of immunity against the prevalent Foot & Mouth Disease virus type.

Expected Completion Date

It is expected that the project will operate under the donor funds for three years and thereafter be taken over on Revenue Account by the Malawi Government. The expected completion date is 1985/86 should the project start in 1983/84.

Background Information

To date, Foot & Mouth Disease has been a problem in Karonga and the Lower Shire Districts: The disease has repeatedly occurred in the referred two parts of Malawi. In Karonga the outbreaks have occurred for over 20 years. It has been shown that each new outbreak was caused by fresh infection and the disease has been controlled in each outbreak by movement restrictions and vaccinations. For the first time, FMD outbreak was reported in Lower Shire Valley in August 1973. The second outbreak was reported in 1976. Both of these outbreaks were successfully controlled by means of cattle movement restrictions and vaccinations. The following were the years of the outbreaks and the various virus types.

Region	Year	Month	Virus Type
N. Region (Karonga)	1957	January & August	O
"	1959	September	SAT 2
"	1962	September	O
"	1966	July	A
"	1970	November	SAT 1
"	1975	September	SAT 2
"	1981	August	A
S. Region (Lower Shire Valley)	1973	August	A
	1976	August	SAT 3

The cattle populations involved in the prophylactic vaccination programmes have been increasing each year corresponding to the increase in cattle populations in the endemic areas. Karonga and the Shire Valley are the main cattle areas in the country as shown in Table 1.

Table 1 - Total cattle population in the endemic areas and their total vaccinations against Foot & Mouth Disease

Year	<u>Cattle population in affected areas</u>			Total Vaccinations
	Lower Shire	Karonga	Total	
1969	23,827	27,228	51,055	81,240
1970	25,982	28,250	54,232	69,235
1971	35,457	30,108	65,565	55,079
1972	41,797	31,407	73,204	54,340
1973	49,656	32,475	82,131	85,385
1974	50,306	36,209	86,515	134,769
1975	58,324	40,099	98,423	125,769
1976	64,270	40,507	104,777	101,336
1977	61,551	41,262	102,813	110,691
1978	72,965	42,170	115,135	82,436
1979	76,111	41,459	117,570	7,712
1980	78,882	44,300	123,182	116,911
1981	82,554	44,864	127,418	120,741

Because of continuous traffic between the three neighbouring countries of SADCC and in addition to the movement of people and livestock in the border areas, it has been difficult for Malawi to prevent the disease entirely.

Success so far Achieved

With the bi-annual vaccinations since 1969 as shown in Table 1, and cattle movement restrictions in the event of outbreaks, the disease has been contained in the Lower Shire Valley and Karonga districts only.

Proposed Work

There is a grave risk of FMD spreading in and out of Malawi with Mozambique in Lower Shire Valley and Tanzania in Karonga. There is danger that FMD can then spread further within the country from affected areas. It is envisaged that the control programme of the disease shall be based on twice yearly vaccination of all cattle in the areas at risk and constant patrol of the border areas to prevent illegal movement of livestock and livestock products across international boundaries. Prompt reporting of suspected outbreaks on the other side of the border will be part of the exercise.

Under this project provision will be made for the establishment of border posts which shall be operational centres for FMD control activities. District Veterinary Officers shall be responsible for supervising the activities in their respective districts.

Justification for Proposed Work

FMD is a highly infectious disease which spreads easily. Unless outbreaks in Lower Shire Valley and Karonga districts are controlled, livestock improvement programmes in these areas can not be implemented effectively. Livestock

development programmes in neighbouring countries could also be affected. The continued presence of the disease in the areas could be detrimental to the marketability of farm produce from these areas because of the fact that most developed countries place restrictions on farm produce from areas where FMD is known to occur. Past outbreaks have severely restricted the movement of essential agricultural products from the infected areas which resulted in socio-economic problems in the areas concerned.

Vaccination of cattle at risk with vaccines of the type of FMD virus isolated in the areas can confer a high degree of immunity. This degree of immunity has to be maintained by vaccination at 6 month intervals. A campaign on these lines has been successful in the Karonga district over the past few years.

Execution and Supervision

The project will be undertaken by the Malawi Government and supervised by the Ministry of Agriculture through the Chief Veterinary Officer in the Department of Animal Health and Industry. As a regional project, coordination with similar programmes in neighbouring countries would be strengthened.

Appendix

Project title: Foot & Mouth Disease Control -
Southern Malawi

Responsible
Ministry/Department: Agriculture/Animal Health & Industry

SADCC project no: ADC 8

Project Officer: Chief Veterinary Officer,
Department of Animal Health & Industry,
Ministry of Agriculture,
Malawi

Financial Details:

Details of Expenditure	Notes	1983/4	1984/5	1985/6	Total
		- - - - - US\$ - - - - -			
<u>(a) Buildings:</u>					
2 x DH6 houses	(1)	35,176	35,176	-	70,352
4 x PH4 houses	(2)	33,897	11,298	-	45,195
22 x traditional houses	(3)	26,344	14,369	-	40,713
2 x store rooms & district laboratory units block	(4)	24,655	24,655	-	49,310
Sub-total		<u>120,072</u>	<u>85,498</u>	<u>-</u>	<u>205,570</u>
<u>(b) Plant & Vehicles:</u>					
2 x refrigerated LWB landrover	(5)	25,279	25,279	-	50,558
8 x motorcycles	(6)	4,949	1,650	-	6,599
2 x caravans	(7)	7,983	-	-	7,983
Sub-total		<u>38,211</u>	<u>26,929</u>	<u>-</u>	<u>65,140</u>
<u>(c) Other Equipment:</u>					
4 x refrigerators	(8)	3,506	3,506	-	7,012
camping equipment	(9)	3,757	1,878	-	5,635
protective clothing	(10)	2,360	2,360	-	4,720
branding equipment	(11)	2,818	1,409	-	4,227
vaccination equipment	(12)	3,757	1,879	-	5,636
Sub-total		<u>16,198</u>	<u>11,032</u>	<u>-</u>	<u>27,230</u>

<u>Expenditure</u>	Notes	1983/4	1984/5	1985/6	Total
		- - - - -	US\$ - - - - -	- - - - -	- - - - -
(d) <u>Personal Emoluments:</u>					
2 x veterinary officers	(13)	9,326	10,110	11,121	30,557
2 x senior technical officers	(14)	6,351	6,986	7,685	21,022
2 x technical officers	(15)	3,649	3,958	4,353	11,960
4 x senior veterinary assistants	(16)	5,925	6,518	7,170	19,613
6 x veterinary assistants	(17)	4,828	5,146	5,660	15,634
22 x veterinary scouts	(18)	5,347	5,347	5,882	16,576
2 x drivers	(19)	1,024	1,073	1,181	3,278
Sub-total		<u>36,450</u>	<u>39,138</u>	<u>43,052</u>	<u>118,640</u>
(e) <u>Running Expenses:</u>					
Transport & travel of staff	(20)	35,617	52,000	57,200	144,817
Subsistence allowance	(21)	3,783	4,162	4,578	12,523
Overtime	(22)	816	898	987	2,701
Tools & materials	(23)	2,217	2,439	2,683	7,339
Sub-total		<u>42,433</u>	<u>59,499</u>	<u>65,448</u>	<u>167,380</u>
(f) <u>Special Expenditure:</u>					
Drugs & Vaccines	(24)	175,920	193,119	212,431	581,470
Sub-total		<u>175,920</u>	<u>193,119</u>	<u>212,431</u>	<u>581,470</u>
(g) <u>Special Expenditure:</u>					
Private hire charges	(25)	2,662	2,218	-	4,880
Sub-total		<u>2,662</u>	<u>2,218</u>	<u>-</u>	<u>4,880</u>
GRANT TOTAL (BASE COST)		<u><u>431,946</u></u>	<u><u>417,433</u></u>	<u><u>320,931</u></u>	<u><u>1170,310</u></u>

Notes

- (1) Two DH6 houses to be build in 1982/83 and 1983/84 at the rate of one each year. One at Karonga Boma and the other at Ngabu for Senior Technical Officers.
- (2) Four PH4 (Mod.) houses, two at suitable strategic sites in Lower Shire Valley and two in Karonga district. Three of these to be build in year one and one in year two.
- (3) Construction of 17 traditional type houses for 17 veterinary scouts in the Lower Shire Valley and 10 veterinary scouts in Karonga district. 14 houses to be constructed in year one and 8 in year two.
- (4) Construction of two store and laboratory unit blocks at Karonga Boma and Ngabu.
- (5) Two refrigerated LWB Landrovers for FMD control, one for each of the two areas at a unit cost of 28 500.
- (6) Motorcycles for supervisory staff on livestock movement control duties. Motorcycles to be purchased in year one and year two.
- (7) Caravans for camping out by supervisory staff engaged on FMD control campaigns in the endemic areas.
- (8) Two paraffin and two electric refrigerators for the storage of vaccine and specimens.
- (9) Camping equipment shall include ridge-type tents with sleeping room and veranda, camping stretcher-type beds, sets of blankets and sheets, steel tables with folding legs, folding chairs etc.
- (10) For boots, bush shirts and shorts, gloves, laboratory coats, head gear and boiler suits.
- (11) Branding equipment to be used for branding cattle during the vaccination campaign.
- (12) Vaccination equipment to be used for vaccinating cattle during vaccination campaign.
- (13-19) Personal Emoluments for the staff to be engaged in the project.
- (20) Transport & travelling expenditure for the staff involved in FMD campaign in the two areas.
- (21) Subsistence allowance for all years has been calculated on the basis of standard rates.
- (22) Overtime for drivers and industrial class workers who from time to time may be deployed for the construction and maintenance of crushes.
- (23) For nails and timber for the construction of crushes in the strategic points in the infected areas.
- (24) FMD vaccine.
- (25) Plant and vehicle hire charges for vehicles during possible outbreaks or vaccination campaigns when the project vehicles may not be adequate.

9. Regional Foot & Mouth Vaccine Bank

BACKGROUND

The Governments of the SADCC member states have given the control of Foot and Mouth Disease a high priority since it is recognised that constant outbreaks of this disease within the region constitute a great barrier to both trade of livestock and their products not only within the region but also to international markets outside Africa.

During the last six (6) years, frequent outbreaks have occurred in Botswana, Malawi, Mozambique, Tanzania, Zambia and Zimbabwe. The virus types responsible for the outbreaks are indicated below.

Botswana and Zimbabwe	S.A.T. 1 + 2
Zambia	S.A.T. 1 + 2 + 0
Malawi	
Mozambique	One, both or all of
Tanzania	S.A.T. 1,2,0 + A.

The above outbreaks, were in the early parts of the six years period controlled with various degrees of successes by movement restrictions, quarantine measures coupled with vaccinations using imported vaccines.

In Botswana and Zimbabwe, however, the imported vaccines, particularly S.A.T. 2, proved ineffective. In view of the serious outbreak that Botswana was facing, it became imperative that an alternative source of effective vaccine against Foot and Mouth Disease should be found. A local vaccine production unit was therefore inaugurated - the Botswana vaccine Institute (B.V.I.). The vaccine produced by this Institute proved effective against the S.A.T. virus and has been proved to be of high potency.

In view of its great regional threat and difficulties experienced by some of the member states in importing vaccines from European countries in the face of an outbreak of Foot and Mouth Outbreak coupled with attendant problems of vaccine production, the B.V.I. was subsequently designated the Regional Centre for Foot and Mouth Disease Vaccine Production as well as virus typing in addition to the world virus Reference Centre for English Speaking Countries in Pirbright U.K.

The Institute is now well geared to produce sufficient vaccines to meet all the demands from member states.

The Control measures within the region have been good in the past years. However, because of factors of a non professional or Technical nature such as inadequate Foreign Exchange etc, the Standards of Foot and Mouth Disease Control measures are gradually declining.

To ensure that control measures are tightened up by all member states, control projects of a regional nature have been proposed. These are to be launched simultaneously and in a well co-ordinated manner. The success of all these projects will mainly depend on readily and constantly available potent vaccine supplies.

To overcome some of the problems such as Foreign Exchange etc, it is proposed to establish a Vaccine Bank which will take care of the supply of the required vaccine's immediately while the other Administrative/Financial problems are being sorted out.

PRESENT SITUATION OF FOOT AND MOUTH DISEASE

Currently, there is an outbreak of Foot and Mouth Disease in the Northern part of Zambia bordering Tanzania which has also an outbreak of Foot and Mouth Disease in its Southern Border with Zambia.

The situation in other member Countries is as follows:-

Botswana	-	Last recorded outbreak was	Sept,	1980
Zimbabwe	-	"	"	Nov. 1981
Malawi	-	"	"	Augu. 1981
Mozambique	-	"	"	Nov. 1981

PROJECT IMPLEMENTATION

It is proposed that the Vaccine Bank be attached to the Botswana Vaccine institute (BVI) in Gaborone and that it should be a member of the Regional Vaccine Banks for Foot and Mouth Disease on global Basis. Since the other Foot and Mouth Disease Regional Vaccine Banks are co-ordinated by the Food and Agriculture Organisation (FAO) of the United Nations, it is proposed that this Vaccine Bank be Co-ordinated by FAO in Rome. This will enable the Bank to have drawing rights (through FAO) from other Banks in the event of non immediate availability from our Bank of the Vaccine that may be urgently required by a member state.

The Vaccine Bank will ensure that:-

- (i) It has ample supplies of each member states annual requirements for its routine vaccination campaigns.
- (ii) A Common Stock of Vaccine (Strategic Reserve Vaccine) for emergencies is always available. The amount

of Reserve vaccine will be based on the 10% of the local annual requirements of each member states. In exceptional cases, and after approval by the Sub Committee a member state maybe allowed a drawing right from this reserve up to 50% only of the Reserve. This will leave sufficient quantities for any other member states that may require the use of the Emergency Vaccine.

Initially the Reserve will keep large quantities of Trivariate Vaccine (S.A.T. 1,2 and 3) and small quantities each of Monovalent S.A.T. 1 and 2.

The Botswana Vaccine Institute will have to investigate the serotypes of Type O and A within the region with a view to including these types to the vaccine Bank in future. It will be extremely important that the Strategic Reserve Vaccine kept at the Vaccine Bank must meet the minimum Agency requirements.

The vaccine used from the Reserve Stock by any member state has to be replaced immediately. where there are Foreign Exchange problems, member states are urged to seek Technical Aid to replace the vaccine on their behalf.

PROJECT ORGANISATION

As briefly outlined under implementation.

It is envisaged that the Veterinary Sub Committee will meet regularly to review the situation of both the annual and Stock Reserve Vaccine and when applicable, estimate for following year's annual requirements.

PROJECT OBJECTIVES

To improve the supply of Foot and Mouth Disease Vaccine to all member states at short notice in the face of an outbreak and also to ensure constant vaccine supplies for effective implementation to Regional and possibly eradication of Foot and Mouth Disease from the Region.

PROJECT BENEFITS

The project will make a valuable contribution in controlling, and eventually eradicating Foot and Mouth Disease thereby promoting inter-country trade within SADC countries. This will also enable those countries with enormous Livestock Industry to secure international markets which are currently inhibited by the Presence of Foot and Mouth Disease. By securing international markets, the Foreign exchange problems could be minimised.

RELATED PROJECTS

Regional Foot and Mouth Disease Control Projects.

ESTIMATED PROJECTS COSTS

The project costs are estimated on the following figures of member states annual vaccine requirements and that 10% of each member's requirements will be pooled into the COMMON STOCK FOR EMERGENCY.

The figure are as follows:

<u>Country</u>	<u>Annual requirements</u>	<u>10% to Reserve</u>
Angola	1,000,000 doses	100,000 doses
Botswana	2,000,000 doses	200,000 doses
Lesotho	-	50,000 doses
Malawi	1,000,000 doses	100,000 doses
Mozambique	1,000,000 doses	100,000 doses
Swaziland	500,000 doses	50,000 doses
Tanzania	2,000,000 doses	200,000 doses
Zambia	1,000,000 doses	100,000 doses
Zimbabwe	2,000,000 doses	200,000 doses
	<u>12,000,000 doses</u>	<u>1,200,000 doses</u>

ESTIMATED COSTS

VACCINES	1983/84	1984/85	1985/86	1986/87	1987/88
Trivalent } Monovalent ¹ } ² }	926 000	1 118 445	1 345 160	1 624 281	1 880 104
Handling } Storage charges }	46 300	55 907	64 258	70 621	94 006
	972 300	1 174 052	1 412 418	1 694 902	1 974 108

NOTES:

1. Costs are estimated in United States Dollars.
2. Vaccine Costs are estimated at Current prices.
Trivalent at 86c/dose
Monovalent at 33c/dose
3. 1 million doses of Trivalent have been estimated for Reserve.
4. 100 000 each of SAT I and II have been estimated for Reserve.
5. 5% Increase has been added to allow for Inflation.
6. Figures have been rounded up in certain cases.

10. Integrated Animal Disease Control - Tanzania

INTRODUCTION

There are many constraints limiting productivity of village livestock. These include problems of selective breeding, nutrition, diseases marketing and general management. To the producers, these constraints impose risks and insecurity especially as it concerns animal survival and maintenance of herd sizes. It is not possible, however, that improvements in all the limiting factors would be made at the same time. The improvement of animal health appears to be a good starting point and can reduce risk and uncertainty associated with cattle production in its current form.

An animal health improvement programme will reduce mortality, will increase fertility, reduce production losses, and by increasing the animal survivability and herd size, the feelings of security on the part of producers will be developed and will simultaneously provide incentive to generate cash through stock sales, and determine the ways to increase the capacity of the range resource to carry higher stock numbers.

It is because of the above reasons that an integrated approach to the control of diseases is preferred to the control of a single disease only, and an economic appraisal of programme designed for the control of four major disease conditions, namely tick control, liverfluke, blackquarter and foot and mouth disease is presented.

The programme consists of a series of activities: tick control starting from year one onwards, liverfluke control from year two onwards, blackquarter control from year four and foot and mouth disease (FMD) from year six. The intensive control and the ranking of these diseases is on the basis of their socio-economic importance found during a survey on one hand, tick borne diseases cause the most mortality in this area, and on the other FMD losses are usually more significant as the stock improves, hence the introduction of the activities for its control are introduced at an advanced stage, year six of the programme.

Operational Activities

- (a) Improvement of Tick Control - This will include rehabilitation of inserviceable dips
- construction of new dips and water facilities for the dips.
 - support facilities for laboratory work and for dip testing will be provided.

(b) Fascioliasis Control

- animals will be drenched twice a year
- six campaign teams will be provided with transport and other support facilities.

(c) Blackquarter and FMD Vaccinations

- these campaigns will start using already established facilities for stock handling.

the campaign teams and vaccination facilities will be proportionally increased.

- Blackquarter vaccinations will be done once a year to all animals above the age of six months.

FMD will be done six monthly with calves being first vaccinated at six months of age.

Economic Evaluation of the Control Systems

The economics of the programme is examined by benefit cost analysis performed over ten years.

A discount rate of 15% is used as is the normal economic planning practice in Tanzania. To show the sensitivity of the discount rate., the results have also been discounted at 18% and 12%.

Generally market prices have been used for benefits and costs but a social value is ascribed for all village consumptions. Foreign currency has been multiplied by an accounting ration of 1.5 to give a shadow price which reflects the scarcity value of foreign exchange.

Livestock population projections

Using the 1978 Livestock Census results as the initial, three cattle population projections were made and a given in Table 3.1.1, 3.1.3, and 3.1.5. The first is made using production coefficients found during the survey and assumes that they will remain constant. On the basis of individual farmers performance found during the survey and on performance by regional ranching units, the second projection is made assuming changing production coefficients with tick-control alone and the third projection assumes changing production coefficients with the extended programme, as described earlier. In the latter two projections, the population is allowed to increase and accumulate within the initial six to eight years, when it is then restricted and stabilizes close to the maximum carrying capacity of one bovine per five

hectares. The respective mortalities and sales are shown on Tables 3.1.2., 3.2.4. and 3.1.6.

Tick-control Only

3.2.1. Benefits

(i) Additional Animals for sale

These are obtained as a result of increased survival rate of animals to three years with the project. It is calculated by subtracting the number of three year old, and culled animals available for sale without the project, from those for sale with tick control project. It is assumed that 20% of these additional animals are consumed within the village and are given a social value of Tshs 950/- per head. The rest of the additional animals for sale are valued at Tshs1,800/- per bull/steer and Tshs.1,600/- for cow/heifers.

The number of additional mortalities is obtained by subtracting those with the project and those without the project. They are valued at half (50%) the village value of otherwise healthy animals. In order to show the social value and importance as a source of protein, cattle found dead or slaughtered in emergency and in extremity, it is assumed that 80% of these are constantly consumed throughout the period of the project. Their values are as shown below.

Table to show proportional value of dead animals consumed

	Calves 1Yr	Immatures 13-36m	Matures 36m
Proportion consumed	0,8	0,8	0,8
Normal value of healthy animals (Tshs)	200	650	950
Proportion of value of mortality	0,5	0,5	0,5
Product (Tshs).	80	260	380

The net value of additional animals for sale is obtained by subtracting the total value of mortalities consumed from the total value of additional animals sold/consumed for each year, as shown in Table 3.2.1.1.

(ii) Additional Milk Production

The additional milk produced with the project comes from:

(a) the base cows population without the project which has increased productivity by $144-90.45 = \text{Tshs. } 53.55$ per head per year - see below.

Table to show milk production

	Without project	With project (tick-control)
1. Lactations per year	0,67	0.75
2. Lactation yield (litres)	225	240
3. Proportion of cows milked	0.15	0.2.
4. Milk price Tshs	4	4
Product	90.45	144

(b) Additional cows generated by the project (from years) and the whole value of their production is a benefit, i.e. Tshs. 144/- per head see Table

(iii) Additional Draught Power

The average fraction of the total population which are draught animals is 0.10 and it is assumed to increase at the same rate, 0,3% with and without the tick control project.

The approximate length of the ploughing season is 78 days and the additional value of draught power per head per year is as shown below.

	Without Project	With Tick control only
1. Ploughing days per year	78	78
2. Area ploughed per day/ head	0.5	0.55
3. Hire price per acre (Tshs)	35	35
Product (Tshs)	1365	1501.5

The value of additional work due to tick control is shown in Table 3.2.1.3.

(iv) Improved Performance of Basic Population Young Stock

This included earlier age at maturity, of slaughter with higher slaughter weights, better carcass quality and subsequent higher productivity. This is calculated at 10% of the average calf value as shown below.

Table to show Improve: Performance of Base Population Young stock

Age Group	Average unit value (Tshs)	Fraction of Population	Total Value Tshs.
0 - 12 months	400	0.19	76
13 - 24 "	900	0.17	153
25 - 36 "	<u>1,400</u>	<u>0.14</u>	<u>196</u>
Sum		0.50	425

The average value of young stock is $425 = 850/-$

10% of the average value is $0.5 = \text{Tshs.}85/-$

The total benefit flow is shown in Table

3.2. COSTS

Capital Costs

1. Dip Construction and Water Development

This will include the construction of a total of 50 dips for the first five years of the project is part from dips, handling facilities and a Dip Attendant house will also be constructed.

The total cost per year for the first five years has been put at Tshs.1.130 mill/=.

The costs for water development has been put at Tshs. 201.6 thousand for the first year and then reduced to Tshs.172.32 thousand for the next four years.

Renovation of the existing dips will all be done during the first year, costing a total of Tshs.1.0905million.

2. Support Facilities and Equipment

The Regional Laboratory will be improved to cope with the anticipated activities. The acaricide testing centre and investigation room is to be modified and equiped into a proper laboratory.

3. Vehicles

Landrovers are required for supervision and monitoring. A total of four will be required in year one, two in year two and one in year four. These will be replaced after every four years.

Trucks are required for all construction purposes as well as for the delivery of acaricides. Three trucks have been estimated for and replaced every four years.

These costs and others are summarised in Table 3.2.2.1.

Recurrent Costs

Staff requirements, salaries, running costs of landrovers and trucks are all shown in table. 3.2.2.2.

No extra costs have been estimated for keeping additional animals.

This is because it is assumed that grazing practices will continue to be on communal land and that children before school age will continue to look after the herds while grazing.

The Extended Programme

3.3.1. Benefits

(i) Additional animals for sale are shown in table

(ii) Additional milk production are calculated from the assumed production parameters with and without the extended programme as shown below:

	<u>Without Project</u>	<u>With extended Programme</u>
1. Lactations per year	0.67	0.80
2. Lactation yield (litres)	225	250
3. Proportion of cows milked	0.15	0.2
4. Milk price Tshs.	4	4
Product Tsh.	90.45	160.0

(iii) Additional Draught Power

Where as in the tick control project alone draught animals increased at 0.3% per year, this rate increases to 0.4% in the extended programme, with the corresponding additional value as shown below_

	<u>Without Project</u>	<u>With extended Programme</u>
1. Ploughing days/year	78	78
2. Area ploughed/day/head	0.5	0.6
3. Hire price per acre Tsh.	35	35
Product Tshs.	1365	1638

The total value are shown in Table 3.3.1.3.

(iv) Avoidance of Permanent Disability in Draught Animals

In the survey 1% of the total oxen became permanently lame with FMD infection. The total value of losses avoided is shown in table 3.3.1.4.

(v) Improved performance of Base Population Young Stock

The benefit flow is shown in table 3.3.1.5.

(vi) Value of Condemned Livers

The value of condemned livers = total animals slaughtered and which are liver fluke positive average price of liver. It is assumed that cattle slaughtered equals total offtake - mortality- and also that 11% of the infected animals with

the extended project will have their livers condemned at slaughter.

See below

	Without Project	With extended project
1. Proportion of cattle slaughtered	0.03	0.11
2. Proportion of livers condemned	0.50	0.11
3. Average liver weight (kg.)	3.5	3.5
4. Price of liver/kg Tshs.	12	12
Product Tsh.	0.63	0.51

The total value is shown in Table 3.3.1.6.

3.3.2 Costs

These costs are for fascioliasis control, and extra costs for Blackquarter FMD control.

(a) Eascioloasis Control

(i) Stock handling facilities will be needed in the villages. Crushes will be needed and a total of 93 will be built in the first three years of the project at the cost of Tsh.19000 each. The total costs are shown in Table 3.3.2.1.

(ii) Vehicles These will be used for transporting six campaign teams to be supervised by three Livestock Field Officers. Four of these will become part of the permanent campaign teams from year four. Thus three land rovers (L/R) are bought at the start of the control in year two but only two will be replaced every four years at a shadow price of Tshs.330,00/=.

Trucks are required for transport and construction especially in the first three years of the project. Two trucks will be bought at the start of fascioliasis control in year two at a shadow price of Tshs.320.000/= but only one truck will be replaced every four years.

Motorcycles will be bought for Field Assistants to enable them to pass information to villages a day or two before the campaign day. Three motorcycles estimated at Tshs. 18000 each and two will be replaced every four years.

Total costs for vehicles are shown on table. 3.3.2.1

(iii) Staff Requirements and Costs

The need for two Veterinary Officers (VO) for the overall organisation and supervision of the programme is a prerequisite for the success of the programme.

Under each of the 3LFOs there will be 5 Livestock Field Assistants. Total costs are shown in table From year four onwards campaign teams become permanent only 2 L.F.O. and 10 L.F.A. are estimated for under liverfluke control project, the other will be considered under Blackquarter control.

(iv) Antihelmintic Requirement

The population will be drenched twice per annum using a broadspectrum antihelmintic. A shadow of Tsh.10.38 per dose has been estimated. Total cost is given on table 3.3.2.1

(v) Drenching Guns

Drenching will be done by LFA's. A total of 45 drenching guns have been estimated per year initially, of which 15 are on stand-by. The increase in the number of teams in years four and six have been considered. Drenching guns are costed at a shadow price of Tsh.85/=each. Total cost is given on table 3.3.2.1

(vi) Running Costs for Vehicles

These are costed as for tick control and total costs are shown below:

Project year	1	2	3	4	5	6-20
1. Land Rover		165.0	165.0	165.0	165.0	110.0
2. Truck		250.0	250.0	250.0	250.0	125.0
3. Motorcycles		43.0	43.0	43.0	43.0	28.0
Total Tshs. (000)		458.0	458.0	458.0	458.0	263.0

(b) Costs for Blackquarter Vaccinations

(i) Vaccines

All cattle above six months will be vaccinated once a year with half of the calves qualifying for vaccination. Small stock, goats and sheep will also be vaccinated in the first three years of the project. A shadow price of Tshs.1.50 per dose is used. Total requirements are shown in table 3.3.2.2. and total costs are shown in table Emergency antibiotic treatments have been estimated, 25,000 doses in the first year reducing to 3,000 doses doses in year 7, at Tshs.15.65 per dose and are shown on the same table, 3.3.2.2.

(ii) Vehicles

Landrovers to be used for the additional vaccination teams are on the same basis as for liverfluke control. Two landrovers are purchased at the start of the project and replaced every four years. Similarly, two motorcycles will be purchased and replaced. Purchases are shown in table and costs appear in table. 3.3.2.3.

(iii) Base Equipment

Refrigerators are required for vaccine storage, one in use and one standby. A small generator is required in case of power failures. Their costs are shown below and will be replaced every five years.

	No.	Unit Cost Tsh	Total Cost Tshs
Refrigerators	2	7320	14640
Generator	1	9000	9000
Miscellaneous equipment		50000	50000
Total Rsh.			73640

(iv) Field Equipment

Team vaccination requirements are shown below

	Quantity per team	Unit Cost T.shs.	Total Quantities	Total Cost Tshs.
1. Vacuum flasks	4	180	32	5760
2. Refrigerators	1	5770	8	46160
3. Multiple dose syringes	6	450	48	21600
4. Sterilizers	1	540	8	4320
5. Pliers for eartags	2	270	16	4320
Total value Tshs.				82160

Half of the vacuum flasks, syringes and pliers are replaced every year and refrigerators are replaced every three years. The sterilizers are replaced every four years.

(v) Ear Tags

For movements and vaccination recording purposes all bovines must be identified by ear tags. These must be easy to read. These are estimated at a replacement rate of 10% per year and a purchase cost of T.shs. 4 per 1000. Total costs are shown in table 3.3.2.3.

(vi) Additional Staff Requirements and cost

These include additional staff for the vaccination teams and drivers as well as their salaries per year as shown in table 3.3.2.3.

Table: 3.3.2.4. Additional Staff Costs

	Number required	Unit Salary Tshs.	Total Salaries Tshs. (000)
L.F.O.	2	176000	352.0
L.F.A.	20	131000	2620.0
Drivers	2	96000	192.0
TOTAL			3164.0

- (c) Costs for Foot and Mouth disease control1. Vaccines

All animals over one year of age will be vaccinated twice per year at about six months intervals. Calves will receive one dose at about six months of age. Estimates for emergency ring vaccination reduced from 30,000 vaccines in year six, reduced to 10,000 vaccines from year ten. Small ruminants, goat/sheep, will be vaccinated in the first five years. Holding grounds will handle about 20,000 vaccines each year. Total requirements are shown in table 3.3.2.5 and total costs are summarised in table 3.3.2.6. A shadow price of TShs.7.50 per dose has been used.

2. Holding Grounds

These will be utilized from observation and vaccination of animals moving into the regions. From the knowledge of animals movements two strategic entry points are suggested.

- INYONGA where 10,000 hectares are required.

KIFETA/LAELA area of about 2,000 hectares.

The final location will be selected depending on availability of other necessities e.g. Water availability. Estimated costs are shown below in table 3.3.2.7.

Table 3.3.2.7. Holding Ground Establishment Costs

	Total Units	Unit Cost Tshs.	Total Cost Tshs. (000)
1. INYONGA			
1.1 Fence (000m)	40	140	5600
1.2. Crush/handling yard	1	19000	19
1.3. Dip + house of att.	1	94000	94

2. KIPETA/LAELA

2.1 Fence (000m)	8	140	1120
2.2. Crush/handling yard	1	19000	19
2.3. Dip + house of att.	1	94000	94

3. Vehicles

Landrover - only one additional landrover is required for use by the additional vaccination teams under one L.F.O.

Truck - one is required especially at the start of the project for construction work.

Motorcycle - only one is estimated for use by the L.F.O.'s Assistant. Shadow prices have been used as before and are summarised in table 3.3.2.6.

4. Base Equipment

Three additional refrigerators are required- two in use and one standby, for storing vaccines. Additional equipment will be supplied to Sumbawanga Laboratory where they will be housed. Total costs are shown in table 3.3.2.8.

Table: 3.3.2.8. Base equipment costs

	Units	Unit Cost Tshs	Total Cost Tshs. (000)
1. Refrigerators	3	7320	22.0
2. Miscellaneous equipment		90000	90.0
TOTAL			112.0

These will be replaced every 5 years.

5. Field Equipment

Team vaccination requirements are shown below..

Table: 3.3.2.9. Field Equipment costs

	Quantity per team	Unit Cost Tshs.	Total	Total Cost Tshs (000)
1. Vacuum flasks	4	180	8	1.5
2. Refrigerators	1	5770	3	17.3
3. Multiple dose syringes	6	450	12	5.4
4. Sterilizers	1	540	3	1.6
5. Pliers for ear tag	2	270	4	1.1.
Total value TShs.				26.9

Half of the vaccuum flasks- syringes and pliers are replaced every year, refrigerators are replaced every four years.

6. Additional Ear Tags

Basic requirements have been considered under Blackquarter control section. Additional ear tags are required for small ruminants, goats/ sheep, in the five years of the project.

Total cost are shown in table 3.3.2.6.

7. Additional Staff requirements and costs

These include additional staff for the vaccination teams and drivers as shown below.

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Table 3.3.2.11 Summary of the Economic Analysis

Project	<u>Present Values at 15%</u>			Net Present Values	<u>Present Values at 12%</u>			Net Present Value	<u>Present Values at 10%</u>			Net Present Values
	Benefits	Costs	B/C Ratio		Benefits	Costs	B/C Ratio		Benefits	Costs	B/C Ratio	
1. Tick Control only	149073.2	33775.9	4.41	115297.3	134217.9	22016.3	6.09	112201.6	79613.7	13059.4	6.09	66554.3
2. Extended Programme	213403.2	107195.9	1.99	106207.3	194230.9	101966.1	1.90	92264.8	115211.5	68642.6	1.67	46568.9

Internal Rate of Return of Tick Control Only is 22.1%

Internal Rate of Return of Extended Programme is 20.3%

Discussion of Analysis

1.99
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This economic assessment of the feasibility of introducing a broad animal health programme gives a benefit - cost ratio of discounted at 15% over a ten year period. It also gives a present worth net present worth of 115297.3 and an internal rate of return of 20.3%. The returns suggest that the programme should receive high priority among the various investments that could be made to improve the traditional herd productivity. It must be stressed, however, that in order to gain the benefit, the whole programme must be taken as a package. This benefit is secure in that it is spread over a wide range of activities which consider many different aspects of disease control in the livestock industry. Partial implementation will result in higher input costs, reduction in profitability and greater risk of failure.

If the project is seen as a starting point for the overall improvement of the livestock industry, then the benefits shown are very conservative. It is expected that on this foundation will be superimposed other projects to tackle other livestock improvement constraints, viz. breeding, nutrition and marketing. Other benefits remain unquantified including the generally improved health of animals, avoidance of zoonoses and better nutrition of farm families.

The end product of health improvements, reduced mortality, increased fertility and reduced production losses, is an achievement of a more predictable and dependable output. With more and healthier animals to herd, the farmer will be more prepared to invest capital to bring about further improvements.

The higher benefit/Cost ratio of for tick control alone suggests that this is a more attractive project. This can be accounted for by the substantial amount of investment which already exists and need not be replaced in the course of the project. The project assumes that these existing investments will be utilized efficiently and have not been incorporated as a cost. It is suggested, therefore, that the tick control project could be a preparatory step toward the more comprehensive programme. The extended programme carries with it so many unquantified and long term benefits as well as sociological implications that it is far more worthy of adaptation than the economic assessment suggests.

Table 3.1.1. Herd Projection without projection

	1	2	3	4	5	6	7	8	9	10
<u>I BREEDING COMPOSITION</u>										
1. Breeding cows	82514	87226	90414	92766	95742	98620	101537	104571	107697	110912
2. Calves < 1 year	26322	27825	28842	29592	30542	31460	32390	33358	34350	35381
3. Heifers 1-2 years	13018	12371	13078	13556	13908	14355	14786	15223	15678	16144
4. Bulls/steers 1-2 years	13018	12371	13078	13556	13908	14355	14786	15223	15678	16144
5. Heifers 2-3 years	13347	12139	11536	12454	12641	12969	13386	13788	14195	14619
6. Bulls/steers 2-3 years	14024	11992	11227	12304	12488	12812	13224	13621	14023	14443
7. Bulls/steers > 3 years	22702	30276	34845	37981	41454	44469	47221	49830	52308	54682
TOTAL ANIMALS	184945	194200	203020	212209	220683	229040	237330	245614	253929	262325

II. PRODUCTION COEFFICIENTS

1. Calving rate %	58
2. Calf mortality rate %	45
3. Mortality of others %	6
4. Culling rate cows %	3.2
5. Culling rate heifers 2-3 years %	0.8
6. Culling rate bulls/steers 2-3 yr %	2.0
7. Culling rate bulls/steers 2-3 yr %	12.3

Table 3.1.2 Mortalities and Sales - without project

	1	2	3	4	5	6	7	8	9	10
<u>I. MORTALITIES</u>										
1. Cows	5444	5752	5962	6117	6313	6503	6695	6895	7101	7313
2. Calves <1 year	21536	22766	23598	24212	24989	25740	26501	27293	28109	28948
3. Heifers 1-2 years	831	790	835	865	888	916	944	972	1001	1030
4. Bulls/Steers 1-2 years	831	790	742	865	888	916	944	972	1001	1030
5. Heifers 2-3 years	859	781	742	785	813	834	861	887	913	941
6. Bulls/Steers 2-3 years	913	781	742	785	813	834	861	887	913	941
7. Bulls/Steers >3 years	1625	2204	2536	2764	3017	3236	3437	3627	3807	3980
TOTAL MORTALITY	32066	33864	35250	36393	37721	38979	40243	41533	42845	44183
<u>II. SALES</u>										
1. Cull cows	2728	2883	2989	3067	3165	3260	3357	3457	3580	3666
2. Cull heifers 2-3 years	108	98	93	100	102	105	108	111	114	118
3. Bulls/Steers 2-3 years	286	233	233	251	255	261	270	278	286	295
4. Bulls/Steers >3 years	3184	4246	4887	5327	5814	6237	6623	6989	7336	7669
TOTAL SALES	6306	7472	8202	8745	9336	9863	10358	10835	11296	11748

Table 3.1.3. Herd Projection - without tick control alone

	1	2	3	4	5	6	7	8	9	10
<u>I. HERD COMPOSITION</u>										
1. Cows	82514	87393	90687	94897	101567	112490	120911	129778	138715	146701
2. Calves < 1 year	31644	38383	43294	48587	53475	59957	64445	69171	73935	78192
3. Heifers 1-2 years	13018	14873	18232	20564	23079	25401	28480	30612	32856	35119
4. Bulls/steers 1-2 years	13018	14873	18232	20564	23079	25401	28480	30612	32856	35119
5. Heifers 2-3 years	13320	12053	13917	17060	19145	21487	23648	26380	28209	30121
6. Bulls/Steers 2-3 years	13861	11503	12999	15762	17582	19513	20994	23268	24719	26219
7. Bulls/Steers > 3 years	22262	23842	32147	35539	39892	44140	48274	51868	55541	58558
TOTAL ANIMALS	189657	207920	229508	252973	277819	318389	335232	361689	366831	410029
<u>II. PRODUCTION COEFFICIENTS</u>										
1. Calving rate	%	59	61	62	64	65				65
2. Colmortality	%	35	28	23	20	19	18			18
3. Mortality of heifers 1-3 years	%	6	6	5						5
4. Mortality of cows	%	6	5.5	5.5						55
5. Mortality of Bulls/Steers 1-3 years	%	6	6	5						5
6. Mortality of Bulls/Steers 3 years	%	6	5	4						4
7. Culling rate cows	%	3.2	3.5	3.5	4	4	4.5	4.5	5	6
8. Culling rate heifers 2-3 years	%	1.0	1.5	1.5	1.5	2	2	2.0	2.5	3
9. Culling rate bulls/Steers 1-3 years	%	3	6	8	9	10	11	13	14	15
10. Culling rate bulls/Steers > 3 years	%	14	16	17	18	19	20	21	22	23

Table 3.1.4 Mortality and Sales - with tick control alone

	1	2	3	4	5	6	7	8	9	10
<u>I. MORTALITIES</u>										
1. Cows	5444	5271	5470	5753	6153	6856	7369	7951	8589	9181
2. Calves 1 year	17039	14927	12932	12147	12544	13161	14147	15184	16230	17164
3. Heifers 1-2 years	831	949	960	1082	1215	1337	1499	1611	1729	1848
4. Bulls/Steers 1-2 years	831	949	960	1082	1215	1337	1499	1611	1729	1848
5. Heifers 2-3 years	859	781	743	912	1028	1154	1270	1424	1531	1642
6. Bulls/Steers 2-3 years	913	781	743	912	1028	1154	1270	1424	1531	1642
7. Bulls/Steers 3 years	1652	1807	1614	1806	2052	2299	2546	2771	3005	3210
TOTAL MORTALITIES	27569	25467	23422	23694	25240	27298	29600	31976	34344	36535
<u>II. SALES</u>										
1. Cull cows	2728	3170	3289	3954	4232	5301	5697	6830	8854	11042
2. Heifers 2-3 years	135	184	212	260	391	439	483	676	872	1092
3. Bull/Steers 2-3 years	429	734	1130	1559	1954	2412	3137	3788	4362	4994
4. Bulls/Steers 3 years	3624	5494	6584	7801	9357	11035	12832	14629	16590	18492
TOTAL SALES	6916	9582	11215	13574	15934	19187	22149	25923	30678	35620

Table 3.1.5. Herd Projection - extended programme

	1	2	3	4	5	6	7	8	9	10
<u>I. HERD COMPOSITION</u>										
1. Cows	82514	87393	90695	94845	103697	1120807	123710	135086	144824	152346
2. Calves 1 year	31644	41293	47161	54014	61347	68496	76203	83213	89211	93845
3. Heifers 1-2 years	13018	14872	19614	22637	25927	29447	32878	36578	39942	42821
4. Bulls/Steers 1-2 years	13018	14872	19614	22637	25927	29447	32878	36578	39942	42821
5. Heifers 2-3 years	13320	12053	13846	18453	21297	24268	27562	30616	33359	36044
6. Bulls/Steers 2-3 years	13881	11503	12857	16758	18906	21405	24027	26513	28794	31059
7. Bulls/Steers 3 years	22262	28842	31372	33718	38190	42645	47218	50614	54614	57445
TOTAL ANIMALS	189657	210828	235159	263062	295291	328515	364480	399198	430686	456379
<u>II. PRODUCTION COEFFICIENTS</u>										
1. Calving rate	%	59	63	65	67	68	69	70		70
2. Calf mortality	%	35	25	20	15	13	13	12		12
3. Mortality of heifers 1-3 years	%	6	6	5	4					4
4. Mortality of cows	%	6	5.5	5						5
5. Mortality of bulls/steers 1-3 years	%	6	6	4	4					4
6. Mortality of bulls/steers 3 years	%	6	5	4	3.5	3				3
7. Culling rate cows	%	3.2	3.5	4	4.5	4.5	5	5	6	8
8. Culling rate heifers 2-3 years	%	1.0	1.5	2	2	2	2.5	2.5	3	5
9. Culling rate bulls/steers 2-3 years	%	3.0	6	9	11	13	14	15	16	18
10. Culling rate bulls/steers 3 years	%	14.0	16	19	21	22	23	24	26	27

Table 3.1.6 Mortality and Sales - extended programme

	1	2	3	4	5	6	7	8	9	10
I. MORTALITY										
1. Cows	5444	5271	4972	5227	5665	6250	6854	7564	8285	8909
2. Calves<1 year	17039	13764	11790	9532	9167	9340	10392	11347	12165	12797
3. Heifers 1-2 years	831	949	1035	943	1080	1227	1370	1524	1664	1784
4. Bulls/Steers 1-2 years	831	949	1035	943	1080	1227	1370	1524	1664	1784
5. Heifers 2-3 years	859	781	744	785	905	1037	1178	1315	1463	1598
6. Bulls/Steers 2-3 years	913	781	744	785	905	1037	1178	1315	1463	1598
7. Bulls/Steers> 3 years	1652	1807	1614	1548	1514	1713	1921	2850	2314	2502
TOTAL MORTALITY	27569	24302	21934	19763	20316	21831	24263	27439	29018	30972
II SALES										
1. Cull cows	2728	3170	3779	4469	4886	5937	6511	8622	12593	16927
2. Heifers 2-3 years	135	184	283	337	435	622	707	947	1756	2301
3. Bulls/Steers 2-3 years	429	734	1272	2071	2825	3485	4240	5050	6321	7285
4. Bulls/Steers> 3 years	3624	5494	7359	8963	10772	12738	14911	17783	20200	23463
TOTAL SALES	6916	9582	12693	15880	18918	22782	26369	32402	40870	49976

Table 3.2.1.1 Value of additional animals for sale (tick control alone)

	1	2	3	4	5	6	7	8	9	10
1. Total additional animals for sale	610	2110	3013	4829	6598	9324	11791	15088	19382	23872
2. Culls/sales village consumed	122	422	603	966	1320	1865	2358	3017	3876	4774
= Value at Tsh. 950 (000)	119.9	400.9	572.9	917.7	1254.0	1771.8	2240.1	2866.2	3682.2	4535.3
3. Sales for slaughter										
(a) Bulls /steers	288	1097	1663	2665	3747	5296	6886	8570	10544	12605
= Value at Tsh. 1800 (000)	518.4	1974.6	2993.4	4797.0	6744.6	9532.8	12394.8	15426.0	18979.2	22689.0
(b) Cows/Heifers	200	591	747	1198	1531	2163	2547	3501	4962	6493
= Value at Tsh. 1600 (000)	320.0	945.6	1195.2	1916.8	2449.6	3460.8	4075.2	5601.6	7939.2	10388.8
A. SUBTOTAL TSH (000)	954.3	3321.1	4761.5	7631.5	10448.2	14765.4	18710.1	23893.8	30600.6	37613.1
<u>MORTALITY CONSUMED</u>										
4. Additional Calves	4497	7839	10666	12065	12445	12579	12354	12109	11879	11784
= Value at Tsh.80 (000)	359.8	627.1	853.3	965.2	995.6	1006.3	988.3	968.7	950.3	942.7
5. Additional immatures	0	-264	-252	-688	-1084	-1482	-1928	-2352	-2692	-3038
= Value at Tsh. 260 (000)	0	-68.6	-65.5	-178.9	-281.8	-385.3	-501.3	-611.5	-699.9	-789.3
6. Additional matures	0	878	1414	1322	1120	584	218	-200	-686	-1098
= Value at Tsh. 380 (000)	0	333.6	537.3	502.6	425.6	221.9	82.8	-76.0	-260.7	-417.2
B. SUBTOTAL TSH. (000)	359.8	892.1	1325.1	1288.7	1139.4	842.9	569.8	281	-10.3	-264.4
TOTAL VALUE (A-B) TSH. (000)	594.5	2429.0	3436.4	6342.8	9308.8	13922.5	18140.2	22361.2	30610.9	37877.5

Table 3.2.1.2 Additional milk production

	1	2	3	4	5	6	7	8	9	10
1. Total cows without the project	82514	87226	90414	92766	95742	98620	101537	104571	107697	110912
= Values of additional production at Tsh. 53.55(000)	-	4671.0	4841.7	4967.6	5127.0	5281.1	5437.3	5599.8	5767.2	5939.3
2. Number of additional cows with project					5825	13870	19374	25207	31018	35789
=Value of production at Tsh. 144.00(000)					838.8	1997.3	2789.9	3629.9	4466.6	5153.6
TOTAL VALUE TSH. (000)	-	4671.0	4841.7	4967.6	5965.8	7278.4	8227.2	9229.7	10233.8	11092.9

Table 3.2.1.3. Additional draught power

1. Fraction of population as draught animals	0.10	0.103	0.106	0.109	0.112	0.115	0.118	0.121	0.124	0.127
2. Population with Tick Control	189657	207920	229508	252973	277819	308389	335232	361689	386831	410029
3. Total value of draught power at Tsh. 150 (000)	-	32155.8	6528.3	41402.4	46720.3	53250.3	59395.4	65712.2	72022.5	78188.6
4. Population without project	184945	194200	203020	212209	220683	229040	237330	245614	253929	262325
5. Total value of draught power without project at Tsh. 1365(000)	-	27303.5	29375.0	31573.5	33738.0	35953.6	38226.7	40566.8	42980.0	45475.4
Additional value of draught power (3-5) Tsh. (000)	-	4852.9	7153.3	9828.9	12982.3	17296.7	21168.7	25145.4	29042.5	32713.2

Table 3.2.1.4. Improved performance of base population's Young Stock

	1	2	3	4	5	6	7	8	9	10
1. Base population	184945	194200	203020	212209	220683	229040	237330	245614	253929	262325
2. Fraction of population young stock	0.5	0.5								
3. Additional value per head (Tsh.)	85.0	85.0								
TOTAL BENEFIT TSH (000)	7860.2	8253.5	8628.4	9018.9	9379.0	9734.2	10086.8	10438.6	10792.0	11148.8

Table 3.2.1. 5 Summary of Benefits from tick control alone

1. Additional animals consumed and for sale	594.5	3436.4	3436.4	6342.8	9308.8	13922.5	18140.2	23612.6	30610.9	37877.5
2. Additional milk production	-	4671.0	4841.7	4967.6	5965.8	7278.4	8227.2	9229.7	10233.8	11092.9
3. Additional draught power	-	4352.9	7153.3	9828.9	12982.3	17296.7	21168.7	25145.4	29042.5	32713.2
4. Improved performance of young stock	7860.2	8253.5	8628.4	9018.9	9379.0	9734.2	10086.5	10438.6	10792.0	11148.8
Sum T.Sh. (000)	8454.7	20206.4	24059.8	30158.2	37635.9	48231.8	57622.6	68426.3	80679.2	92832.4
Control Factor	0	0.1	0.5	0.7	0.9	1.0				
Total Value	-	2020.6	12029.9	21110.7	33872.3	48231.8	57622.6	68426.3	80679.2	92832.4
DISCOUNTED VALUES AT 15% TSH (000)	-	1527.6	7915.7	12075.3	16834.5	20836.1	21666.1	22375.4	22912.9	22929.6

TOTAL DISCOUNTED VALUE TSH. (000) = 149073.2

Table 3.2.2.1. Support facilities and equipment - establishment costs

	1	2	3	4	5	6	7	8	9	10
1. Storage shed for acaricide at Tsh. 55,000 (000)	55.0									
2. Dip Testing Centre and Investigation Room at 125,000	37.5									
3. Equipment for Dip Testing and Field Investigation at Tsh. 5000 per set	15.0	-	15.0	-	15.0	-	15.0	-	15.0	-
4. Dip Tools at Tsh. 200 per Dip	9.4	2.0	2.0	2.0	2.0	9.4	2.0	2.0	2.0	2.0
5. Improvement of Regional Laboratory	25.0	-	-	-	-	-	-	-	-	-
6. Transport Vehicles - Landrovers	1320.0	660.0	-	330.0	1120.0	660.0	-	330.0	1320.0	660.0
- Trucks	640.0	-	320.0	-	640.0	-	320.0	-	640.0	-
- Motorcycles	216.0	36.0	36.0	36.0	252.0	36.0	36.0	36.0	252.0	36.0
TOTAL COSTS TSH. (000)	2317.9	698.0	373.0	368.0	2229.0	705.4	373.0	368.0	2229.0	698.0

Table 3.2.2.2 Staff Requirements, acaricides and recurrent costs

	1	2	3	4	5	6	7	8	9	10
Staff Requirements and costs										
(i) VO - at 37100 p.a.	2									
(ii) LFO - at 17600	2	2	3	3	4					
(iii) LFA - at 13100 p.a.	10	14	16	18	20					
(iv) Drivers - at 9600 p.a.	6	8	9	10						
(v) Clerk/Store/cleaner at 7200 p.a.	3									
Sub-total costs Tsh. (000)	319.6	391.2	444.6	480.4	524.2	524.2	524.2	524.2	524.2	524.2
Acaricides at 8.47 Tsh (000)	1606.4	1785.7	1991.8	2228.1	2501.1	2782.5	3087.1	3381.2	3647.9	3865.5
Maintenance costs and depreciation										
(i) Dip & stock handling facilities	153.4	351.2	416.2	489.2	562.2	635.2				
(ii) Buildings	-	49.2	86.2	129.2	169.2	209.2				
(iii) Water supply	-	77.6	94.0	110.6	127.0	143.6				
Sub-total Tsh (000)	153.4	478.0	599.4	729.0	858.4	988.0	988.0	988.0	988.0	988.0
Running costs of vehicles										
(i) Land Rovers	220.0	330.0	330.0	385.0						
(ii) Trucks	250.0	250.0	375.0							
(iii) Motorcycles	172.6	201.6	230.4	259.2	288.0					
Sub-total	642.6	781.6	935.4	1019.2	1048.0	1048.0	1048.0	1048.0	1048.0	1048.0
Recording and administration Tsh	130.0									
TOTAL TSH (000)	8852.2	3566.5	4101.2	4586.7	5061.7	5472.7	5777.3	6071.4	6838.1	6555.7

Table 3.2.2.3 Tick Control Costs - Summary

	1	2	3	4	5	6	7	8	9	10
1. Construction of new dipping centres	1130.0	1130.0	1130.0	1130.0	1130.0					
2. Water development	201.6	172.32	172.32	172.32	172.32					
3. Renovations & repairs to existing dips	1090.0									
4. Support facilities & equipment	2317.9	698	373.0	368.0	2229.0	705.4	373.0	368.0	2229.0	698.0
5. Staff salaries	319.6	391.2	444.6	480.4	524.2	524.2	524.2	524.2	524.2	524.2
6. Acaricides	1606.4	1785.7	1991.8	2228.1	2501.1	2782.5	3087.1	3381.2	3647.9	3865.5
7. Maintenance & depreciation	153.4	478.0	599.4	729.4	858.4	988.0	988.0	988.0	988.0	988.0
8. Vehicle running costs	642.8	781.6	935.4	1019.2	1048.0	1048.0	1048.0	1048.0	1048.0	1048.0
9. Recording, office and general	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0
Sum Tsh (000)	7591.7	5566.8	5776.5	6257.0	8593.0	6178.1	6150.3	6439.4	8567.1	7253.7
DISCOUNTED VALUE AT 15%	6604.8	4208.5	3800.9	3579.0	4270.7	2668.9	2312.5	2105.7	2433.1	1791.7

TOTAL DISCOUNTED VALUE TSH (000) = 33775.9

Table 3.3.1.1 Additional animals for sale with the programme

	1	2	3	4	5	6	7	8	9	10
1. Total additional for sale	610	2110	4419	6835	9581	12919	16011	215567	29574	37337
2. Culls/Sales village consumed	122	422	898	1367	1916	2584	3202	4313	5915	7467
= Value at Tsh. 950 (000)	115.9	400.9	853.1	1298.7	1820.2	2454.8	3041.9	4097.4	5619.3	7093.7
3. Sales for slaughter										
(a) Bulls/steers	288	1097	2443	3773	5519	7337	9351	12250	15378	18519
= Value at Tsh 1800 (000)	518.4	1974.6	4397.4	6791.4	9934.2	13208.4	16831.8	22050.0	27680.4	33334.2
(b) Cows/Heifers	200	591	1150	1695	2146	2997	3458	5004	8281	11351
= Value at Tsh 1600 (000)	320.0	945.6	1840.0	2712.0	3433.6	4795.2	5532.8	8006.4	13249.6	18161.6
A. Sub-Total Tsh. (000)	954.3	3321.1	7090.5	10793.1	15188.6	20458.4	25406.5	34153.8	46549.3	58589.5
<u>Mortalities consumed</u>										
4. Additional calves	4497	9002	11808	14680	15822	16400	16109	15946	15944	16152
= Value at Tsh 80 (000)	359.8	720.2	944.6	1174.4	1265.8	1312.0	1288.7	1275.7	1275.3	1292.2
5. Additional immatures	0	-312	-404	-156	-568	-1028	-1486	-1960	-2426	-2822
= Value at Tsh 260 (000)	0	-82.7	-105.0	-40.6	-147.7	-267.3	-386.4	-509.6	-630.8	-733.7
6. Additional matures	0	878	1912	2105	2151	1776	1357	108	309	-118
= Value at Tsh 380 (000)	0	333.6	726.6	799.9	817.4	674.9	515.7	41.0	117.4	-44.8
B. Sub-total Tsh. (000)	359.8	971.1	1566.2	1933.7	1935.5	1719.6	1418	307.1	762.1	513.7
TOTAL VALUE (A-B) TSH (OOO)	594.5	2350.0	5524.3	8859.3	13252.5	18738.8	23988.5	33346.7	45787.2	58075.8

Table No. 3.3.1.2. Additional milk production

	1	2	3	4	5	6	7	8	9	10
1. Total cows milked without the project	82514	87226	90414	92766	95742	98620	101537	104571	107697	110912
Value of additional production at sh. 69.55 (000)	-	6066.6	6288.3	6451.9	6658.9	6859.0	7061.9	7272.9	7490.3	7713.9
2. Number of additional cows with project					7955	14187	22173	30515	37127	41434
Value at Tsh. 160 (000)					1272.8	2269.9	3547.7	4882.4	5940.3	6629.4
Total Value Tsh. (000)		6066.6	6288.3	6451.9	7931.7	19128.9	10609.6	12155.5	13430.6	14343.3

Table 3.3.1.3 Additional draught power

1. Population with the programme	189657	210828	235159	263062	295291	328515	364480	399198	430686	456379
2. Fraction of population as draught animals	0.10	0.104	0.108	0.112	0.116	0.120	0.124	0.126	0.132	0.136
3. Total value of draught power with programme at Tsh 1638 (000)		35915.0	41600.6	48260.3	56107.7	64572.9	74030.3	83697.4	93121.2	101666.6
4. Total value draught power without project		27303.5	29375.0	31573.5	33738.0	35953.6	38226.7	40566.8	42980.0	45475.4
Additional value of draught power Tsh. (000)	-	8611.5	12225.6	16686.8	22369.7	28619.3	35803.6	43130.6	50141.2	56191.2

Table 3.3.1.4 Avoidance of permanent disability in draught animals

	1	2	3	4	5	6	7	8	9	10
1. Population with programme	189657	210828	235159	263062	295291	328515	364480	399198	430686	456379
2. Fraction of population as draught						0.125	0.13	0.135	0.14	0.145
3. Total value avoided at Tsh 8 per head (000)							379.1	431.1	482.4	529.4

Table 3.3.1.5 Improved performance of base population's young stock

	1	2	3	4	5	6	7	8	9	10
1. Base population	184945	194200	203020	212209	220683	229040	237330	245614	253929	262325
2. Fraction of population	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
3. Additional value per head Tsh.	86.94	86.94	86.94	86.94	86.94	86.94	86.94	86.94	86.94	86.94
4. Total benefit Tsh. (000)	7878.7	8273.0	8648.8	9040.2	9401.2	9757.0	10110.4	10463.3		

Table 3.3.1.6 SUMMARY OF BENEFITS FROM EXTENDED PROGRAMME

1. Additional animals for sale and consumed	594.5	2350.0	5524.3	8859.4	13252.5	18738.8	23988.5	33246.6	45787.2	58075.8
2. Additional milk production	-	6066.8	6288.3	6451.9	7931.7	9128.9	10609.6	12155.3	13430.6	14343.3
3. Additional draught power	-	8611.5	12225.6	16686.8	22369.7	28619.3	35803.6	43130.6	50141.2	56191.2
4. Avoidance of permanent disability of oxen	-	-	-	-	-	-	379.1	431.1	482.4	529.4
5. Improved performance of young stock	7878.7	8273.0	8648.8	9040.2	9401.2	9757.0	10110.4	10463.3	10817.5	11175.2
6. Avoided value of condemned livers			28.2	31.2	35.5	39.4	43.7	47.9	51.6	54.8
Sum Tsh. (000)		25301.2	32715.2	41069.9	52990.6	66283.4	80934.9	99574.9	120710.5	140369.7
Control factor	0	0.1	0.5	0.7	0.9	1.0	1.0	1.0	1.0	1.0
Total Value Tsh. (000)	-	2530.1	16357.6	28748.9	47691.5	66283.4	80934.9	99574.9	120710.5	140369.7
DISCOUNTED VALUE AT 15% TSH (000)	-	1912.8	10763.3	16444.4	23702.7	28634.4	30431.5	32561.0	34281.8	34671.3

TOTAL DISCOUNTED VALUE TSH. (000) = 213403.2

Table 3.3.2.1. Costs of Fascioliasis control

	1	2	3	4	5	6	7	8	9	10
1. Stock handling facilities	-	5890.0	5890.0	5890.0	-	-	-	-	-	-
2. Vehicles	-	1684.0	-	-	-	1016.0	-	-	-	1016.0
3. Staff Costs	-	3117.0	3117.0	2190.0	2190.0	2190.0	2190.0	2190.0	2190.0	2190.0
4. Antihelminthic costs	-	4378.7	4884.1	5463.6	6133.0	6823.0	7570.0	8291.0	8945.0	9478.6
5. Drenching guns	-	9.2	9.2	12.4	12.4	15.3	15.3	15.3	15.3	15.3
6. Camping equipment	-	21.0	21.0	28.0	28.0	35.0	35.0	35.0	35.0	35.0
7. Running costs	-	458.0	458.0	458.0	458.0	263.8	263.8	263.8	263.8	263.8
8. Maintenance costs of stock handling facilities	-	-	58.9	117.8	176.7	176.7	176.7	176.7	176.7	176.7
9. Office and general	-	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Total costs Tsh. (000)	-	10286.9	9167.2	8888.8	9028.1	10549.8	10280.8	11001.8	11655.8	13205.4
DISCOUNTED VALUES AT TSH. (000)	-	7778.4	6027.5	5082.2	4488.5	4560.9	3865.0	3596.5	33313.3	3264.1
<u>TOTAL DISCOUNTED COSTS TSH. (000) = 41976.4</u>										

Table 3.3.2.2. Establishments for Blackquarter Control - Summary

	1	2	3	4	5	6	7	8	9	10
1. Vaccines (000)										
- Routine				236.1	264.6	294.3	326.4	357.6	386.1	409.5
- Small stock				6	60	60				
2. Emergency antibiotic loses (000)				25	15	5	3	3	3	
3. Vehicles - Landrovers				2	-	-	-	2	-	
- Motorcycles				2	-	-	-	2	-	
4. Base equipment										
- Refrigerators				2	-	-	-	-	2	-
- Generator				1	-	-	-	-	1	-
5. Field equipment										
- Vacuum flasks				32	16	16	16			
- Refrigerators				8	-	-	8	-	-	8
- Multipledose syringes				48	24	24	24			
- Sterilisers				8	-	-	-	8	-	-
- Pliers for ear tags				16	8	8	8			
6. Ear Tags (000)				325.7	357.2	390.0	365.4	394.1	425.5	452.1

Table 3.3.2.3 Costs of Blackquarter Control - Summary

	1	2	3	4	5	6	7	8	9	10
1. Vaccine				444.2	486.9	531.5	489.6	536.4	579.2	614.3
2. Emergency antibiotic doses				391.3	234.8	78.3	47.0	47.0	47.0	
3. Vehicles				696.0	-	-	-	696.0	-	-
4. Base equipment				73.6	-	-	-	-	73.6	-
5. Field equipment				82.2	15.9	15.9	62.1	20.2	15.9	62.1
6. Ear Tags				1.3	1.4	1.6	1.5	1.6	1.7	1.8
7. Additional staff salary				3164.0	3164.0	3164.0	3164.0			
8. Running costs (vehicles)				154.4	154.4	154.4	154.4	154.4		
9. Additional camping equipment				14.0	14.0	14.0	14.0			
10. Offices and general				30.0	30.0	30.0	30.0	30.0		
Total Costs (Tsh (000))				5051.0	4101.4	3989.7	3962.6	4663.6	4079.8	4087.6
DISCOUNTED VALUE AT 15% Tsh (000)				2887.9	2039.1	1724.8	1489.7	1524.6	1159.7	1010.4
<u>TOTAL DISCOUNTED COSTS Tsh (000) = 11836.2</u>										

Table 3.3.2.5 Establishments for Foot and Mouth Disease Control - Summary:

	1	2	3	4	5	6	7	8	9	10
1. Vaccine Requirements										
- Routine						588.5	652.8	715.2	722.2	818.9
- Emergency						30	25	20	15	10
- Goats/sheep						60	60	60	60	60
- Holding ground						20	20	20	20	20
TOTAL						698.5	757.8	815.2	867.2	908.9
2. Holding grounds										
- Fence (000 m)						48				
- Crushes						2				
- Dips						2				
3. Vehicles										
- Landrover						1	-	-	-	1
- Truck						1	-	-	-	1
- Motorcycles						2	-	-	-	1
4. Base equipment - Refrigerators						3	-	-	-	2
5. Field equipment										
- vacuum flasks						8	4	4	4	4
- Refrigerator						3	-	-	3	-
- Syringes						12	6	6	6	6
- Sterilisers						3	-	-	-	3
- Pliers						4	2	2	2	2
6. Ear Tags						60	66	66	66.7	

Table: 3.3.2.6 -

COSTS OF FOOT AND MOUTH DISEASE CONTROL - SUMMARY

	1	2	3	4	5	6	7	8	9	10
1. Vaccines						5238.8	5683.5	6114.0	6502.5	6816.8
2. Holding ground						6946.0	-	-	-	-
3. Vehicles						686.0	-	-	-	686.0
4. Base equipment						112.0	-	-	-	-
5. Field Equipment						26.9	4.0	4.0	21.3	5.6
6. Additional Bartsags						0.2	0.3	0.3	0.3	-
7. Additional Staff Costs						2988.0	2988.0	2988.0	2988.0	2988.0
8. Running costs - vehicle, base and field equipment						208.3	208.3	208.3	208.3	208.3
9. Additional camping equipment						7.0	7.0	7.0	7.0	7.0
10. Maintenance costs						347.3	347.3	347.3	347.3	347.3
11. Office and general						30.0	30.0	30.0	30.0	30.0
12. Recording						100.0	100.0	100.0	100.0	100.0
Total Tshs. (000)						16653.3	9368.3	9798.9	10204.7	11189.3
Discounted valued at 15% Tsh. (000)						7215.6	3521.9	3203.3	2900.8	2765.8
Total Discounted Costs Tsh. (000) = 19607.4										

11. Control/Eradication of Rinderpest in Tanzania

RECENT HISTORY OF RINDERPEST IN TANZANIA

The last major outbreak of Rinderpest in Tanzania began in Northern Tanzania in 1969 and caused high mortality in cattle but was brought under control by quarantine and vaccination, with the last recorded case occurring in 1975. Annual vaccination campaigns, using the highly effective tissue culture vaccine, were instituted in a barrier zone comprising parts of Northern and Lake Zones, where the risk of reintroduction was considered to be greatest.

Annual vaccination of young and previously unvaccinated cattle has given the results shown in Table 1.

TABLE I.

Rinderpest vaccine doses administered in annual campaign in Northern and Lake Zones 1976 - 1981.

(THOUSAND DOSES)

	<u>Northern Zone</u>	<u>Lake Zone</u>
1976	296	304
1977	379	343
1978	479	341
1979	454	354
1980	408	380
1981	438	NIL

In 1981 there was no vaccination in Lake Zone due to unsettled refrigerator conditions and shortage of vaccine. Despite difficulties due to lack of efficient transport and of field equipment, particularly refrigerators, which have affected the campaign to an increasing degree in recent years, cover has been estimated at 75% or higher. It is however, always

essential to perform post-vaccination serological surveys to check the efficacy of vaccination, particularly in large scale campaigns with their attendant logistical problems. This was last done in 1976 when protective titres were present in 75 - 90% of vaccinates. The potential variability of success is shown however by the 1975 serological survey results where only 47.3% of recently vaccinated animals were protected. The reason for this was not determined although exposure of vaccine to high temperatures or ultra-violet light are possibilities.

No further serological surveys have been performed since the mid 1970s and the extent of protection is thus unknown. As memories of the disease fade it may be anticipated that co-operation from owners and the technical efficiency of vaccination may be eroded. The total numbers vaccinated seem to be holding up well, although the figures cannot be related to the size of the population at risk. Some isolated areas have remained un-vaccinated for several years due to logistical problems, notably Magadini and Pinyinyi in Ngorongoro districts.

THE PRESENT OUTBREAK

Beginning in early 1981, deaths in wildlife were reported by livestock owners who suspected rinderpest. The species concerned were Buffalo and Lesser Kudu. Five reports were received:

Kilimanjaro Region: Mkomazi and Olmolog.

Arusha Region: Longido, Terat-Kiteto and Serengeti.

Despite vigorous efforts by the veterinary services, no diagnosis was obtained for any of these incidents and no disease in contact cattle was observed, even in the absence of Rinderpest vaccination. Both Buffalo and Lesser Kudu are highly susceptible to Rinderpest virus and it is noteworthy that a major epidemic in Ethiopia in the early 1970s was first observed by the authorities in Lesser Kudu (although the disease had gone unreported in cattle).

In March 1982 Buffalo deaths were observed in Northern Serengeti in the Grumeti River area, close to the Kenyan border, & later spread to Ngorongoro area. Although there was a suggestion that this was due to starvation, material collected by Dr Mollé of the Serengeti Research Institute (SRI) was submitted to Maguga Veterinary Research Institute, Kenya Agricultural Research Institute, and a telephoned report

to the Director of Veterinary Services, Dar es Salaam, stated that this had proven positive in the agar gel immune diffusion test. Confirmation of this in writing was still awaited at the time of preparing this report. Around two hundred Buffalo are reported to have died in the area. Reports of cattle deaths in adjoining Loliongo district have been received but no confirmation of cause of these deaths has been obtained.

THE RISK OF DISSEMINATION OF RINDERPEST FROM THE PRESENT LOCUS

Animal movement - game species.

The wildlife in Serengeti/Ngorongoro is characterised by large scale seasonal migration. These movements are complex and involve several species notably Wildebeeste and Burchell's Zebra. At present large concentrations are converging on Seronera and these will continue generally north towards the locus of the disease, with one segment passing along the Western Corridor before moving up the Western edge of the park. Wildebeeste numbers are particularly high at present, approaching two million and this species experienced mortality in the 1960s outbreak. Game and cattle graze in close proximity particularly on the west edge, and in the Ngorongoro conservation area. There is, however, little movement of game from Serengeti/Ngorongoro to more southerly parts of Tanzania. Buffalo do not generally move great distances.

Animal movement - livestock

Livestock movement in the area is considerable and not readily controlled. Over the next few months it probably represents a greater hazard than wildlife movement:-

1. Nomadic movement by Masai graziers occurs throughout the Northern Zone and across the Kenyan border. Large scale movements away from disease outbreaks were observed in the 1960s and represent a potent means of spread. There is, however, little contact between Northern and Southern Masai populations in normal times but in a Rinderpest epidemic such contact could not be ruled out. An encouraging feature is that the Masai recognise the disease and understand the value of vaccination. They are generally prompt in reporting its presence to the authorities.

Other large scale movements involve Wasukuma. Cattle in significant numbers are moved from Mwanza and Shinyanga to Mbeya and Rukwa regions with limited possibilities for official supervision.

2. Cattle thefts continue to occur on a moderate scale in Lake and Northern Zones and subsequent movement is clearly likely to be outside official control. Groups of stolen cattle, up to several hundred strong, are known to be moved rapidly over long distances. Such interchanges occur between Masai and Kurya in Mara and between Masai and Wasukuma in Mwanza.

3. Trade Stock. Due to price differentials there is a tendency for many slaughter stock to move north into Kenya reducing the risk of disease spread south. The major trade routes in Tanzania are well known and will only be briefly mentioned here. A movement south down the east side of Lake Victoria is particularly significant. The major route from west to east; from Sukumaland through Arusha/Moshi to Karogwe and thence to Dar es Salaam is the major axis.

Contagious Spread

Rinderpest has been observed to spread slowly through cattle populations in which there is a degree of vaccine induced immunity, mortality being confined to young and unvaccinated animals. However, where vaccination coverage dwindles and no natural exposure to the disease takes place a dangerous situation develops. Numbers of fully susceptible animals build up rapidly. When the proportion in the population is high enough and the disease slips in, the threshold is passed at which contact spread between animals can continue and 'bush-fire' epidemics occur. This pattern is particularly worrying in that it may not give rise to public concern until a focus of susceptible animals is affected and high mortality attracts attention. Before this occurs it is often very difficult and certainly time consuming to obtain good field cases for material for laboratory diagnosis.

Summary and ability of Veterinary Services to Respond

The major risk is that disease could penetrate the barrier zone and establish itself in the completely susceptible cattle population beyond.

Movement of cattle by nomads, following theft or in the normal course of trade constitute major risks. The veterinary service is severely hampered in its surveillance and control function by lack of vehicles. The Arusha Regional Veterinary Office has one elderly Landrover, the R.V.O's vehicle having been stolen last year. The V.I.C. Arusha also lost a vehicle by theft recently. The Mwanza V.I.C. has no vehicle of its own and had to borrow a landrover to visit Serengeti. The general situation is of a Veterinary Service unable to respond to the very real risk of an outbreak of Rinderpest with grave economic consequences. Some attempt to quantify this risk is made below.

CALCULATION OF PROPORTION OF PRESENT CATTLE POPULATION SUSCEPTIBLE TO RINDERPEST

If it is assumed that successful vaccination confers lifetime immunity then the fraction of a population protected will be the product of:

1. The fraction injected, and
2. The fraction of those injected which are successfully vaccinated.

The fraction of the population injected depends not only on the 'cover' of the previous campaigns but also on subsequent recruitment of young stock following the last campaign. In the case of Lake Zone it is assumed that calves added since the 1980 campaign represent 30% of the total population and in Northern Zone since 1981, 20% of the total (there is a high mortality rate up to 12 months of age).

We can then proceed using 'best' and 'worst' assumptions. Under 'best' assumptions we assume that of the available population during campaigns 90% are injected and of those 80% are successfully vaccinated. Under the worst scenario we assume 75% are injected and 40% of those are successfully vaccinated. Table 2 shows the results for both zones. In round terms between a half and three-quarters of the present population of cattle in the barrier zone is susceptible to rinderpest.

TABLE 2.

Proportion (as percentage to nearest whole number) of cattle population
susceptible to Rinderpest in Lake and Northern Zone segment of Barrier Zone

(a)	(b)	(c)	(d)	(e)
% of present population available during vaccination campaigns.	% of (a) injected	% of (b) successfully vaccinated	% of present population protected (axbxc)	% of present population susceptible (100 - d).

Lake Zone

Best case	70	90	80	50	50
Worst case	70	75	40	21	79

Northern Zone

Best case	80	90	80	58	42
Worst case	80	75	40	24	76

RECOMMENDED ACTIONImmediate action

Disease surveillance and follow-up in livestock and wildlife is required throughout the barrier zone but particularly in Serengeti and Ngorongoro districts. Tracing of suspected cases can be time-consuming and arduous but every effort should be made to detect further cases. It is also necessary that priority be given to submission of material to confirm the laboratory diagnosis. Liaison with S.R.I. should be maintained. A minimum of three experienced and fully mobile teams is required on a continuous basis until the outbreak is officially declared to be over.

Surveillance at a lower but appropriate level should be instituted throughout Tanzania and the relevant authorities should be alerted. A public awareness campaign is needed which alerts stock-keepers to the dangers without being alarmist.

Movement controls. Every effort should be made to enforce the existing regulations concerning movement of livestock across regional borders and across the national borders, particularly with Kenya and Uganda.

Prompt action.

The annual vaccination campaign in the barrier zone should begin as soon as supplies of vaccine are to hand. Maximum publicity should attend this and a strong case be made to ensure adequate resources are made available. The barrier zone should be extended to cover the whole border area with Uganda and Kenya.

Serological survey procedures should be reinstated immediately to assess the degree to which the present population is protected. Vaccination strategy should then be based on these results. Prior to receipt of these results serious consideration should be given to vaccinating all cattle in the area at risk.

The area covered by vaccination would be modified if further outbreaks occurred.

Diagnostic capability at Arusha, Mwanza and Temeke, in a confirmatory capacity should be re-established as soon as practicable.

ECONOMIC APPRAISAL OF RINDERPEST CONTROL

THE POTENTIAL LOSS FROM RINDERPEST

Rinderpest should not be allowed to proceed unchecked in Tanzania. It is however, most instructive to attempt an estimate of the total loss which would be experienced if an epidemic occurred. Two cases, an outbreak in the barrier zone and a nationwide epidemic, are examined. These losses when avoided in a control activity may then be considered as benefits accruing to the activity.

Contained outbreak in high-risk areas of Serengeti : Ngorongoro and Bunde districts Assumptions

Total bovine population	700,000
Of which calved	150,000
Morbidity rate calves	0,5
adults	0,1
Case fatality rate calves	0,8
adults	0,2
Value of cattle calves	1,000/=
adults	2,000/=

<u>Value of Losses</u>		<u>TSH Million</u>
Calves $150,000 \times 0.5 \times 0.8 \times 1,000/=$	=	60
Adults $550,000 \times 0.1 \times 0.2 \times 2,000/=$	=	<u>22</u>
Total losses TSH million		82

Uncontrolled outbreak - whole of mainland Tanzania

Assumptions

A generous allowance for successful vaccination gives a susceptible population of two million calves and eight million adults. With values as above, losses with three different mortality rates are calculated.

	Losses in TSH million		
Mortality Rate	0.2	0.4	0.8
Calves	400	800	1,600
Adults	800	6,400	12,800
Total TSH million	1,200	7,200	14,400

Losses of this magnitude would clearly result in major socio-economic dislocation and the country would be placed on an emergency footing long before such a situation occurred. The figures do indicate, however, the top end of potential loss and the need for the most serious effort to contain the disease.

The Costs

These have been grouped into Tanzania inputs and foreign inputs. The total cost for the three years is put at US.\$11,050,303.7.

The Economic Justification of the Control/Eradication of Rinderpest in Tanzania.

Apart from the obvious direct loss which would occur with the onset of Rinderpest (mortalities), the social unrest that will follow the outbreak of Rinderpest in Tanzania and the ever present uncertainty on the part of our neighbours as to whether the disease will spill over into their countries, far outweigh the costs incurred in the control / eradication of Rinderpest. As such it has been found that there is no need to dwell on the benefit/cost analysis of the proposed project.

APPENDIX - FINANCE ESTIMATES (ERADICATION OF RINDERPEST IN TANZANIA)

A. RECURRENT EXPENDITURE

I Manpower

(1) Salaries:

8 Senior Veterinary Officers
@ US.\$ 4,800

27 Veterinary Officers
@ US.\$ 4,295

40 Team Leaders (Senior
Field Officers)
@ US.\$ 2,021

400 Livestock Field Assistants
@ US.\$ 1136.8

60 Drivers @ US.\$884

(2) Allowances

35 Veterinary Officers @ US.\$20
per night

440 Other staff @ US.\$15 per
night x 90 days

	1ST YEAR		2ND YEAR		3RD YEAR	
	TANZANIA INPUTS	EXTERNAL INPUTS	TANZANIA INPUTS	EXTERNAL INPUTS	TANZANIA INPUTS	EXTERNAL INPUTS
	US.\$	US.\$	US.\$	US.\$	US.\$	US.\$
8 Senior Veterinary Officers @ US.\$ 4,800	38,400		38,400		38,400	
27 Veterinary Officers @ US.\$ 4,295	115,958		120,000		122,000	
40 Team Leaders (Senior Field Officers) @ US.\$ 2,021	80,842		82,800		84,800	
400 Livestock Field Assistants @ US.\$ 1136.8	454,736.8		456,740		458,740	
60 Drivers @ US.\$884	53,052.6		54,052.6		54,160.0	
35 Veterinary Officers @ US.\$20 per night	21,000		21,000		21,000	
440 Other staff @ US.\$15 per night x 90 days	594,000		594,000		594,000	

II Transport & Others

(1) Transport Running Costs

(a) 36 L/Rovers at approx.
3km per litre for approx.
20,000 km per vehicle
= 667 litre x 36 x 10/-

252,644

252,644

252,644

(b) 24 lorries at approx. 5km
per litre for approx.
15,000 km each lorry
300 litres x 24 x 6/-

45,473.7

45,474

45,474

(c) Maintenance costs of 60
vehicles at approx. 4/-
per running km -
- 36 L/Rovers x 20,000 km x4/-
- 24 lorries x 15,000 km x4/-

303,157.8
151,578.9

303,158
151,580

303,158
151,580

(2) Running Costs of Refrigerators

and Deep Freezers

20 Deep Freezers at US.\$ 10 p.m.
per deep freezer

2,400

2,400

2,400

40 Kerosene Refrigerators at
US.\$.10 p.m. per Fridge

4,800

4,800

4,800

20 Electric Refrigerators at US.\$10
p.m. per Fridge

2,400

2,400

2,400

	1ST YEAR		2ND YEAR		3RD YEAR	
	TANZANIA INPUTS US.\$	EXTERNAL INPUTS US.\$	TANZANIA INPUTS US.\$	EXTERNAL INPUTS US.\$	TANZANIA INPUTS US.\$	EXTERNAL INPUTS US.\$
(1) <u>Transport Running Costs</u>						
(a) 36 L/Rovers at approx. 3km per litre for approx. 20,000 km per vehicle = 667 litre x 36 x 10/-	252,644		252,644		252,644	
(b) 24 lorries at approx. 5km per litre for approx. 15,000 km each lorry 300 litres x 24 x 6/-	45,473.7		45,474		45,474	
(c) Maintenance costs of 60 vehicles at approx. 4/- per running km - - 36 L/Rovers x 20,000 km x4/- - 24 lorries x 15,000 km x4/-	303,157.8 151,578.9		303,158 151,580		303,158 151,580	
(2) <u>Running Costs of Refrigerators</u> <u>and Deep Freezers</u>						
20 Deep Freezers at US.\$ 10 p.m. per deep freezer	2,400		2,400		2,400	
40 Kerosene Refrigerators at US.\$.10 p.m. per Fridge	4,800		4,800		4,800	
20 Electric Refrigerators at US.\$10 p.m. per Fridge	2,400		2,400		2,400	

	1ST YEAR		2ND YEAR		3RD YEAR	
	TANZANIA INPUTS US.\$	EXTERNAL INPUTS US.\$	TANZANIA INPUTS US.\$	EXTERNAL INPUTS US.\$	TANZANIA INPUTS US.\$	EXTERNAL INPUTS US.\$
3 <u>Costs of Vaccine</u>						
2 million doses per year at Tshs.0.60 per dose	126,315.8		126,320		126,320	
<u>SUB - TOTAL</u>	<u>2,246,759.4</u>		<u>2,245,766.6</u>		<u>2,261,876</u>	
B. CAPITAL EXPENDITURE						
(1) <u>Purchase of Vehicle</u>						
36 L/Rover @ US.\$ 18,950		682,105				
24 Lorries @ 31,578.9		757,894.7				
(2) <u>Purchase of Refrigerators</u>						
20 Deep Freezers @ US.\$1,200		24,000				
40 Kerosene Fridges @ US.\$580		23,200				
20 Electric Fridges @ US\$500		20,000				
(3) <u>Purchase of Vaccination Equipment</u>						
500 50cc Automatic syringes @ US.\$25		12,500				
1500 spare glass barrels 50cc @US.\$2.5.		3,750		3,750		3,750
5000 dozens of Luer Lock 14G ³ / ₄ " @ US.\$4		20,000		20,000		20,000
60 Ice boxes @ US.\$150		9,000		-		-

	1ST YEAR		2ND YEAR		3RD YEAR	
	TANZANIA INPUTS US \$	EXTERNAL INPUTS US \$	TANZANIA INPUTS US \$	EXTERNAL INPUTS US \$	TANZANIA INPUTS US \$	EXTERNAL INPUTS US \$
B.' CAPITAL EXPENDITURE (Cont'd)						
100 Thermos Flask (wide-mouthed) @ US.\$50		5,000				5,000
200 Thermos Flask Refills @ US \$20		4,000		4,000		4,000
200 Saucepans @ US \$35		7,000				
80 Pressure stoves @ US \$60		4,800				4,800
100 Jerry cans @ US \$20		2,000				
200 Empty Drums @ US \$20		4,000				
150 Saline Tablets @ US \$5		750		750		750
160 Ear Punches @ US \$36		5,760				
300 Dust Coats @ US \$50	15,000					
300 Pairs Gum Boots @ US \$60 (assorted sizes - 7,8, 9 & 10)		18,000				
70 Sterilizer (Fish-kettle) @ US \$120		8,400				
80 Spades @ US \$60		4,300				
80 Pangas @ US \$15		400				
80 Forceps @ US \$3		240				

A. CAPITAL EXPENDITURE (CONT'd)	TANZANIA INPUTS US \$	EXTERNAL INPUTS US \$	TANZANIA INPUTS US \$	EXTERNAL INPUTS US \$	TANZANIA INPUTS US \$	EXTERNAL INPUTS US \$
(4) <u>Camping Equipment</u>						
600 Hurricane lamps @ US \$30		24,000		24,000		24,000
600 Camp Beds @ US \$ 80		48,000		-		-
600 Camp Bed mattresses @ US \$ 40		24,000		24,000		24,000
300 Camp Tables @ US \$ 35		10,500		-		-
300 Camp Chairs @ US \$ 30		9,000		-		-
300 Junior Tents @ US \$900		270,000		-		-
(5) 80 Senior tents @ US \$ 500		40,000		-		-
(5) <u>Construction of Vaccination Crushes</u>						
600 @ US \$ 1000		600,000		-		-
(6) <u>Miscellaneous Expenditure</u>	50,000		50,000		50,000	
SUB-TOTAL	50,000	2,633,099.7	50,000		50,000	86,300
SUB-TOTAL RECURRENT EXPENDITURE	2,746,759.4		2,745,768.6		2,761,876	
SUB-TOTAL CAPITAL EXPENDITURE	-	2,633,099.7		76,500		86,300
GRAND TOTAL	2,746,759.4	2,633,099.7	2,745,768.6	76,500	2,761,876	86,300

12. Equipment of the Biological Substance Laboratory in Mozambique

Geographical coverage: national
Duration: 1983/85
Investment indicative cost: US\$2 700 000

Objectives

The objective of the project is to increase and diversify Mozambique's capacity for producing essential vaccines, allergens and antigenes for sanitary defence programmes for both animal breeding and people's health. Besides its social aims, the project itself envisages a contribution to increasing the production and productivity of the livestock sector. It will increase capacity for producing biological substances in the quantity and quality required in order to contribute to the achievement of regional self sufficiency.

Justification

Currently the production of biological substances is carried out in the Central Laboratory of the Veterinary Service, which, besides this activity, has the research sector, diagnostical analysis and food quality controls.

Among this group of activities, the biological substances sector has achieved such a production level that it currently covers the main needs of the country and has surpluses, in some products, for neighbouring countries. Nevertheless, the installed capacity and the technology of production are clearly insufficient to cover the requirements for expansion of animal stock as well as for improving the veterinary assistance programmed for the present decade. The animal breeding development requires an increase of research capacity and a more efficient supply of diagnostical analyses and other biological substance production.

These aspects require the creation of an up-to-date laboratory exclusively devoted to vaccine production, allergens and antigenes, which will satisfy, both in terms of quality and quantity, the requirements of national and regional users.

On the other hand, it is important to remember that the production of biological substances was started in Mozambique in 1945 with the production of sera and vaccines, receiving new impetus after Independence, mainly after 1979 with the increase in the percentage of vaccinations as well as the export of some vaccines, mainly rabies, to some neighbouring countries.

Also, the expansion of national poultry breeding in recent years led to the creation of an egg-producing aviary MDF which guarantees vaccine production in embryonic eggs, especially for fowls.

In these conditions, there exists in Mozambique the necessary infrastructure and experience to create the Biological Substance Laboratory with industrial characteristics.

Project Description

The Laboratory of Biological Substances Production will be located in Maputo to facilitate the use of the infrastructure and general services already being used for the sector, such as the laboratory of animal breeding, water and electricity supply, cold stores for conservation and storage, etc. Besides, the support industries such as glass factories, plastic, cardboard, hygienic products and disinfectants are located in this area which facilitates the acquisition and transport of the necessary inputs.

Following Maputo, ten distribution centres of biological products will have to be created at the provincial level with the installation of cold stores for storage and conservation.

In order to be used in the national programmes of sanitary defence and disease control, the Laboratory will have to produce the following products:

Vaccines

- Anthrax
- Brackleg
- Brucellosis
- Salmonellosis (calves)
- Enterotoxaemias
- Erysipelas
- Colibacillosis (pigs)
- Leptospirosis (pigs)
- Pasteurellosis (rabbits)
- Rabies
- Newcastle Disease
- Fowl pox
- Mareck Disease
- Lumpy Skin Disease
- Canine Distemper
- Rickettsias (Heartwater)
- Rabesiasis
- Rift Valley Fever
- Horse Sickness
- Tetanus
- Enzootic Abortus of Bovin

Reagents for Diagnosis

- Tuberculin P.P.D.
- Antigenen Brucellosis (all types)
- Pullorosis (rabbits)
- Complement
- Hemolysin

Indicative Cost

The component in foreign currency of the total costs of the investment including equipment, facilities etc. is US\$ 2 700 000. This cost corresponds to the installation of a Laboratory of Biological Substances Production, the feasibility of which is currently being analysed. This, besides satisfying national herds, also has a surplus capacity for export.

Regional Framework

The existence in Mozambique of the production capacity of biological substances will decrease dependence in relation to the acquisition of these products from countries whose epizootic situation is very different from that of the region. The biological products are very specific and the vaccines contribute much to the prevention of diseases. It is therefore very important that the region possesses the necessary instruments for their research, evaluation and production. The development of this capacity in the People's Republic of Mozambique may be used for all the region and so contribute to regional self sufficiency in the supply of strategic inputs.

ADC 12

13. Animal Disease Reference Laboratory in Zimbabwe

Background

The Government of Zimbabwe is giving the development of the livestock sector high priority since it is recognised that the keeping of livestock is one of the main tools for developing the communal lands and for the successful implementation of the resettlement schemes on the former commercial farms.

Zimbabwe is fortunate in having vast tracts of land suitable for livestock but unfortunately Zimbabwe, at the same time, is situated in a part of the world where a number of tropical animal diseases ravage.

In order to control these diseases very extensive and costly vaccination programmes have to be established but before any vaccination programmes can be initiated a proper diagnosis must be made.

Since a number of devastating diseases are caused by viruses where the initial symptoms are more or less the same and since diagnosis of these calls for highly skilled personnel and highly sophisticated equipment, only the best equipped veterinary laboratories can cope with these problems.

Zimbabwe has one of the best veterinary services in Africa but due to the recent war the development of the veterinary research laboratory has lagged behind. With the development of modern equipment and utilisation of the latest research methods the possibilities of early, accurate diagnosis of animal diseases is improving year by year thus minimising the losses to the individual farmer and the country as a whole e.g. in the case of Foot & Mouth Disease an otherwise lucrative export market may be lost.

The Veterinary Field Service is expanding to make closer contact with the peasant farmer and a rapid increase in routine diagnostic work is foreseen. Zimbabwe, again, is fortunate in having a well developed network of roads and transport so any specimen shipped from the field can reach the veterinary laboratory within 24 hours.

Regarding human health the veterinary research laboratory plays a very important role since all the work connected with diagnosis of rabies is carried out here.

However, due to the lack of equipment and research facilities Zimbabwe still has to rely heavily on the more advanced Veterinary Laboratory at Onderstepoort in the Republic of South Africa.

An up-to-date veterinary research laboratory would reduce this reliance and could become a valuable reference and training laboratory for all SADCC countries facing similar livestock disease problems to Zimbabwe.

Project Activities

The Bevan Building, of which one wing is occupied by the Veterinary Research Laboratory, was completed in 1976. At that time the senior staff totalled 35. The staff has now increased to 46 and the accommodation is nearing saturation. In 1981 a total of 77 637 examinations was carried out.

A very substantial list of scientific publications in the international scientific press, bears witness to the high standards of research which has been achieved in the past.

It is desirable that the laboratory should expand to be able to offer a wider range of diagnostic services, to intensify research on existing projects, to initiate research into several fields so far neglected, to provide accommodation for visiting scientists and to provide facilities for training people from other SADCC countries.

Project Organisation

Overall responsibility will rest with the Ministry of Agriculture and the Department of Veterinary Services will be the implementing agency.

Project Objectives

To improve and extend the existing facilities to enable the laboratory to provide a diagnostic and confirmatory service to the existing laboratories and field staff in SADCC countries. This will assist the veterinary field staff to take appropriate action against infectious diseases which may cause severe losses to the individual farmer and pose a threat to the livestock industries of other countries.

Project Benefits

It will improve the diagnostic ability of the laboratory to assist SADCC countries in obtaining confirmatory diagnosis without resort to Onderstepoort, Republic of South Africa, or other laboratories overseas.

Related Projects

- (a) The Veterinary Faculty at the University of Zimbabwe to be supported by the EEC. The Veterinary Research Laboratory will make a valuable contribution by providing training and research facilities for the graduates.
- (b) Training School for Veterinary Extension Assistants, funded by FAO and the Swiss Government, opened in October 1982.
- (c) Projects on economics of tick and tick-borne diseases, to be funded by FAO and the Government of Denmark.

Project Costs

It is proposed that a new laboratory block attached to the present Veterinary Research Laboratory be constructed and equipped.

	Z\$
Buildings - 6 000 square metres	2 000 000
Equipment*	300 000
	Z\$ 2 300 000 ⁺

* Expenditure on main items of equipment is detailed in Table 1.

+ equivalent to 25.0 million D.kr

Table 1: Estimated Costs of Major Items of Equipment

<u>Section</u>	<u>Item</u>	<u>Z\$</u>
Virology	Electron Microscope	160 000
	Ultra-Centrifuge	
	Research Microscope	
	Biohazard Cabinet	
Biochemistry	Spectrophotometer	25 000
Pathology	Densitometer	15 000
Bacteriology	Biohazard Cabinet	15 000
	Fluorescent Microscope	
	Centrifuge	
Haematology	Coulter Counter	15 000
	Sonicator	
Rabies	Biohazard Cabinet	15 000
	Fluorescent Microscope	
	Freeze Drying Apparatus	
Foot & Mouth Disease Laboratory	Sundry Laboratory Equipment	15 000
Tick & Tick-borne Disease	Fluorescent Microscope	5 000
Tick Ecology	Micro-climate recorder	10 000
	Incubator	
Vaccine Production (Autogenous Vaccines)	Autoclave	10 000
	Incubators	
	Miscellaneous Laboratory Equipment	15 000
	TOTAL	Z\$ 300 000

SECTION THREE - FISHERIES AND WILDLIFE

A. INTRODUCTION

The purpose of this progress report is to give an up-to-date picture of what has been achieved by the Fisheries and Wildlife Sub-Committee under the coordination of Malawi.

To a large extent this is a development of the report "Proposals for a Regional Approach to Fisheries and Wildlife Development Conservation and Utilisation" which was presented for noting to the Blantyre Council of Ministers meeting in November 1981.

Further data has been collected and the Sub-Committee has had two meetings, first to discuss the report presented at the Blantyre Council of Ministers meeting and later to discuss the project proposals ensuing from the first meeting. These meetings took place in February 1982 (Malawi) and September 1982 (Swaziland) respectively.

This report is divided into four parts, namely:

Summary of Progress - general progress since the responsibility for the coordination of Fisheries and Wildlife was assigned to Malawi

Regional Programme of Fisheries & Wildlife Projects

Projects - a detailed description of individual projects

Summary Review of Individual Projects Requiring Funding

No attempt has been made to prioritise the projects as such, although it may generally be said that projects affecting the whole region naturally have priority over those that involve a small group of states or individual states even though the ultimate goal of all of them is to increase fish production to feed the entire population of the region.

The project serial numbers are prefixed F and W denoting Fisheries and Wildlife respectively.

B. SUMMARY OF PROGRESS

Coordination of the Fisheries and Wildlife sectors of SADCC was assigned to Malawi at the Harare Conference on 19 July 1981. Immediately after the announcement of the assignment contact was established between Malawi fisheries and wildlife officials and their counterparts in the remaining eight Member States.

By November 1981 some data on fisheries and wildlife potentials of the region had been gathered enough to prepare a preliminary report for the Conference held in Blantyre, Malawi from 19-20 November 1981.

The report, which included information on areas of possible cooperation between Member States, was very preliminary and therefore not ready for consideration by the Conference. It was, however, noted by the Council of Ministers.

A meeting of the Fisheries and Wildlife Sub-Committee was approved by the Council of Ministers so that the preliminary report could be fully discussed by its technical members before identifying regional projects in these sectors.

All Member States except Angola were represented with two specialists (one in fisheries and one in wildlife) at the Sub-Committee's meeting held in Malawi from 22-25 February 1982. Angola sent only a wildlife specialist therefore had no representative on the fisheries meeting of the Sub-Committee.

The Sub-Committee proposed four projects, namely:

- (1) Regional Fisheries Training Centre
- (2) Fisheries Data Bank
- (3) Regional Fish Marketing Survey
- (4) Wildlife Conservation, Management and Utilisation
- Phase I

The Sub-Committee, in addition, requested Member States to suggest any other projects not discussed at the meeting.

Project outlines prepared after the Malawi Sub-Committee meeting are the following:

- (1) Lake Kariba Fisheries Research and Development
(Zambia/Zimbabwe)
- (2) A Joint Study of Pelagic Fishery Resources of Lake Malawi/Niassa (Malawi/Mozambique/Tanzania)
- (3) A Study to Identify Regional Projects/Programmes of Production and/or Commercialisation of Fishing and Fish Processing Materials and Equipment in the SADCC Region

These proposals were submitted as follows: (1) by Zambia; (2) and (3) by Mozambique.

On September 10-12 the Sub-Committee met in Mbabane, Swaziland to discuss the seven project proposals to decide which ones were to be finalised for submission to donors for funding.

Project proposals for the Regional Fisheries Training Centre and the Fisheries Data Bank were considered to be not ready for presentation. The other five proposals were passed by the Sub-Committee as being fit for submission to SADCC Agriculture Ministers with a view to presentation to the Maseru Conference. The proposals were approved by Agriculture Ministers at their meeting in Harare in November 1982.

C. REGIONAL PROGRAMME OF FISHERIES AND WILDLIFE PROJECTS

Introduction

Development of the fisheries potential of the region can be seen as one of the means by which SADCC can achieve self sufficiency in food production.

Three of the Member States have access to the sea and therefore have the potential for development of the fisheries resources within their territorial waters or the Exclusive Economic Zones (EEZ). Of the remaining six Member States which are land-locked, four have large freshwater lakes, rivers and swamps while the last two states could develop aquaculture as a means of providing fish locally. To a large extent, however, all the land-locked states could absorb the surplus fish produced by the coastal states if their fish production was stepped up.

Project Identification Process

Through technical consultations and data collection by a questionnaire, it has been established that the following broad areas have over the years, lacked support and that situation has resulted in little or no development of the fishery potential of the region:

- manpower development
- research data collection and interpretation
- development of the fish catching gear and equipment within the region
- research and development of fish marketing and distribution within the region
- development of aquaculture

Manpower development in the fisheries and wildlife management sectors have relied on overseas assistance through training scholarships to study in countries with completely different fisheries and wildlife problems.

Research and development data collected in the past has not been compiled properly for fruitful use. This has resulted in some research work being repeated or duplicated thereby wasting scarce financial and manpower resources. Needless to say most of the research done has been by experts from outside the region (mostly from overseas) upon whose departure from the region little or no follow-up action was taken, nor was the data ever analysed and stored properly.

Fish catching techniques introduced have relied on materials and equipment imported from countries outside the region (mainly overseas). Little attempt has been made to develop on a large scale the local production of such materials and equipment. The constraint in this development activity has been the smallness of the market as each state has not looked beyond its borders for such markets.

Like markets for locally produced fishing materials and equipment, those for fish have also been limited to include only the domestic ones. Coastal states have thus not been able to expand their fishing efforts for fear of over production, among other reasons, yet their immediate non-coastal neighbours have been importing overseas surpluses to meet their deficits in animal protein supplies. Other non-coastal states like Botswana have considerable fishery potential in their inland waters but for lack of domestic markets such resources have remained virtually untapped.

The Regional Fisheries and Wildlife Programme Comprising Projects

To overcome the problems stated above, eight projects have been proposed or formulated. Four of the projects are fully regional, two are sub-regional (involving two to three neighbouring Member States) and the last one is to be undertaken by one State but with the regional goal of providing fish to neighbouring Member States. The projects are as shown from the next page.

D. PROJECTS

Project F1 - Joint Research of Pelagic Fishery Resources of Lake Malawi/Niassa (Malawi/Mozambique/Tanzania)

Background Information

Lake Malawi/Niassa fishery resources are at present exploited by fishermen of the three SADCC Member States - Malawi, Mozambique and Tanzania. Although large catches are recorded they are mostly obtained by artisanal and subsistence in-shore fishermen as only in the South East and South West area of the lake has a semi-industrial fishery been developed.

Although an effective traditional fishing gear, the "Chilimira" or traditional open water seine, contributes to the landings of pelagic catches, the immense off-shore waters remain unexplored and unassessed. In Malawi a little work has been done on the survey of the pelagic fishes of the deeper northern parts of the lake but the results were not conclusive. Nevertheless it is felt by the three Member States that a research study involving all three would enable fishery scientists to follow the movement and inter-relationships of stocks of fish in the sectors fished by the fishermen from the three countries. In other words the work would cover the entire lake and so knowledge of the stocks would be thorough; by this means information would be gathered in order to assess the development possibilities of the fisheries in the region as well as the national management of resources.

Objectives

A joint research of pelagic off-shore resources is proposed aiming at improved knowledge of fisheries potential and of rational management of resources. The three Member States will utilise their existing personnel and equipment where possible supplemented by international experts and additional equipment and running expenses.

Project Targets

- (a) An estimate of the distribution, composition, behaviour and abundance of the pelagic fish resources and their variation;
- (b) An analysis and subsequent improvement or settlement of fishery statistics collection systems of the three countries. The design and settlement of a standardised system for the collection of the catch and efforts statistics (of the three countries). The improved systems would be designed to provide information enabling the assessment of the impact of the fishing effort on stocks;
- (c) Production of a check list and biological information of main species in order to support the estimates of yield so that recommendations may be made for the development of the fishery;

- (d) Assessment of the impact of environmental changes on the fishery so as to recommend action to prevent adverse effects.
- (e) On the basis of the findings of the project, make recommendations for a joint management strategy to be followed by the three Member States.

Financial Breakdown

Funds will be required for the payment of:

- (a) 3 international fisheries biologists
- (b) 3 international fisheries statisticians for the 3 centres to be set up
- (c) running of research vessels and vehicles
- (d) purchase of equipment
- (e) air fares of experts travelling between bases in the three countries and local travel, including local personnel
- (f) project review and report work

Summary:

<u>Capital Costs</u>	<u>US\$</u>
Vehicles	50 490
Research vessel	-
Equipment	88 800
Housing	288 000
	<hr/>
Sub-total	427 290
<u>Recurrent Costs</u>	
Salaries	1 269 000
Vehicle operating costs	135 000
Research vessels & equipment operating costs	126 000
Supplies	75 000
Project review	45 000
	<hr/>
Sub-total	1 650 000
 Total Base Cost	 2 077 290
	<hr/>
Add: Physical contingency (5%)	103 860
Price contingency (15%)	327 170
	<hr/>
Sub-total	431 030
 TOTAL COST WITH CONTINGENCIES	 2 508 320
	<hr/> <hr/>

Execution and Supervision

It is proposed to form a SADCC Project Steering Group composed of local experts from the three countries assisted by an international specialist in fresh water research. The function of the Group will be to prepare the programme of work and how work is to be shared by the Member States and to evaluate progress from time to time.

The reports of the Group will be ratified by the competent authorities of the three countries. Recommendations of the proposed management strategy will first be discussed by this Group before the three Governments decide how to implement the strategy.

The project would be based on three research stations, one in each of the three countries.

F 1

Appendix - Cost Details

	Unit Cost	1	2	3	4	5	Total 5 years
CAPITAL COSTS							
-----US\$-----							
1. <u>Vehicles</u>							
4-wheel drive (3)	16 020	48 060	-	-	-	-	48 060
motorcycles (3)	810	2 430	-	-	-	-	2 430
		50 490	-	-	-	-	50 490
2. <u>Equipment</u>							
boat (2)	-	-	-	-	-	-	-
acoustic survey equipment	4 600(3)	13 800	-	-	-	-	13 800
seine net	25 000(3)	75 000	-	-	-	-	75 000
		88 800	-	-	-	-	88 800
3. <u>Buildings</u>							
class 'C' houses (6)	48 000	144 000 (3)	144 000	-	-	-	288 000
TOTAL CAPITAL COSTS		283 290	144 000	-	-	-	427 290
OPERATING COSTS							
1. <u>Salaries & Wages</u>							
Fisheries Biologists (P4)	47 000	70 500 (3)	141 000	141 000	141 000	141 000	634 500
Fisheries Statisticians (P4)	47 000	70 500 (3)	141 000	141 000	141 000	141 000	634 500
		141 000	282 000	282 000	282 000	282 000	1269 000
2. <u>Vehicle operations</u>							
4-wheel drive	3c/km	13 800	27 500	27 600	27 600	27 600	124 200
motorcycles	8c/km	1 200	2 400	2 400	2 400	2 400	10 800
		15 000	30 000	30 000	30 000	30 000	135 000
3. <u>Research vessel & running equipment</u>		15 750	31 500	31 500	31 500	15 750	126 000
4. <u>Office supplies</u>		15 000	15 000	15 000	15 000	15 000	75 000
5. <u>Project review</u>		-	-	15 000	-	30 000	45 000
TOTAL OPERATING COSTS		186 750	358 500	373 500	358 500	372 750	165 000
TOTAL BASE COST		470 040	502 500	373 500	358 500	372 750	3077 290

Notes

1. The costs have been prepared for the three countries to be involved in the research work: Malawi, Mozambique and Tanzania.
2. Malawi has research boats already. It has been assumed that other countries would use some of their existing boats. The boat like the one available in Malawi costs around US\$350 000.
3. Four-wheel drive vehicles estimated to cover 24 000 km per annum; motorcycles estimated to cover 10 000 km per annum.
4. Diesel: 6 000 litres per month and oil at 210 per six months. It is assumed that the boat would be operating for some six months, at least.
5. In year three, a mid-term review of the project by the steering committee and the donor and in year five a project completion report would be prepared jointly by the team.

Project F2 - Regional Fish Production, Processing
and Marketing Survey

Background Information

From information collected from the nine states it is clear that fish produced in the region could be given wider distribution in the region to assist those areas with animal protein deficits. Some of the countries have large untapped fish resources which are not urgently required locally because other sources of animal protein are readily available. However, such idle resources could be exploited for export to other Member States where animal protein is deficient.

The Technical Consultative meeting on Fisheries which met in February 1982, in Malawi, unanimously agreed that rational utilisation of the region's fishery resources should include distribution of the fish throughout the region. Nevertheless certain trade agreements will need to be made by the states concerned.

Objectives

The study would focus on current and potential fish production, processing and marketing and recommend on how best the region can achieve self sufficiency in fish requirements. The main issues to be addressed are:

- (a) An assessment of current fish supply within the region and also disaggregated by country. Supply here refers to both local production and imports.
- (b) An assessment of the supply potential from the region's resources that could be exploited to meet self sufficiency.
- (c) An assessment of current and projected fish consumption in the region. Consumption to be grouped as to whether fish is canned, smoked or dried, frozen, etc.
- (d) Description of the current national and inter-regional trade in fish.
- (e) Description of fish processing and curing methods and facilities used and their capacity.

Based on the information obtained above, the study should make specific recommendations for SADCC action as follows:

- (a) Recommendations on how national and regional trade in fish might be expanded.
- (b) Recommendations on how fish marketing, processing and distribution might be improved.

- (c) Identify and recommend necessary investments to achieve these goals with particular emphasis on:
- (i) On-shore based infrastructure in fish processing distribution, and
 - (ii) Off-shore infrastructure (development of off-shore fleets to tap the potential and artisanal facilities).

Project Life

Six man/months (see below).

Finance

The study would be undertaken by consultants. The following experts would be required for a total of six man/months:

- (a) Fish Marketing Expert (3 man/months)
- (b) Fish Processing Expert (3 man/months)

Funds in the region of US\$100 000 will be required to pay the fees and allowances of the consultants while collecting data and producing the report.

Project Target

To prepare a report which would make specific recommendations for SADCC action on how the region could improve mainly in the production, processing and distribution of fish within the region in order to attain self sufficiency.

Execution and Supervision

The survey will be carried out through a consultancy which will report to the Ministry of Forestry and Natural Resources of the Government of the Republic of Malawi.

Project F3 - Lake Kariba Fisheries Research & Development
(Zambia/Zimbabwe)

Background Information & Justification

Zambia and Zimbabwe are both land-locked countries with fisheries based on lakes, rivers and reservoirs. One of these fisheries is Lake Kariba which is situated on the Zambezi River and is an important part of the boundary between the two SADC Member Countries.

Kariba Dam was built in 1958 to hold back Zambezi River water for the production of hydroelectric power. The resulting Lake Kariba is still one of the largest reservoirs in the world. The lake is estimated to cover 4 325 m² at lowest drawdown and 5 820 m² at maximum storage level.

Since its creation, Lake Kariba has progressively gained importance as a source of animal protein to nationals of both Zambia and Zimbabwe. From the time of the dam closure and right through the sixties Fish Biologists and Environmentalists of various disciplines studied the aquatic biology of the lake. One report indicates that the number of fish species of Lake Kariba increased from 28 in 1963 to 41 in 1971. Another significant event in the lake has been the successful introduction of the Lake Tanganyika clupeid into Lake Kariba during 1968. This introduction was so successful that a yield close to 14 000 metric tons is estimated to have been taken from both sides during 1981 alone. In 1956 pre-impoundment research hydro-biological research was initiated by the Joint Fisheries Research Organisation. The project placed special emphasis on seasonal fishery surveys. In 1959 routine collection of Limnological data over the whole lake started under the auspices of the Lake Kariba Coordinating Committee. Between 1963 and 1964 the Lake Kariba Fisheries Research Institute was established at Kariba to undertake research work over the whole lake.

However, the operations of the institute were disrupted in 1966 when, due to political reasons, all international staff were moved to Zambia. Since then research work on the lake has been conducted on territorial lines. On the Zambian side active research continued until 1973 when the last resident research officer left the country, and researching was altogether suspended in 1975 when, again, due to political reasons the security situation in the area became precarious.

In the post-liberation war period both countries are conducting independent fishery research programmes in Lake Kariba. Because of the territorial boundaries of the lake it is impossible for either country to undertake a research programme which would be totally meaningful. This together with economic considerations makes international cooperation not only desirable but necessary if proper development and management of the fish resources of the lake is to take place.

Project Objectives

The project being proposed would study various aspects of the fish resources and recommend to both countries alternative ways and means of managing the fishery for each to reap the best sustained benefits. The study would be multi-disciplinary but would place emphasis on the following:

(a) Fishery Limnology

To conduct a physio-chemical study of the lake on a seasonal basis and to monitor the changes that may have occurred since the construction of the dam and especially those changes that have taken place since the last major study in 1971. This study would assist the evaluation of the impact of such changes on the productivity of the lake up to and including tertiary level.

To conduct a biological study of lower organisms (plankton) which constitute the bulk of fish food.

(b) Stock Assessment

To study the population dynamics of the major species of the lake and their life histories for proper assessment of their abundance, the possible annual sustained yield, and to assist in the formulation of measures to be affected by each of the two countries.

The species to be included in the study are:

(i) Limnothrissa miodon (Kapenta)

This species was introduced from Lake Tanganyika in 1963. It has established well in Lake Kariba and is contributing substantially to fish production of both countries. The available catch data (especially on the Zambian side) is inadequate for any scientific deductions on yield potential.

(ii) Hydrocynus vittatus (Tiger fish)

This fish is popularly known as a game fish. It is also an excellent table fish of great commercial significance. The introduction of sardines in the lake has considerably altered the distribution, abundance and food preferences of this principal predator.

(iii) Other species

Prior to 1973 (in Zimbabwe) and 1980 (in Zambia), Kapenta fishing was not an important activity on the lake. In fact even at the moment Kapenta fishing operations to be undertaken on a large commercial scale require a high level of investment. For the artisanal fishermen, gill-net fishing has continued as the main means of livelihood.

Biological information available on such fish as *Distichodus* spp, *Labeo* spp, *Sarotherodon* spp, and *Mormyridae* is about ten years old. There is thus a gap in our knowledge about the life history, migration patterns and behaviour of these and many other species upon which the artisanal fishermen subsists. The project should assist in further identifying other lesser known species with potential for commercial exploitation.

(c) Fishing Gear Development

(i) Artisanal Level Sardine Fishing

Sardine Fishing in Lake Kariba is being carried out exclusively by commercial operators. The lack of enthusiasm from the artisanal sector may be attributed to the complicated method now in use and the huge capital investment required. Gear trials with simple and less expensive methods are therefore suggested to evolve a suitable method of fishing for artisanal fishermen.

(ii) Gill-net Fishing

For the proper and coordinated management of the Gill-net fishery, it is imperative that the project carries out gear trials to determine suitable mesh sizes and fishing methods to be employed. For example at the moment a drum beating method for driving fish into the nets is encouraged in Zimbabwe as the best for catching *Tilapia rendalli* while the same technique is completely outlawed on the Zambia side of the lake.

(iii) Long-line Fishing

As part of the exploratory fishing gear trials, long lines and set lines will be used to assess the effectiveness of these gears to exploit evasive species such as tiger fish, clarias and eels. The eels have acclimatised to lacustrine conditions but probably migrate up the river for breeding purposes. At the moment the species is not favoured in the local markets. However, the species is highly favoured elsewhere and may become handy as a source of foreign exchange.

(d) Fish Processing

Land accessibility to most areas of the lake is still poorly developed, and there are serious communication difficulties in most fishing villages along the shore of the lake. As a result, most fishermen and fish traders resort to simple sun drying, often in poor hygiene conditions. For this reason it is suggested that fish processing experiments be included in this project to find suitable methods for the processing of different species of fish.

Economic and other studies for improving the conditions of the artisanal fishermen should be carried out. These would be carried out in the final phase of the project but before the implementation phase of the project.

Environmental pollution studies to monitor effects of agricultural and industrial activities on the fish stocks of the lake.

Project Period and Phasing

The studies proposed above could be carried in five years and could be phased as follows:

Year	Aspect of the Project to be Undertaken
1	Procurement of equipment, facilities, personnel, review of available literature and commencement of limnological and biological studies
2	(a) Biology, (b) Limnology, (c) Fishing Gear, (d) Environmental pollution
3	(a) Stock assessment, (b) Limnology, (c) Fishing Gear, (d) Fishing processing, (e) Environmental pollution, (f) Marketing review
4	Analysis and writing up of draft report finalising formal research in fishing, stock assessment, limnology and environmental pollution studies.
5	Finalise fish processing and social economic survey studies during the first half of the year. During the second half of the year the report should be tabled and discussed by the two countries.

The implementation phase will be carried out by each Government separately but in consultation with each other.

Project Work Plan

In view of the distances involved, it is proposed to carry out the work of the project from two main centres. These main stations could be at Kariba on the Zimbabwe side and Sinazongwe on the Zambian side. Sub-stations could be established if need arise.

Limnological, biological, fishing gear trials and environmental pollution studies could be carried out at pre-selected sites distributed all over the lake. Fish processing could be done at the main stations using samples collected from gear trials and environmental pollution studies could be carried out at pre-selected sites distributed all over the lake. Fish processing could be done at the main stations using samples collected from gear trials and biological research.

The existing facilities at Sinazongwe Fisheries Centre and Kariba Research Institute could be made use of on the project. One of the two stations could also be made the Headquarters of the project. A decision on this should be taken after inspection of available space and existing permanent infrastructure.

Training Component

Apart from providing ready data to be used by the management to plan effectively the development of this fishery, the project should also aim at producing local expertise to ensure continuity of the research programmes at local level. In view of this we are proposing that funds be made available to up-grade Sinazongwe Fisheries Training Centre so that courses may be good enough for training medium level technical staff in addition to fishermen from the two countries.

It is further proposed that the project should include a component for high level training abroad of junior scientists and technicians. For this we propose 15 man/years of fellowships at a total cost of K120 000.

International Assistance Requested

International assistance is requested in the form of expert personnel, equipment and running costs of the project. (see attached table)

Project Personnel

A Project leader/manager should be appointed three months in advance to prepare a plan of operation and assist in the recruitment of suitably qualified personnel. The structure of key posts on the project should be as shown in the attached table.

SADCC Contribution

The contribution to be made by the Government of Zambia is shown on the attached table. It is hoped that Zimbabwe will also make a contribution to this project.

Project Life

It is proposed that the project should take five years during which time the funds requested will be spent on an annual basis.

DONOR CONTRIBUTION

	<u>Man/Months of Service</u>	<u>Total Cost</u>
<u>Project Personnel:</u>		
		US\$
1 Project Manager	60	260 000
1 Limnologist	48	82 000
1 Stock Assessment Biologist	36	82 000
1 Fish Processing Technologist	30	65 000
1 Fishing Gear Technologist	48	82 000
1 Economist	24	41 000
1 Extension Officer	12	22 000
	Total	716 000
<u>Equipment:</u>		
<u>Land Transport</u>		
2 Landrover Station Wagons (diesel)		36 000
6 Landrover Pick ups (diesel)		90 000
1 x 10-ton lorry		40 000
1 car		16 000
1 tractor		20 000
	Total	202 000
<u>Water Transport</u>		
1 research vessel		165 000
2 fishing boats		50 000
2 speed boats		24 000
8 outboard motors		20 000
	Total	259 000
<u>Fishing Gears</u>		
fishing gear & equipment		120 000
laboratory equipment		40 000
office equipment		20 000
	Total	180 000
<u>Training</u>		
individual fellowships		72 000
group training		50 000
	Total	122 000
<u>Project Running Costs</u>		
fuels & lubricants		300 000
travel		100 000
miscellaneous costs		50 000
		450 000
 GRAND TOTAL DONOR CONTRIBUTION:	 US\$	 <u>1 929 000</u>

GOVERNMENT OF ZAMBIA CONTRIBUTION

	<u>Man/Months of Service</u>	<u>Total Cost</u>
<u>Project Personnel:</u>		
		US\$
1 Limnologist	48	34 000
1 Biologist	48	34 000
1 Economist	24	17 000
1 Fishing Gear Technologist	24	12 000
1 Laboratory Technician	48	10 000
4 Research Assistants	48	98 000
3 Laboratory Assistants	48	38 000
1 Administrative Officer	60	30 000
1 Accounts Officer	54	14 000
1 Stores Officer	54	14 000
1 Personnel Clerk	54	14 000
1 Stenographer	50	20 000
2 Copy Typists	108	30 000
10 maintenance staff drivers	600	62 000
	<u>Total</u>	<u>427 000</u>
<u>Equipment Already Available For Use by the Project:</u>		
<u>Water Transport</u>		
1 x 30 foot fishing boat		16 000
8 x banana boat		12 000
1 x speed boat		6 000
	<u>Total</u>	<u>34 000</u>
<u>Fishing Gear</u>		
2 x Chiromila nets		10 000
<u>Fishing Gear to be Purchased</u>		
2 x lift nets		4 200
2 x dip nets		2 000
net accessories		10 000
	<u>Total</u>	<u>26 000</u>
<u>Facilities Available</u>		
1 Laboratory		20 000
1 Fish Processing Plant		8 000
1 Marine Workshop		50 000
1 Netshed		2 000
2 Office Blocks		40 000
3 Senior Staff Houses		120 000
	<u>Total</u>	<u>240 000</u>
 GRAND TOTAL ZAMBIA GOVERNMENT CONTRIBUTION		 <u><u>\$717 000</u></u>

Project F4 - A Study to Identify Regional Projects/
Programmes of Production and/or
Commercialisation of Fishing and Fish
Processing Materials and Equipment in
the SADCC Region

Background Information

The fishing industry in the SADCC countries plays an important role in the provision of protein for the population and in the trade balance.

If, on the one hand, the inputs which enable that activity are mostly imported from countries outside the region, on the other hand, there has been an increased development in the small-scale support industries to the sector in the region.

The lack of knowledge of the regional industry in fishing equipment and outfit as well as of processing leads to the seeking of far-off markets for which there is already a reasonable regional capacity which could meet demand in certain products.

In some countries it is also possible to increase and/or reconvert some already installed capacity with little investment.

The project envisages the setting up of programmes/projects to enable a better inter-relation in the fishing industry in the region.

Objectives

To promote technology transfer and exchange of subsidiary industrial products in the fisheries sector, in order to increase the degree of regional integration thus contributing to greater economic and technological independence of the SADCC countries.

To identify and recommend projects/programmes of regional cooperation in subsidiary industries in the fisheries sector.

Methodology

A consultancy contract to carry out preliminary studies in order to identify the projects/programmes of regional cooperation to manufacture and/or commercialise materials and equipment for fish processing and fishing.

Terms of Reference:

- Assessment of the main existing and planned fisheries programmes in the region and technologies employed or to be employed;
- Assessment of the existing and planned subsidiary industries in the region and of the imported products of similar type, namely;

- * Fishing nets, natural and synthetic fibres, cords, leads, buoys, lines and hooks
 - * Fishing boats, construction materials, navigation fishing and on-board processing materials and equipment
 - * Materials and equipment for fish processing industries, metallic nets, cans, chemical products etc.
- Assessment of related industries, that may be used as a technical and material basis for the manufacture of materials and equipment for fishing and fishery products. Textiles, metals, cement, synthetic materials, forestry industries and others.

Based on the above, make recommendations on projects/programmes that could be initiated to produce these materials to make SADCC self sufficient.

Project Target

- (a) to produce a report showing the present production capacity, the present and future needs for fish processing equipment and fishing materials (in accordance with National Development Plans) and proposals to increase production in order for the SADCC region to become self sufficient in these materials and equipment.
- (b) make a recommendation on what type of products could be obtained through the use of converted or upgraded existing manufacturing plants and/or industries in the SADCC region.

Project Life

Five man/months.

Personnel Requirements

- 1 Fisheries Expert (2 months)
- 1 Expert in industrial and small-scale fisheries equipment and materials manufacture (2 months)
- 1 Fisheries Economist (1 month)

Finance

Funds amounting to US\$ 60 000 will be required to meet the costs for salaries, travel, accommodation, subsistence allowance etc.

Execution and Supervision

The above work will be undertaken by consultants engaged by a donor agency under the supervision of the Ministry of Forestry and Natural Resources of Malawi.

Project W1 - Wildlife Conservation, Management and
Utilisation in the SADCC Region - Phase I

Objectives

To obtain the information necessary to implement the Regional Wildlife strategy.

Background Information

The Government of the Republic of Malawi was allocated responsibility for coordinating a regional approach to the conservation and development of Wildlife Resources in the Southern African Development Coordination Conference region.

To obtain a consensus of opinion, a questionnaire was prepared by the Ministry of Forestry and Natural Resources in Malawi after which two Ministry officials were despatched to each of the other eight Member States to discuss the questionnaire with their colleagues. The purpose of the questionnaire was to compile basic data on the wildlife situation within the Member States of SADCC so that areas of coordination and cooperation for mutual benefit could be identified.

At the SADCC Council of Ministers held in Blantyre, Malawi in November 1981 it was agreed that a Technical Consultative Meeting on Fisheries and Wildlife should consider the report. This meeting was held in Malawi between 22-25 February 1982 and the report, with certain amendments set out in the report of the meeting, was accepted. The meeting also agreed on the basis for a SADCC Regional Wildlife Approach and the methods to be used to implement the Regional Wildlife Strategy (Section 2 of Part II of the document produced for the Blantyre Council of Ministers).

At the Technical Consultative Meeting, Malawi, as the coordinator of the Sub-Committee on Fisheries and Wildlife, was given the task to compile a final detailed project proposal for the Standing Committee of Officials (section 6 of the Minutes of the Wildlife Section of the Consultation).

This proposes a detailed investigatory approach as a logical next step, in conformity with the operating philosophy of SADCC which has been described as follows: "the basis of our cooperation, built on concrete projects of specific programmes, rather than grandiose schemes and massive bureaucratic institutions, must be to the mutual advantage of all participating states" (Lusaka Summit).

Goals of the Project

- (a) the production of a paper in sufficient detail to set out in practical terms the wildlife resources and wildlife problems of major importance within the SADCC region in order to provide the information necessary to implement the Regional Wildlife Strategy as set out at section 2.3 of the proposal for a Regional Approach to Wildlife. This paper is to

provide consolidated base line information for planning and coordination at regional level for the conservation, management and wise utilisation of wildlife resources.

- (b) The production of a paper to set out in precise terms the present information gathering capability of the states within the region and to propose detailed methods and actions to ensure that for the future this data is readily available to SADCC states; to provide detailed proposals for an adequate and coordinated monitoring organisation on a regional basis.
- (c) The production of a paper setting out in precise terms the existing training facilities for conservation staff within the SADCC region; to recommend improvement and/or expansion if needed; to propose specific action in the task of advising decision makers and educating the public so that a wide dissemination of the reasons for conservation of the environment and of wildlife resources in particular is achieved.

Project Life

1 year

Total Financial Cost

US\$ 200 000

<u>Financial Summary*</u>	1983/84
Personal Emoluments	160 000
(2 x experts: 1 wildlife ecologist, 1 natural resources economist with experience in wildlife)	
Running Expenses	40 000
TOTAL	US\$ 200 000

Project Target

Before large scale projects for Wildlife Conservation, Management and Utilisation for the SADCC region are presented to the Standing Committee of Officials and through that Committee to the Council of Ministers, it is necessary for the coordinator of the Sub-Committee on Fisheries and Wildlife to have available background material covering the assets, the problems and the ideas to develop and catalyse regional coordination and cooperation, in accordance with the Statement for a Regional Approach in the Field of Wildlife Conservation, Management and Utilisation which was adopted at the first Technical Consultative Meeting of this Sub-Committee.

The target of this project is to obtain the background data for planning coordination and cooperation of all relevant national agencies.

Execution and Supervision

The execution of this investigatory and data gathering project will be supervised by the coordinator of the Sub-Committee on Fisheries and Wildlife of SADCC

* Figures subject to detailed discussion with donor.

E. SUMMARY REVIEW OF INDIVIDUAL PROJECTS REQUIRING FUNDING

Project F1 - Joint Research of Pelagic Fishery Resources
of Lake Malawi/Niassa (Malawi/Mozambique/Tanzania)Identification and Summary

Origin of the Project: Submitted by the Government of Mozambique as a joint project for Malawi, Mozambique and Tanzania

Project Authority: Department of Fisheries, Ministry of Forestry & Natural Resources, Malawi

Nature of the Project: To provide fish stock assessment biologists for the deep waters of Lake Malawi/Niassa in the sectors fished by the three Member States, who will determine the potential, recommend effective fishing methods, study the biology and behaviour of the stocks and recommend standard management strategy to be complied with by fishermen on all three fishing sectors of the Lake i.e. the Malawi, Mozambique and Tanzania sectors. The biologists will be provided with the materials, equipment and funds for operating costs.

Cost of Project: US\$ 2 508 320

Foreign Currency Part: 100%

Duration: 5 years

Desirable starting time: 1983/84

Description of Project

Lake Malawi/Niassa is fished by the three Member States of SADCC - Malawi, Mozambique and Tanzania. Although a little commercial and industrial fishing is carried out in Malawi, the greater part of the fishery is still artisanal subsistence. There is no commercial or industrial fishing in Mozambique and the same applies to the Tanzania side. The present fishery therefore is mainly in-shore, taking fish that is not more than two to three kilometres from the shores. There is therefore the remaining expanse of the Lake which is deep and unexplored.

The project aims at exploring these deep parts of the Lake to study the fish found therein, devise effective methods of catching them, recommend methods of controlling the fishing activities to avoid over-exploitation and ensuring that these are adopted in the national fishery policies of the participating states.

Progress During the Past Year

The project is being submitted for the first time after approval by all three participating governments

Future Activities

The project is submitted for funding and terms of reference will be drafted.

Project F2 - Regional Fish Production, Processing
and Marketing Survey

Identification and Summary

Origin of the Project: Submitted by the Government of Malawi after approval by all Member States

Project Authority: Department of Fisheries, Ministry of Forestry & Natural Resources, Malawi

Nature of the Project: To conduct a survey of the fish supplies in the SADCC region, consumption in each country, unsatisfied demand, country by country, present fish processing and preservation practices, problems inhibiting wider distribution; and, to recommend measures the region should take to overcome the problems identified. The work will be undertaken by a team of consultants assisted in each country by national staff.

Cost of Project: US\$ 100 000

Foreign Currency Part: 100%

Duration: 6 months

Desirable Starting Date: 1983/84

Description of Project

Fish, which is the main source of cheap animal protein in the region, is produced in large quantities in at least six of the nine Member States. However in the region as a whole there is always an unsatisfied demand for fish not necessarily because the region cannot meet this demand from its production, but because the fish produced is not widely distributed owing to technical difficulties.

The Project aims at conducting a survey to identify areas where production can be increased; which unsatisfied markets such additional production can serve; what improvements in the distribution methods need to be introduced; and any other trade problems that need to be solved in order to allow easy movement of fish from one side of the region to the other.

The consultants carrying out this survey will prepare a comprehensive report containing their findings and recommendations (for a Phase II if necessary).

Progress During the Past Year

The project is being submitted for the first time.

Future Activities

The project is being submitted for funding and terms of reference will be drafted.

Project F3 - Lake Kariba Fisheries Research & Development
(Zambia/Zimbabwe)

Identification and Summary

- Origin of the Project: Submitted by the Government of Zambia as a joint project with Zimbabwe
- Project Authority: Department of Fisheries, Ministry of Forestry & Natural Resources, Malawi
- Nature of the Project: To conduct full research of the Kapenta, (Limnothrisa), Tiger Fish (Hydrocynus) and other fisheries of the man made lake in order to assess the size of the stock develop suitable fishing gear, develop management systems, devise good fish processing methods and to conduct an economic appraisal of the present artisanal fisheries. Environmental pollution studies to devise methods of monitoring effects of agricultural and industrial activities on the fish stocks will also be done.
- Cost of Project: US\$ 2 656 000
- Foreign Currency Part: approximately 72.6%
- Desirable Starting Date: 1983/84

Description of Project

The objective of the project is to study the various aspects of the fish resources of Lake Kariba and recommend to the two participating Member States the best harvesting methods and management systems to ensure the best sustained benefits from the resources.

This will be a multifaceted project but with emphasis on:

- (a) limnology of the lake
- (b) fish stock assessment
- (c) fishing gear development
- (d) fish processing development
- (e) economic evaluation of the artisanal fisheries, and
- (f) environmental pollution detection and monitoring.

At the end of the project a report containing the findings and recommendations will be submitted for consideration by the two participating Governments', and implementation.

Progress During the Past Year

The project is being submitted for the first time.

Future Activities

The project is being submitted for funding and terms of reference will be drafted.

Project F4 - A Study to Identify Regional Projects/
Programmes of Production and/or
Commercialisation of Fishing and Fish
Processing Materials and Equipment in
the SADCC Region.

Identification and Summary

Origin of the Project: Submitted by the Government of Mozambique

Project Authority: Department of Fisheries, Ministry of Forestry & Natural Resources, Malawi

Nature of the Project: This is a survey of the fishery materials and equipment manufacturing industry in the SADCC region. The survey will report on the materials and equipment which are currently being manufactured locally and those which could be manufactured locally, the local demand for these; and recommend to what extent production should be stepped up to meet the regional demand. These materials and equipment will include fishing nets, ropes, floats, weights, accessories, deck equipment (e.g. fish boxes), cans for canneries, finished boats and boat building materials e.g. wood.

Cost of Project: US\$ 60 000

Foreign Currency Part: 100%

Duration: 3 months

Desirable Starting Date: 1983/84

Description of Project

A consultancy will be required to prepare and conduct a study of the existing fisheries as well as those planned for the future in each Member Country, particularly to make an inventory of the gear used (or planned to be used, in the case of projected development).

The inventories will include fishery supporting industries (e.g. net making factories etc.) found in the region. Also an inventory of imported materials and equipment used in the fishing industry will be made.

Recommendations will be made as to whether some existing local industries could be expanded to manufacture materials and equipment used in the fishing industry to meet the requirements of the region in this field. Industries which could be expanded or converted to include the manufacture or supply of materials and equipment for the fishing industry include;

- (a) textile factories (for fishing nets)
- (b) metal industries (for fish boxes, boatbuilding materials, cans, etc.)
- (c) cement factories (for ferro-cement boats)

- (d) plastic and synthetic fibre industries (for fish boxes, ropes, nets, twines, etc.)
- (e) wood industries (for boatbuilding, fish boxes, oars, masts, etc.)

Personnel required will be:

- 1 Fisheries Expert (2 months)
- 1 Expert in the manufacture of industrial and small-scale fisheries materials and equipment (2 months)
- 1 Fisheries Economist (2 months)

These will be assisted by national personnel as and when necessary.

Progress During the Past Year

This project is submitted for the first time.

Future Activities

The project is submitted for funding and terms of reference will be drafted.

Project W1 - Wildlife Conservation, Management and
Utilisation in the SADCC Region - Phase I

Identification and Summary

Origin of the Project: Submitted by the Government of Malawi after approval by all Member States

Project Authority: Department of National Parks and Wildlife, Ministry of Forestry & Natural Resources, Malawi

Nature of the Project: This project is a study to obtain information needed to implement the Regional Wildlife Management Strategy which was agreed at the SADCC Wildlife Technical Consultative Meeting in February 1982.

Cost of Project: US\$ 200 000

Foreign Currency Part: 100%

Duration: 12 months

Desirable Starting Date: 1983/84

Description of Project

At the first Technical Consultative Meeting for the Fisheries and Wildlife sectors of SADCC, held in Malawi in February 1982, it was agreed that a Regional Wildlife Management Strategy should be formulated for adoption by SADCC. However, to identify the strategy and prepare projects to implement it detailed background material covering the assets which the region has in the field of wildlife conservation and management and the problems being faced at present. This background information will be used in planning coordination and cooperation in this field by all Member States to solve the problems identified and standardise efforts in combating the problems of wildlife conservation and management.

Progress During the Past Year

The project is being submitted for the first time.

Future Activities

The project is submitted for funding and terms of reference will be drafted.