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Ministry of Agriculture

# Bay Region Agricultural Development Project Mid-term Review

Volume 1  
The Main Report

December 1983

Hunting Technical Services Limited  
Elstree Way  
Borehamwood  
Herts WD6 1SB  
England



# HUNTING TECHNICAL SERVICES LIMITED

A division of Hunting Surveys and Consultants Limited

ELSTREE WAY - BOREHAM WOOD - HERTS - WD6 1SB - ENGLAND

(Registered Office)

Telephone: 01-953 6161

Telex: 23517 HUNBOR G

Cables: HUNTECO BOREHAMWOOD

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12th December 1983

The Project Director,  
BRADP,  
Ministry of Agriculture,  
Mogadishu,  
Somalia.

Dear Sir,

## Bay Region Agricultural Development Project Mid-Term Review - Final Report

In accordance with our contract dated 18th June, 1983 (Clause 12), we have pleasure in submitting our final report for the Mid-Term Review. The report is structured as follows:

Volume 1	The Main Report
Volume 2	Annex 1 Crops
	Annex 2 Livestock
Volume 3	Annex 3 Roads
	Annex 4 Water Supply

May I take this opportunity to thank you and your staff for the invaluable assistance and support that was given to the project team during their stay in Somalia.

Yours Faithfully,

H. Piper  
Director

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# **Bay Region Agricultural Development Project**

## **Mid-term Review**

**Volume 1**

**The Main Report**



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## SUMMARY AND CONCLUSIONS

### PURPOSE OF THE MID-TERM REVIEW

The Bay Region Agricultural Development Project has been operating since April 1980 with finance from the Government of Somalia, IDA, USAID, ADF and IFAD. The Project was designed primarily to increase crop and animal production in a region of Somalia with relatively high potential for rainfed production. The programme for Stage I of the Project and the purpose of the MTR were clearly stated in the IDA Appraisal Report (1979):

'The first stage would last three years and concentrate on procuring project goods, staffing, training, gathering information, extending assistance to farmers (within the limits of proven region-specific technology) and initiating an applied research programme to find solutions to already identified farming problems. This first stage would culminate in the preparation of a work plan that specified the timing, ways and means for completing the implementation of each Phase I component during the second three-year stage. Disbursement of credit funds for each project component following this mid-term review would be contingent upon agreement between IDA and Government to continue with the implementation of each component as originally defined or as modified as a result of the review.' (para. 2.01, IDA, 1979).

This mid-term report, therefore, reviews the progress of the Bay Region Project and, where necessary, makes proposals for improvements in Stage II (1984 - 86). It aims to provide the detailed justification to the donors for continued support to the Project and also demonstrate the need for long-term commitment.

### STAGE I EVALUATION

In the course of the preparation of the Stage II programme, the performance of the Project during Stage I was evaluated. It was concluded that many of the assumptions on which the Project was based were excessively optimistic with respect to the following:

- the physical resource potential of Bay Region,
- the state of technical knowledge of current farming systems,
- the management capacity of the implementing agencies, and
- the speed at which a multi-donor, multi-sectoral project could be launched.

Nonetheless, much of what was planned for Stage I in the field of procurement, establishment of the PMU and information gathering was achieved. As a result of the Stage I studies, the physical resource information available to the Consultants was significantly better than that available to the original planners.

The assignment of staff from different field ministries and agencies to the Project to work under the PMU (under the MOA) was difficult and has not worked smoothly. The PMU has become overloaded with staff and functions, and the planning and direction of the proposed rural development programme has taken second place to solving the day-to-day problems of managing a complex operation with few experienced staff. These difficulties have their root in the lack of attention to management aspects at the design stage and to long delays in the assignment of capable TAs to fill key posts.

The Pilot Agricultural Development Units which were to be the core of the Project by introducing a new system of self-sustaining land use, integrating crop and livestock husbandry, proved impracticable. The Project lost the initiative in crop extension work to

the National Agricultural Extension and Farm Management Project (AFMET) which has itself achieved very little in the Region without the support of adaptive research and a supply of inputs.

At the planning stage of the Bay Region Project, rural water supply was to be included under the responsibilities of the PMU. However, Government concluded an agreement for technical assistance with USAID which included the water supply work for the Region under a national project.

As a result of these fundamental changes to the original plan of operation, the Bay Region Project lacked a coherent strategy and was left with a number of unrelated programmes, i.e.:

- Bonka Research Station
- The Seed Farm
- Range Reserves
- Veterinary Service
- Road Construction.

Whether the PMU would have had the capacity to manage agricultural extension and water supply as well as implement a field programme such as the PADUs is an open question. This does not alter the fact that the Project was charged with the agricultural development of Bay Region, without being given command over the means of implementation.

## STAGE II OBJECTIVES

A major objective for the Mid-Term Review has been to re-define the role of the Project in the agricultural sector so that it can provide an integrated field service to agro-pastoralists consisting of adaptive research, input supply (seeds, plant protection, simple drugs, tools, etc), extension (through AFMET and Veterinary Department field staff), and immunisation of livestock against major diseases. Related to these production objectives, the Project will ensure that better rural water supplies and roads are provided in the areas with the greatest need and potential. A third objective is to strengthen government agencies and departments in the expectation that, with the dissolution of the Project, these will resume responsibility for their sectoral functions. Account has been taken of the likely future organisation of the field services of the MOA and the need to build up the district-level organisation which has so far been neglected in the investment programme;

The project objectives in Stage II would remain fundamentally the same, but they would recognise that benefits from increased crop production would not be realised in the short term and that surpluses are likely to be absorbed by the increasing population in rural as well as urban areas of the Region. Thus the people of Bay Region would be the primary beneficiaries of the Project. The emphasis will be on sustaining *per capita* income and reducing risks in a drought-prone area.

## ORGANISATION

Alternative organisational forms for multi-sectoral rural development projects were examined during the Mid-Term Review. The key decision was whether the Project could best meet its objectives merely supporting the activities of various sectoral departments, by simply procuring and disbursing on their behalf, or whether the Project should adopt an active role in implementing field programmes, as originally intended. It was concluded that the Project should proceed as planned since much of the work of establishing the PMU had already been done and because sectoral agencies and departments could not be relied upon

in the short term to assume an implementing role.

Therefore, in Stage II, the PMU will continue to direct the work of the MOA, MLFR and the MPW's Civil Engineering Department and coordinate the WDA's water supply programme in the Region in pursuit of expanded agricultural production. However, to make its task more manageable, the Project will no longer try to direct the range management staff of the NRA in the Region, who will return to their parent agency. It was concluded that the implementation of what would amount to an inter-regional range management programme would be far beyond the capacity of the PMU.

Thus, organisational proposals for the PMU in Stage II will be confined to improved administrative measures. Chief among these is the proposal to arrange regular meetings of the Regional Coordinating Committee (RCC), comprising the heads of project components, representatives of AFMET and the Water Development Authority's CGDP and the Regional Governor. These meetings should serve to keep the Project's targets continuously in view, inform participants on all aspects of the Project and encourage the decentralisation of planning and decision-making envisaged in the Project Documents. The Programme Officer (new TA post) will be the Secretary of the RCC and will assist in the preparation of monthly progress reports on individual components which will form the agenda of the RCC.

#### **SUPPORT TO THE FARMING SYSTEM**

An important conclusion from surveys in Stage I is that there are no large unutilised areas which can be readily exploited, nor are there obvious ways in which farmers can greatly increase production, given the resources of capital and family labour available to them. Agro-pastoralists integrate farm and range activities with greater skill than the planners gave them credit for. If ways of achieving large increases in production are not immediately feasible, there are means by which Government can help the small farmer, for example through veterinary services, the provision of seed in times of drought, seed dressings, pesticide to control stalkborer, crickets and grasshoppers, advice on how to use them and an assured market for grain in good years. None of these individually represent major breakthroughs, but if well managed and effectively coordinated they can reduce many of the risks to which farmers are exposed. The district offices of the MOA have a key role in coordinating these field services. During Stage II, the Project will seek to improve the currently poorly organised and extremely fragmented agricultural services of Bay Region and lay the foundations for an expanded programme of support in Phase II.

#### **ADAPTIVE RESEARCH**

Following a comprehensive review of research needs and the capacity of Bonka Research Station (BRS), it is concluded that the existing research team of an agronomist and a sorghum breeder should be strengthened by the assignment of an agronomist to study current farming methods in the Region and the main production and economic constraints, an agronomist to work on soil management and agricultural engineering problems, and an entomologist to investigate sorghum pests and their control. The research programme will be built around sorghum, the dual purpose fodder and grain staple. Only by improving the yield and reliability of the sorghum crop are farmers likely to consider cash crops such as groundnuts and sunflower. New practices would be developed under controlled conditions on the Station at Bonka and at three sub-stations in outlying districts. The research team will collaborate with the AFMET Project to test the economic and practical feasibility of new practices on farmers' fields, the results of which will be made known to extension agents. The Project will provide technical assistance and training, buildings and equipment, and operating expenses during Stage II. By the end of Stage II, Bonka Research Station should be established as the premier rainfed crop experimental station in Somalia.

## **THE SEED FARM**

During Stage I, the Seed Farm (originally started in 1976 with the specific objective of bulking seed of local varieties as an insurance against shortages following dry years) has been attempting to produce higher-yielding sorghum seed for distribution to farmers. Unfortunately, yields and other characteristics of these seeds have not been demonstrably better than the local varieties.

Improved varieties are expected to emerge from indigenous breeding programmes or from the introduction and screening of exotic material within the next three years. In the meantime, the logistic function of the farm will be paramount, that is the production of local varieties of sorghum seed, properly processed and stored for provision to farmers in emergencies. During Stage II, therefore, the Seed Farm under the direction of the TA already in place will establish the necessary seed production methods and procedures and train staff for such time when proven improved crop varieties emerge.

The currently proposed 200 ha farm will be reduced to 50 ha, the remaining area to be allocated to research activities when BRS moves across to the Seed Farm site. The Project will provide technical assistance and training, buildings and equipment, and cover the operating costs of the Seed Farm for the duration of Stage II.

## **PLANT PROTECTION**

In Stage II, the existing Plant Protection Unit of the MOA in Baydhabo will be upgraded and refurbished with the objective of controlling major outbreaks of crop pests in the Region and providing material and technical support to field extension agents. The Project will provide the capital necessary for rehabilitation of the HQ in Baydhabo, for construction of input stores in the districts, and for the purchase of vehicles, equipment and protective clothing. Operating costs will cover staff, materials and supplies. The Unit will be assisted by the Entomologist at BRS in the screening of pesticides for use in the Region.

## **FARM INPUT SHOPS**

The Project will open a small farm input shop in each district centre. The stock of items will include pesticides, acaricides, anthelmintics, seeds, improved hand tools, utensils, oxdrawn equipment and harnesses, hand sprayers and spares, etc. Items will be packaged for distribution to individual farmers with instructions for use. The objective would not be to pre-empt the development of private-sector trade, but to provide a temporary outlet for farm requisites to test and demonstrate the need. The Project will provide a revolving fund for materials and supplies, shops and operating costs.

## **MOA DISTRICT OFFICES**

During Stage II, the MOA District Coordinators will be of increasing importance in administering the field services of the Ministry in their districts. They will be formally brought under the Project which will refurbish buildings, equipment and transport.

## **VETERINARY SERVICE**

The services of the regional Veterinary Department will also be strengthened at district level by the assignment of qualified veterinarians to each district. Among their duties will be the direction and supervision of the district vaccination teams. The Project will provide the necessary materials, equipment and transport to establish and maintain vaccination against Rinderpest and Black Quarter.

A suitably qualified veterinarian will be recruited in Stage II to mount an investigation into the epidemiology and incidence of the important diseases in the Region and train laboratory staff.

The design of a systematic curative programme must await the outcome of this investigative work. In the meantime the Project will construct seven new dispensaries, as part of the Phase I building programme, and provide supplies and basic equipment for all village dispensaries in the Region. A pilot extension programme consisting of four staff equipped with motor-cycles and drugs (acaricides and anthelmintics) will concentrate on the proposed villages in the Pilot Village Development scheme.

### **PILOT VILLAGE DEVELOPMENT**

This component will be a joint undertaking by the Project and AFMET with possible involvement of the USAID Health Project as well. The purpose will be to bring together the full range of services (crop and livestock extension, farm inputs, plant protection and water supply) at village level in an attempt to obtain a significant impact on rural living standards. Reasonably accessible, representative villages will be selected in each district, and the people themselves will be involved in the planning and implementation of the scheme.

The pilot scheme will be on sufficient scale to throw up the real problems of rural development and to generate worthwhile increases in production. At the same time, the scheme will not be so demanding of management, supervision, materials and equipment that its methods will not be replicable over a wider area in Phase II of the Project.

Costs will be absorbed in the operating costs of participating agencies. No special infrastructure will be provided apart from the pumps to be installed in the tubewells. Technical Assistance will be provided for a three-month period in each year to train Project staff and village people in community development methods, launch the programme and maintain the necessary impetus.

### **ROADS**

Mechanical plant for the roads programme funded by ADF was delivered in the second half of 1982 and four TAs were assigned to the Project. Even allowing for the late arrival of equipment, the performance of the roads unit was poor in the first year of its operation. Not only was the rate of construction slow, but the work was done to a very low standard. Very little upgrading or maintenance of the existing road network has been done. Most of the equipment is unsuitable for this purpose.

In Stage II, the roads component of the Project will be reorganised for the completion of a revised construction and maintenance schedule. There will be three functional units: a Road Construction Unit, a Road Maintenance Unit operating from depots in Baydhabo and Diinsoor, and a Workshop and Plant Maintenance Unit. The vehicles and plant will be re-allocated from the current two construction units. Some additional equipment will be obtained for the Road Maintenance Unit at an estimated costs of US\$0.6 million.

Two more TAs will be recruited to improve the direction and control of the roads programme. Two senior government staff will receive post-graduate training to MS level and nine intermediate staff will be provided with practical training abroad with an appropriate highway authority.

### **WATER SUPPLY**

The objectives of the Bay Region water supply programme were to improve the supply of potable water in the Region for human and livestock consumption, especially in the crop producing areas. This included the development of both groundwater and surface water resources, but, following the inclusion of the water supply programme for the Region under the Central Groundwater Development Project, the work on surface water

sources was shelved. Thus, while the progress of the exploratory drilling work scheduled for Stage I has been generally satisfactory, no systematic work has been done on the development of surface water resources in those areas (e.g. Buurhakaba District) where the provision of perennial supplies from groundwater is both difficult and expensive.

Whereas the Mid-Term Review of other project components has resulted in a costed programme for implementation in Stage II of the Bay Region Project, the outcome of the review of the water supply component is a costed proposal for consideration by GOS and USAID when planning Stage II of CGDP.

The recommended work plan in the field of groundwater is basically that needed to complete the programme laid down in the IDA Appraisal Report (1979) with only minor modifications and additions. The surface water programme will be aimed at those cropped areas of Buurhakaba District deficient in groundwater. Although the proposed pilot programme (including four experimental wars to provide perennial potable supplies for small farming communities) will not have a significant impact on the water supply in those areas, it should provide the information which would make such improvement possible in the long term.

### PROJECT COSTS

The total costs of the three years of Stage II of the Project are estimated at US\$25.0 million. This figure includes proposals for support to the farming system, veterinary service, roads, water supplies and PMU. A minimum of 10 per cent contingencies has been included and an annual inflation rate of eight per cent has been assumed from 1983 onwards. The costs of the various components are as follows:

	Stage II Projected cost (US\$ '000)	Amount available (US\$ '000)
PMU and Housing	5 348	3 570
Farming system	4 967	2 001
Veterinary (and Range)	1 417	3 786
Roads	5 889	7 481
Technical Assistance and Training	7 481	6 198
<b>TOTAL</b>	<b>25 102</b>	<b>23 036</b>

The table above also shows the amount remaining of the original funding allocation as of 1st January, 1984. The total of US\$23.036 million excludes any unspent balances originally allocated for the Water Supply Component or the National Monitoring and Evaluation Facility.

Assuming that the individual funders will cover the same cost categories as originally agreed, the Stage II costs will be allocated between them as follows:

	Cost to Funder (US\$ '000)	Available Funds (US\$ '000)
GOS	1 439	3 696
IDA	9 434	7 823
IFAD	6 287	5 149
AFD	4 487	4 469
USAID	3 455	1 899
<b>TOTAL</b>	<b>25 102</b>	<b>23 036</b>

# 1

## Introduction

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### 1.1 GENERAL BACKGROUND TO THE PROJECT

The Bay Region Project was conceived following the food crisis of the mid 1970s. It was recognised that investment in agricultural development had been primarily in high-income irrigated agriculture along the two principal rivers. Low-income subsistence agriculture and pastoralism had been comparatively neglected. Despite its size (about 25 per cent of the cultivated area) and rapid growth rate, the modern sector, was capable of absorbing only a small proportion of the 40 000 or more annual entrants into the labour market in the foreseeable future (ILO, 1976). Expansion of irrigated agriculture was constrained on the Shabeelle by a shortage of irrigation water and on the Jubba by lack of irrigable land.

Much of the national potential for an expansion of rainfed cropping was believed to lie in the Bay Region in the districts of Baydhabo, Diinsoor and Qansaxdheere. On the basis of reconnaissance surveys in the inter-riverine area, the IDA Appraisal Report (1979) estimated that there were 370 000 ha of potentially cultivable land in the Bay Region which could be brought into production to decrease the country's reliance on imported cereals.

In addition, gains in productivity could be achieved on the currently cultivated area by eliminating elementary failures in the farming system without substantial inputs and by applying known techniques (paragraph 1.06, IDA, 1979). In other words, rapid increases in production were believed to be possible without resort to long-term research programmes. The prospects for rapid vertical and horizontal expansion in crop production were considered to be good.

The IDA Appraisal Report (paragraphs 1.29-1.32) identified the major constraints in Bay Region as:

- (a) A lack of permanent water for human and animal use during the dry seasons hindering the integration of crop and livestock production;
- (b) An inadequate network of farm-to-market roads resulting in wastage of surplus grain and weight losses by livestock;
- (c) The practice of shifting cultivation coupled with a "complete dichotomy" between crop and animal production;
- (d) The lack of qualified manpower and "clear lines of responsibility" in government agencies.

Accordingly, the purpose of the IDA support was to increase crop and livestock production in the Bay Region. Over a period of six years, the project was to improve the potable water supply, upgrade the road network, support the development of an integrated, permanent and non-exploitative farming system, provide professional training for Somalis and help build institutions capable of carrying on the agricultural development task in the Bay Region.

According to USAID (p.3, 1980), the Bay Region Development Project had three objectives:

- (a) "Increase crop and livestock production in the region by increasing production on currently cultivated land and expanding cultivation into new lands;
- (b) Integrate extension operations to incorporate both crop and livestock interventions in a farm systems approach; and
- (c) Establish a basis for decentralised integrated development planning and implementation through the PMU."

The IDA Appraisal Report (paragraph 2.01) recommended that the Project consist of two phases in which the first phase would provide the infrastructure, institutional strength and information base, funds and facilities required to prepare a second phase project for implementation. Because of the many technical and institutional questions that remained unanswered, the first phase was to be implemented in two stages. During the first stage of three years, the Project would concentrate on procurement, staffing, training, gathering information, extending assistance to farmers (within the limits of known technology) and applied research. This would culminate in a Mid-Term Review (MTR) and the preparation of a detailed programme and budget for the completion of each Phase I component. The IDA Appraisal Report (paragraph 2.01) envisaged that the MTR might lead to the modification of the project components as originally defined.

The Project was prepared by the FAO/World Bank Cooperative Programme in mid-1977. Appraisal by IDA and USAID was completed more than two years later. The Project Director and key technical assistance staff were not in place before mid-1980, and it was not until 1981 that implementation really got under way. Thus by the end of 1983 the Project had been operating for three years.

## **1.2 OBJECTIVES OF THE MID-TERM REVIEW**

The evaluation of the last three years' work and the preparation of the programme and budget for Stage II were carried out by the Consultants in close cooperation with project personnel during the period July-October, 1983. Every effort was made to reach clear understanding of the lessons to be learned from Stage I and the steps to be taken to correct any deficiencies. While the Consultants accept full responsibility for the contents of this document, it is our understanding that the proposals have been discussed and agreed with the government authorities. In the course of the study, the Consultants have had informal discussions with USAID, and latterly, with the IDA representative responsible, with a view to incorporating the wishes of the donors in the Stage II proposals.

Accordingly, the report reviews the progress of the Bay Region Project and, where necessary, makes proposals for changes which would improve the performance in Stage II. It aims to provide the detailed justification to the donors for continued support for Stage II (1984-1986) and demonstrate the need for longer-term commitment after 1986.

This report does not address itself to the NMEF component which is clearly discrete from BRADP although financed under the same IDA/IFAD agreement.

### 1.3 THE PROJECT AREA AND POPULATION

The physical, human and animal resources of the Project Area and its land-use potential have been documented in several project papers and reports. In this Section only the salient points are mentioned.

#### 1.3.1 Bay Region

The Project covers the whole of the Bay Region (about 4 million ha), but its boundaries, and those of its districts, have not been formally surveyed. The geometrical pattern shown on the project map (see Figure 1.1) reflects the best approximation, given the information available. The four districts of the Region (Buurhakaba, Diinsoor, Qansaxdheere and Baydhabo) are defined by their centres rather than by their boundaries. They are located on the fertile clay plains developed on the Jurassic limestone and on the Basement Complex. The rest of the Project Area (about 80 per cent) is rangeland on infertile, stony soils. The climate is arid or semi-arid with an unreliable bi-modal rainfall (see Annex 1, Chapter 1 for a review of physical resources).

#### 1.3.2 Population

The population estimates of Bay Region by various government departments, aid agencies and consultants vary greatly. Table 1.1 shows seven such estimates extrapolated to 1983.

TABLE 1.1 ESTIMATES OF BAY REGION HUMAN POPULATION

Source	Population in 1983 <sup>1</sup>
National Census 1975	385 615
IDA 1980	407 719
USAID 1980	376 353
Min. of Local Govt. 1981	823 795
HTS 1982	453 640
RMR for HTS <sup>2</sup> 1982	735 103
WHO <sup>3</sup> 1982	282 082

Notes: <sup>1</sup> Assumes 3.1 per cent per annum increase as given in *Five Year Development Plan (SDR, 1982)*.

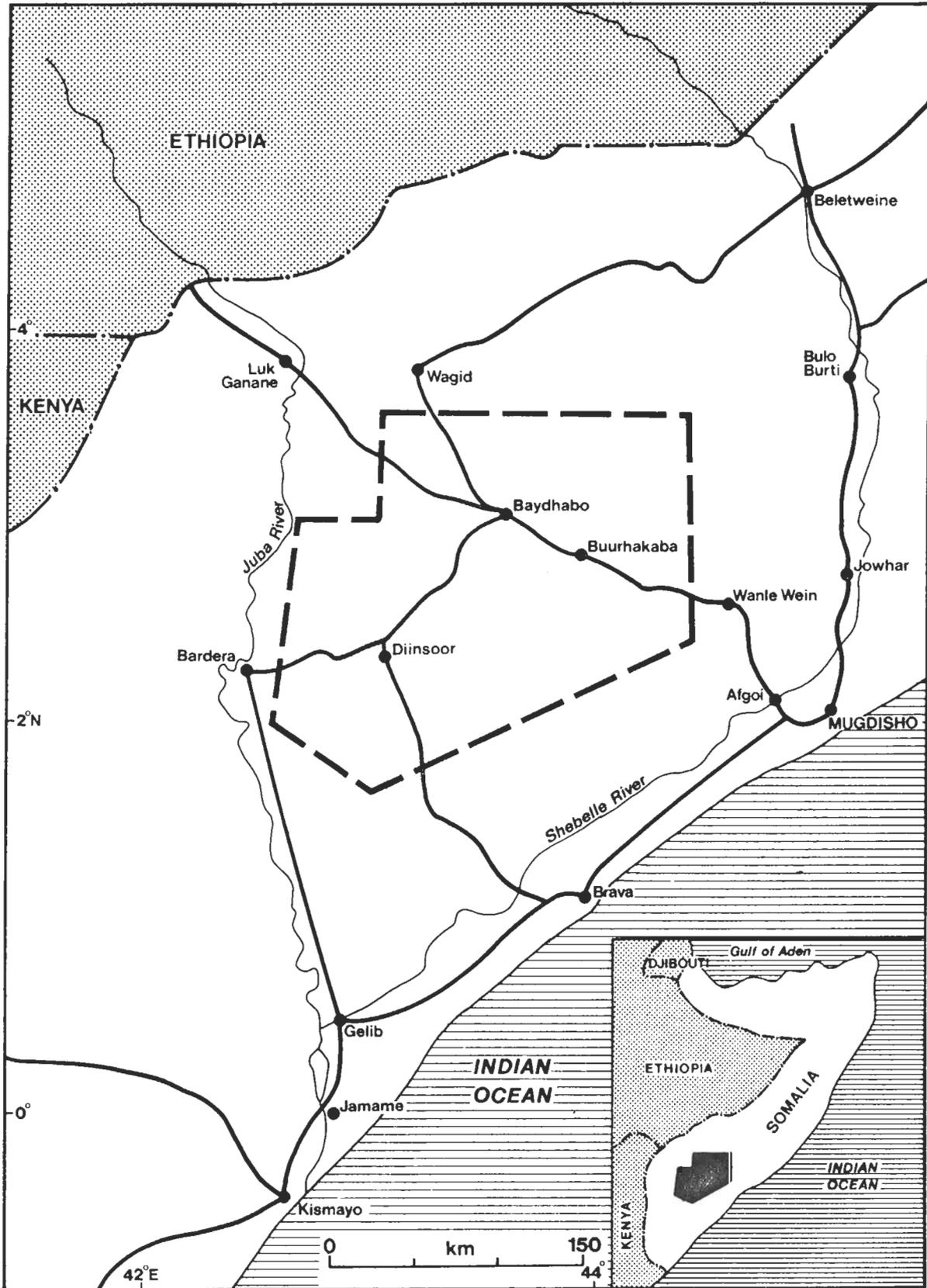
<sup>2</sup> Assumes Baydhabo had a population of 50 000 in 1982.

<sup>3</sup> Based on smallpox campaign.

Source: *Hunting Technical Services, 1983.*

The proportion of the population in each district given by USAID (1980) differs from that given by IDA (1979) as follows:

# 1.1 The Bay Region. Project Area



	IDA %	USAID %
Baydhabo	43	59
Buurhakaba	28	20
Diinsoor	15	11
Qansaxdheere	13	10

The main difference lies in the estimate of the population of Baydhabo town. USAID (1980) estimated that urban population of the Region at 68 683; Lewis et al (1983) believe the population of the regional capital to be between 55 000 and 60 000. Probably the most accurate urban figures are for a few towns where the USAID Public Health Project carried out their own census in 1982.

	Total Population
Buurhakaba	9 800
Diinsoor	6 711
Qansaxdheere	1 742
Awdinle	3 274
Berdaale	4 172

### 1.3.3 Rural Economy

Again, the various estimates of settlement types show little agreement. The Ministry of Local Government estimated in 1981 that 70 per cent of the Bay Region population were settled farmers, 28 per cent nomads and 2 per cent urban. USAID (1980, Annex XIII) gives an estimate of 47 per cent settled farmers, including semi-nomads, 33 per cent nomads and 20 per cent non-agricultural. Much of the difficulty lies in defining the categories. It is nonetheless clear that the bulk of the population (some 60 per cent) cultivate sorghum for fodder and grain in both seasons, if rainfall permits. During the cropping seasons, the population is concentrated on the clay plains which cover about 20 per cent of the area, about half in Baydhabo District. When water in local reservoirs and shallow wells is used up, animals are moved from the plains to the rivers, springs or government reservoirs, where water and grazing/browsing are available. The total livestock population (February 1982) of over one million animals is made up of almost equal numbers of camels, cattle and goats (HTS, 1982).



# 2

## Evaluation of Stage I

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Prior to commencing the preparation of the detailed work plan and budget for Stage II, the Consultants carried out a systematic evaluation of the Stage I results. The objectives and assumptions set out in the original project documents (i.e. the IDA Staff Appraisal Report, September 1979; the USAID Project Paper, April 1980) and the planned means of achieving these objectives were analysed.

The actual performance was compared with planned performance and the reasons for any shortfalls were identified: deficiencies in design (faulty assumptions and over-ambitious targets), other factors beyond management control (late delivery by donors, shortages of skilled manpower, changed circumstances), and other factors internal to management.

A draft evaluation report on Stage I was submitted to the Project Director for comment at the end of the eighth week of the Mid-Term Review (MTR). The main conclusions of the evaluation are summarised below. The results of the evaluation of each project component are presented in more detail in the appropriate sections of this report.

It is apparent that many of the assumptions on which the Project was based are now questioned, for example:

- (a) That 370 000 ha of new arable land could be brought into cereal production;
- (b) That gains in productivity could be readily achieved by introducing farmers to simple inputs and improvements in cultural practices;
- (c) That the current agricultural system was characterised by complete separation of crop and animal enterprises;
- (d) That a special Project Management Unit would have the capacity to direct the regional staff of MLFR, NRA, WDA, MPW's CED and the MOA, effectively draw together their work as well as mobilise local representative bodies so as to achieve substantial increases in crop and livestock production.
- (e) That a complex, multi-donor project could be launched in one year.

The arrangement by which staff of ministries and agencies were seconded to the PMU under MOA was difficult to set up and has yet to work well. The PMU has been overburdened with staff and functions and the planning and direction of an integrated project have taken

second place to the day-to-day problems associated with such a complex operation. This overloading of management personnel has inevitably resulted in inadequate planning and monitoring and lack of control over the use of materials and supplies. Most of the problems of the PMU have arisen from lack of attention to management aspects at the design stage and to delays in the assignment of the TAs who were to fill key posts (see Figure 2.1).

What would have happened if the implementation of the project had been left to the individual line ministries and agencies, and merely coordinated by the PMU, is open to question. Performance may have been no better. It is noteworthy, however, that progress in the water supply work, over which the PMU had very little direct management control, has been moderately satisfactory. This element, however, was strongly supported by US technical assistance which played an operational as well as an advisory role. In contrast, agricultural extension, which was to have come under the PMU, but which has operated independently under AFMET, has been largely ineffective due to the lack of an appropriate extension message.

Without the extension component and the Pilot Agricultural Development Units and irrigation expansion, both of which proved unfeasible, the agricultural components of the Project have been reduced to adaptive research at Bonka Research Station and seed multiplication. Progress of both these elements in Stage I was delayed by the late arrival of TAs provided under the USAID agreement.

Nonetheless, much of what was planned for in Stage I in the field of procurement, establishment of the PMU and information gathering have been achieved. Of particular note is the land capability survey carried out in 1982 which provides a rational basis for planning land use. Also, the hydrogeological work conducted in the limestone formation provides the basis for the Stage II drilling programme which if accompanied by pump installation, should bring immediate and welcome benefit to the settled population of the area.

Many of the problems of establishing the Project have now been resolved. During Stage II, the number of trained staff returning to Bay Region will increase and in the meantime an experienced team of technical assistants will be in place. With the proposed design changes and the introduction of management procedures, the pace of implementation should increase during Stage II.

FIGURE 2.1 TECHNICAL ASSISTANTS: PHASING AND JOB TITLES, STAGE I.

	1980	1981	1982	1983
<b>Project Management Unit</b>				
Technical Manager	-----	-----	-----	-----
Financial Controller	-----	-----	-----	-----
<b>Water Supply</b>				
Hydrogeologist	-----	-----	-----	-----
Water Engineer*	-----	-----	-----	-----
Drilling Superintendent	-----	-----	-----	-----
Chief Driller*	-----	-----	-----	-----
Chief Mechanic*	-----	-----	-----	-----
<b>Access Roads</b>				
Senior Highway Engineer	-----	-----	-----	-----
Plant Superintendent	-----	-----	-----	-----
Mechanical Engineer	-----	-----	-----	-----
Mechanical Superintendent	-----	-----	-----	-----
<b>Farming System</b>				
Seed Farm Manager	-----	-----	-----	-----
Agric. Research Officer	-----	-----	-----	-----
Veterinarian	-----	-----	-----	-----
Extension Specialist	-----	-----	-----	-----
Range Management Specialist	-----	-----	-----	-----

\* Part-time.

----- = planned.

----- = actual

Source: *Hunting Technical Services, 1983 and PMU*



# 3

## Funds Available for Stage II

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### 3.1 ORIGINAL FUNDING LIMITS

The original level of investment for BRADP, as defined in the Staff Appraisal Report (IDA, 1979) was US\$45.0 million. This was divided between the co-financing agencies as follows:

GOS	5.6
IDA	12.0
IFAD	8.0
USAID	10.5
ADF	8.9
	<b>US\$45.0 million</b>

The different agencies took responsibility for particular sections of the Project. The joint IDA/IFAD loan, split 60:40 between the two, was to cover all buildings and consulting services and part of the total project expenditure for materials and equipment, local salaries (32 per cent), materials and supplies, technical assistance and training abroad. GOS was responsible for paying 68 per cent of local salaries, plus some other vehicle and material costs. USAID were to supply vehicles and equipment, technical assistance and training for the water supply and agricultural components. ADF financing was limited to the roads component, except for the buildings, technical assistance and training elements.

USAID subsequently re-appraised the Project in April 1980 and made two significant alterations. Assistance for the water supply component with the exception of about US\$3 million of commodities which remained, was removed from BRADP and allocated to the Comprehensive Groundwater Development Project (CGDP). At the same time, other costs were revised and the total USAID funding raised to US\$11.2 million. GOS have provided another US\$1 550 000 from PL 480 funds, raising the total allocation to US\$47.2 million.

### 3.2 REMAINING FUNDS

An estimate of the funds available for Stage II is a necessary first step in the preparation of a detailed workplan. The 31st December 1983 has been chosen as an appropriate cut-off date, in that expenditure up to that date can be estimated with some confidence. This coincides with the co-financing meeting planned for the beginning of 1984.

An estimate of expenditure by 31st December 1983 compared with the original allocation, is presented in Table 3.1. The estimate is based on actual operating costs since the start of the Project in April 1980 until 30th April 1983, and capital expenditure until

31st May 1983. To those actual costs have been added committed expenditure and estimates of capital and operating costs until 31st December 1983. The value of the long-term contracts between USAID and other contractors has been included, as well as the first US\$3.0 million of the Wyoming contract.

In addition to the uncertainties involved in projecting operating costs to the end of 1983, there are problems in obtaining accurate figures on capital expenditure. The Somali shilling was devalued from 6.295 to 12.47 per US dollar on 30th June 1981 for all items except essential imports, and these were also affected from 1st February 1982. A further devaluation on all items to 15.36 took place on 30th June 1982. Because the funding agencies have not provided the Project with up-to-date statements, it is impossible to tell from PMU records on what date a particular purchase took place. Therefore, the following convention has been adopted for all purchases:

1980-81 @ Ssh 6.295

1982 @ Ssh 13.4

1983 @ Ssh 15.36

An additional complication with USAID-financed items is that commodity purchases are initially estimated. The estimate then remains on the file until the final figure for a set of purchases is established. In cases where the file had not been closed, the initial estimate has been used.

**TABLE 3.1 EXPENDITURE TO 31st DECEMBER 1983 in US\$'000**

	Committed funds	Amount spent	% spent
PMU, Overheads, Unallocated	5 155	1 585	31
Water supply (excluding CGDP)	6 671	2 084	31
Access roads	12 600	5 119	41
Research and Seed Farm	3 359	1 358	40
Range and veterinary	5 170	1 384	27
NMEF	1 000	368	37
Technical assistance and training	13 270	7 072	53
<b>TOTAL</b>	<b>47 225</b>	<b>18 970</b>	<b>40</b>

*Source: Hunting Technical Services Limited, 1983, and PMU.*

Table 3.2 shows the estimated disbursements to 31st December 1983 by financier. GOS expenses include direct local salary and other costs and a sum of US\$555 000 allocated to BRADP from PL 480 funds.

Halfway through the Project 40 per cent of the money has been spent. Only a fifth of the IDA/IFAD has been disbursed, but a major proportion of this will be allocated to the building programme once this has been finalised. Half of the ADF allocation has been expended; the capital equipment has now been supplied but, due to delays, operating costs have not yet reached maximum levels. The USAID budget, which was mainly for commodities and technical assistance, is three-quarters spent, but most of the budgeted

TABLE 3.2 DISBURSEMENT BY FINANCIER TO 31st DECEMBER 1983 in US\$'000

	Committed funds	Amount spent	% spent
GOS	7 155	2 394	33
IDA	12 000	2 403	20
IFAD	8 000	1 600	20
ADF	8 900	4 431	50
USAID	11 170	8 142	73
<b>TOTAL</b>	<b>47 225</b>	<b>18 970</b>	<b>40</b>

Source: *Hunting Technical Services Limited, 1983, and PMU.*

commodities have been delivered and a long-term technical assistance contract has been signed. Only a third of the GOS budget has been spent because this allocation was mainly for operating costs and the emphasis in Stage I has been on capital expenditure.

Most of the components have fallen behind their expenditure targets due to delays in the building programme and in the start of field operations. PMU expenditure include several items which should not strictly be allocated to the PMU, but which are difficult to assign to a component. These include the petrol station, the bank and port charges incurred through import of capital items for other project components and the cost of rents and guards resulting from delays in the building programme. However, there is a clear over-expenditure on staff and vehicle operating costs which are currently the subject of management's attention. Overall, the number of staff employed by the Project is close to the planned total of 440 (see Table 3.3).

The costs of the building programme are difficult to assess at this stage because tenders have not yet been received and the size and scope of the programme not divided. An informal estimate places the costs at US\$6.0 million.

Additionally, at the time of writing, there are indications that more funding could be made available. First, the original estimated total costs of the CGDP was US\$13.0 million over a six-year period. During the first three years about US\$8.0 million has been spent and USAID financing for the second stage of the CGDP is now being considered. It is hoped that the re-negotiated CGDP will include provision for the proposed water supply elements of the Bay Region Project. Secondly, the ADF have indicated that another US\$4.0 million may be made available for the roads component, particularly for strengthening the maintenance unit. Finally, USAID are expected to reconsider their budgetary ceiling for commodities and training for the crop and livestock components, as they are likely to exceed their budget allocation.

From the US\$28.255 million unspent at the end of 1983 only US\$23.036 million is assumed to be available for a Stage II programme because it is necessary to reallocate the remaining US\$4.587 million in the water supply budget to the second stage of CGDP (which has taken over responsibility for the water supply component of the Project) and US\$0.632 million remaining in the NMEF allocation. (NMEF has not been included in the MTR).

TABLE 3.3 PROJECT MANPOWER: PLANNED AND ACTUAL (MAY, 1983)

Component	Professional/Technical		Semi-skilled		Unskilled		Total		Cost/Month (Ssh '000)	
	Planned	Actual	P	A	P	A	P	A	P	A
MAO District Offices	-	0	-	9	-	12	-	21	-	16.5
Regional Plant Protection	-	2	-	6	-	4	-	12	-	9.8
Seed Farm	8	6	8	9	4	11	20	26	33	28.5
Adaptive Research	4	6	16	13	0	4	20	23	26.8	30.5
Veterinary Service	5	15	56	34	6	14	67	63	61.6	82.7
Range Guards	0	0	0	0	56	80	56	80	37.3	9.2 <sup>1</sup>
Project Range Service	5	7	12	4	5	2	22	13	22.5	20.7
Water Supply	16	0	49	0	10	0	75	0	73.8	0
Roads	5	8	106	78	34	67	145	153	128.3	183.4
PMU	12	15	18	36	2	18	32	69 <sup>3</sup>	45.2	92.6
Temporary watchman	0	0	0	0	-	29	-	29	-	13.8
<b>TOTAL</b>	<b>55</b>	<b>59</b>	<b>265</b>	<b>189</b>	<b>117</b>	<b>241</b>	<b>437</b>	<b>489</b>	<b>428.5</b>	<b>487.7<sup>2</sup></b>

Notes:

<sup>1</sup> Cash component only, excludes WFP food aid.<sup>2</sup> US\$1 = Ssh 6.295; exchange rate since 30.6.82 = Ssh 15.36.<sup>3</sup> Excludes about 10 staff in Mugdisho.

Dash symbol = not planned in IDA Appraisal Report.

Source: HTS 1983, based on BRADP pay sheets for May 1983.

# 4

## The Rationale for the Stage II Programme

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### 4.1 OBJECTIVES

#### 4.1.1 Production

In retrospect, the IDA Appraisal Report (1979) is recognised to be excessively optimistic about the resources of the Project Area and the ease with which changes could be achieved. On closer inspection, the project benefits postulated by IDA are extremely vulnerable to reassessment. The IDA and USAID documents emphasise the importance of the Project in bringing about sustainable production increases, but fail to specify the intended beneficiaries of increased production.

The Consultants have benefitted from information generated by the work carried out during Stage I, unavailable in 1979, and recognise the need to propose more plausible objectives. Benefits are expected to derive from supporting traditional producers in the production of sorghum and livestock. However, as wide departures from existing systems of production are not considered feasible in the next decade or so, the incremental production is not expected to be large. The emphasis must be on sustaining *per capita* production in the face of increasing population and reducing the risks faced by producers.

Nonetheless, in the formulation of the Stage II proposals, care has been taken in devising the best strategy possible for achieving project benefits. It is possible to distinguish between:

- (a) Productive components which can be implemented in the next three years and which will generate benefits immediately, e.g. some roads, water supplies and veterinary work;
- (b) Productive components the benefits from which will be delayed, e.g. adaptive research, the seed farm;
- (c) Other components, up to the limits of the financing available, e.g. buildings for non-agricultural components, staff housing.

In Annex 2 estimates have been made of production parameters for different types of livestock within the Region and the estimated capital value of trade stock passing through it. These data adequately demonstrate that a one per cent reduction in mortality from veterinary services would be worth Ssh 8.0 million per annum.

An increase in sorghum production beyond demand within the Region would be of questionable value. The crop is used for human consumption principally in the Bay, Bakool and Gedo Regions and Northern Somalia. Consumers in the rapidly growing coastal towns have already developed more sophisticated tastes. Improvements in sorghum yield (from improved varieties, pest control, etc.) and in the returns to labour (from limited mechanisation) should allow greater security for the farmer and make more time available for the production of other crops. But more research is needed to establish the feasibility of this diversification.

#### **4.1.2 Living Standards**

After Stage I, there is more awareness of the difficulties of achieving significant increases in traditional crop and livestock production and greater appreciation of the importance of improved water supply as a means of bringing immediate benefits to the rural population.

#### **4.1.3 Institution Building**

The original project documents placed emphasis on the institution building objectives of BRADP. Government agencies and departments involved in implementation were to be strengthened. Their staff were to be placed under the Project Management Unit (PMU) which would finance training and capital operating costs. In Stage II, the PMU will continue to oversee the strengthening of these institutions, at the same time seeking the orderly transfer of project functions to the parent ministries by the end of Stage II.

#### **4.1.4 The Target Group**

Although the main focus of project activity would be in the cultivated areas, where the majority of the population live for most of the year, the Project would also benefit the more mobile elements through the provision of improved water supplies in range areas and veterinary services.

### **4.2 DEFICIENCIES TO BE RESOLVED**

#### **4.2.1 Productive Component**

During Stage I very little of what was originally proposed for the agricultural sector was implemented. The Pilot Agricultural Development Units were to be the core of the agricultural component and in some ways the core of the Project. In the event, they proved unfeasible. Without the PADUs, the extension component (taken by AFMET Project) and the anticipated irrigation development (insufficient groundwater), the agricultural element was reduced to adaptive research and seed multiplication, which were pursued separately from extension. A major objective for Stage II is to implement an integrated support programme for small farmers incorporating adaptive research, input supply and extension and to relate the provision of roads and water supplies to that programme.

#### **4.2.2 Effective Field Presence**

The Project has so far concentrated investment and infrastructure in Baydhabo District and the town itself. A high proportion of its staff have been recruited outside the region and established in the town. In the absence of work on the PADUs and control over extension and the water supply development (under CGDP), the Project has had little direct contact with the rural people. In Stage II, the Bay Project will aim to develop a visible and effective field presence in the outlying districts.

#### **4.2.3 Decentralisation**

The Regional Coordinating Committee should meet at regular intervals so that local government officials and concerned departments and agencies in the region can be kept informed on all aspects of the Project. The main focus of the RCC would be monthly progress reports on project components, short-term problems, and opportunities for integrated action. This should encourage the decentralisation of planning and implementation for which the Project was designed.



# 5

## Farming System

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### 5.1 LESSONS AND EXPERIENCE FROM STAGE I

The agricultural component of the Project was noticeably deficient in Stage I. A major task for the Mid-Term Review is therefore to redefine the role of the Bay Region Project in the agricultural sector.

The original programme was based on the belief that the Bay Region possessed a large reserve of cultivable land for rainfed cereals and of groundwater for irrigation. It was also believed that a large surplus of grain and livestock could be drawn from the area by introducing farmers to simple improvements.

An important conclusion from surveys in Stage I is that there are no large unutilised areas which can be readily exploited, nor are there obvious ways in which farmers can greatly increase production, given the resources of capital and family labour available to them. Agro-pastoralists integrate farm and range activities with greater skill than the planners gave them credit for. In Somalia, as in Sahelian Africa, research has not developed fodder crops well-suited to the semi-arid climate and feed supplies remain scarce around the farm for at least six months of the year.

Field evidence gathered in Stage I suggests that the farming system is well adapted to the low reliability of rainfall (one crop failure in two seasons in Buurhakaba; one in four in Baydhabo). Farmers give priority to the establishment of food crops for the household. Cash crops, other than the staple cereal, are uncommon. This is unlikely to be due to lack of knowledge. Farmers have evolved various strategies to reduce their risks: the over-year storage of grain in underground silos; different combinations of livestock; and arrangements with people in distant areas to receive them in times of need. If in some years large surpluses can be sold to the ADC, it is because farmers routinely plant a larger area than they need, in case rainfall is poor.

During Stage I, the Bonka Research Station, the Seed Farm and the extension service worked in isolation. The experimental programmes often took little account of the farmers' priorities; the Seed Farm produced seed of sorghum varieties which had failed to perform well in trials, and the National Extension Service provided advice which could seriously reduce the productivity of small farms in Bay Region (see Annex 1, Sub-section 2.3.3).

## **5.2 PROBLEMS AND CONSTRAINTS**

There is little doubt that agricultural services for small farmers are currently poorly organised and extremely fragmented and that the great mass of farmers remain untouched by the system.

### **5.2.1 Adaptive Research**

Over the last decade, agricultural research has been severely handicapped by the makeshift nature of the programme. Bearing in mind the diverse nature of the Project Area, the wide range of problems to be solved and its remoteness, the agricultural research station has been hopelessly undermanned and the facilities at the station have been totally inadequate.

### **5.2.2 Input Supply**

Two parastatal agencies, ONAT and ADC, once in the business of input supply, have largely withdrawn. The agency recently set up by AFMET to handle inputs is not active in the Bay Region and in any case, has no allocation of foreign exchange with which to purchase supplies from abroad. The MOA Plant Protection Department which potentially could be of great benefit to small farmers in the Region was omitted from the programme set out in the project documents. Although under the direction of the Project, it has lacked funds and technical support. Drugs supplied by the Veterinary Service are scarce and, when available, are inappropriately packaged. Commercial supplies of farm inputs are generally not sold in the market place.

### **5.2.3 Extension**

Agricultural extension is supported by the national project (AFMET) financed by IDA and USAID with 23 field agents dispersed throughout the Region. They lack the back-up of adaptive research and the inputs which they recommend are not available. Even if there were a technical package to offer, it is doubtful if many field agents would be effective without a stronger support system to manage the flow of information.

When proposing that the PMU take over the activities of the MOA in Bay Region, the IDA Appraisal Report overlooked several of its current responsibilities including the supervision of about twenty district-level staff whose work included extension. Although financed by the GOS contribution to the Project, their role has yet to be defined.

### **5.2.4 Organisational Constraints**

A major problem for the Ministry of Agriculture is the coordination of national and regional extension and research programmes financed by several different agencies. The widespread organisation of agricultural administration in Somalia with separate authorities for agricultural development is clearly not conducive to the effective provision of services at local level or the utilisation of scarce manpower and resources. This compounds the problem arising from low rates of pay in the public sector and the consequent scarcity of managers, accountants and technicians willing to work in government service.

## **5.3 RATIONALE FOR STAGE II**

### **5.3.1 The Need for Coordination of Supporting Services**

Future development should be based on close coordination of adaptive research, input supply, extension and marketing services in the Region. None of these can achieve major breakthroughs on its own but, if well managed and effectively coordinated, they

could together reduce many of the risks inherent in crop and animal husbandry in Bay Region.

Improvement of the links between research and extension must be a major objective for both the Bay Region and the AFMET projects. This should not merely consist of a few meetings and the designation of inter-project coordinators. A joint programme is needed which builds a bridge between research and extension and puts staff from both projects in the role of partners with the farmer. Only by working together can research and extension staff overcome the present dearth of useful information.

### 5.3.2 National Organisation of Field Services

The effectiveness of an administrative system for agricultural development depends upon the capacity of the system to provide the opportunities for farmers to improve their incomes and production. The main strength of such a system should be at its point of contact with the producer. But this level has to be supported from above, with the organisational structure and the distribution of functions at each higher level designed to support the level below. In choosing an administrative system for Bay Region in Stage II, it is necessary to consider national requirements and the most appropriate structure in the longer term.

The day-to-day management of agricultural service functions (e.g. extension, pest control) is undermined if there are a series of separate lines of authority from different central departments to field officers. At the district level in particular, the field service needs to be administratively coordinated to ensure that the particular functions of extension, regulation and field research are regarded as the responsibility of the Ministry staff at that level, rather than the responsibility of particular compartments of the Ministry working separately.

This degree of administrative (as opposed to policy) coordination probably requires that all staff work under the general direction of the District Coordinator of field services, who could be drawn from any department operating in the district. The precise structure is not important as long as it ensures that:

- (a) there is not a separate field service for different functions (e.g. extension or pest control);
- (b) field staff pass back demands to research staff as well as disseminate research results;
- (c) there is not a 'general' extension service operating separately from specialised crop or livestock extension services.

At the central Ministry, this type of structure suggests that a Director of Field Services should be rather more than a Director of Extension and should also have responsibility for departments with operational tasks (except regional research stations). In this way, each level of administration (i.e. district, region) would have specialist departments (where resources permit), but these would work under the general direction of a Coordinator responsible through a single line of administrative authority to a Director of Field Services in the Ministry.

It is beyond the Terms of Reference of this study to formulate organisational proposals for the central Ministry, but in making proposals for the Project, the Consultants have assumed that the coordination of agricultural field services would eventually be the

responsibility of the MOA Regional and District Coordinators and that short-term project arrangements should not pre-empt the eventual transfer of these functions.

### 5.3.3 Organisation at the District Level

Within any district in the Region, there are clearly three overlapping services which must be provided by the office of the District Coordinator if "extension" in its wider sense (helping farmers to identify, analyse and deal with their production problems) is to succeed. These are as follows:

- (a) Planning Training and Visit schedules, preparing extension materials, attending to the flow of technical recommendations;
- (b) The commercial function: organising input supply, promotion of cash crops, marketing, transport;
- (c) Liaison with the local community, the District Commissioner, farmers' groups, schools, cooperatives.

Thus it should be possible to subdivide the work between the two projects (AFMET and BRADP) without duplication and without one project fearing a takeover by the other. This is what is currently happening in the district offices in the Bay Region. AFMET organise extension along T & V lines and BRADP, who pay and back-stop the District Coordinator, look after the other functions. But the lines of authority must be clear. Currently, at district level there is no single officer administratively responsible for field services in the district (i.e. field research stations, pest control, extension) and this should be resolved in Stage II.

### 5.3.4 Technology Transfer

AFMET plan to place 10 more Field Extension Agents (FEAs) in Bay Region, but, given current levels of knowledge and support for existing staff, it is necessary to question their capacity to do so. The wide dispersion of FEAs carried the risk that new graduates will rapidly become demoralised, recommending "improvements" which neither they nor the farmers believe will give greater income. In the long term, an extension message will be evolved, but in the meantime a solution is needed.

If AFMET and the Bay Region projects were to concentrate their effort within a few receptive communities in the implementation of a joint programme, the induction training of FEAs should be more rewarding and the integration of adaptive research, input supply and extension more beneficial. In Chapter 9 such a joint programme (Pilot Village Development) is proposed for selected communities in each district.

## 5.4 PROPOSALS FOR ADAPTIVE RESEARCH

In Stage II of the Project, the Bonka Research Station would be upgraded to enable it to fulfil its important role as regional research station and the principal station for rainfed crops in Southern Somalia. The Station would be transferred to the Seed Farm site and three substations would be established in the outlying districts.

### 5.4.1 Research Programme

Priority would be given to work which is likely to be widely and readily applicable to improving the productivity and income of small farmers. Sorghum is currently the dominant crop occupying more than 95 per cent of the total cropped area in Bay Region. This crop would command the highest priority in the research programme which would be largely built around it. All aspects of sorghum husbandry require study and improved varieties are urgently needed.

Progress in increasing sorghum yield levels (as well as the reliability of yields) would determine the scope for crop diversification (e.g. oil seeds) because household labour is believed to be fully committed to the establishment of the sorghum crop within the short period of time available. At this time animals must be herded outside the cultivated areas, which is a drain on household labour.

The research programme, which is detailed in Annex I, would consist of:

(a) Screening and Selection of Sorghum:

The selection criteria for Bay Region would be early maturity (100 days), high yield and good grain and stover quality. Screening of other food crops would be confined to those with a well defined role in the future cropping pattern (e.g. cowpea, groundnut, sunflower, maize).

(b) Cultivation Methods:

Since no significant changes in manual methods are anticipated in the foreseeable future, a general review would be made of hand tools; suitability of existing hoes. Traditional moisture conservation techniques would be tested to determine their suitability on different soil types. Comparisons would be made of ONAT disc ploughs and introduced chisel ploughs; the effectiveness of the Australian system of semi-mechanised production would be tested in the context of local farming systems.

(c) Soil Fertility Investigations:

Permanent rotation trials under sorghum would be established at Bonka. Fertiliser trials would be restricted to Baidoa soils and would involve both nitrogen and phosphate application.

(d) Crop Management:

This would be confined to spacing and plant population trials with sorghum (both at Bonka and the substations), intercropping and weed control.

(e) Pest and Pest Control:

Pests are considered to be a major factor limiting crop production levels in Bay Region. The programme would develop a pest control strategy; sorghum insect pests, especially stalkborer would receive priority.

(f) Crop Storage:

The traditional storage pits would be examined and the losses determined with a view to identifying the most effective pit designs for the region.

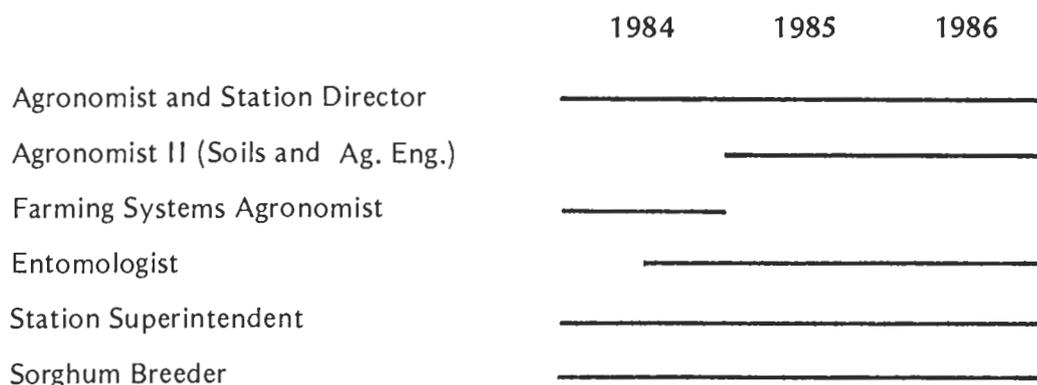
(g) Forage Crops:

This would include trials on the utilisation and conservation of sorghum by-products. Trials would also be conducted with introduced species (annuals and woody perennials) for cutting, silage as well as browsing *in situ*.

#### 5.4.2 Technical Assistance

Four senior research posts and one farm manager would be financed under the Project; three of these would be new posts (Agronomist II, Farming Systems Agronomist and Entomologist). Job descriptions of these posts and that of the Sorghum Breeder (financed separately by IDRC) are given in Annex I, Chapter 6. The timing of their inputs is shown in Figure 5.1.

**FIGURE 5.1 TA RESEARCH STAFF INPUTS, STAGE II**



The arrival of the second agronomist should be delayed until the end of 1984 after the Research Station has been moved to its new site on the existing Seed Farm. The entomologist would arrive in mid-1984 to commence his preliminary surveys, identification of problems and formulation of his work programme which would be followed by the ordering and procurement of equipment. The farming systems agronomist would commence work early in 1984 since no equipment is necessary for his studies.

#### 5.4.3 Local Staff

Three of the four graduate staff on the station are expected to leave for prolonged periods of postgraduate training within the next 12 to 18 months. During Stage II the establishment would be expanded to include one more university graduate so that there would be one counterpart for each of the five TAs. In addition, four more field assistants (high school graduates) would be recruited to bring the establishment to eight. A suitably qualified typist would be recruited to assist in the compilation of experimental records and station reports. A librarian would also be appointed. Apart from the additional posts listed above, the staff establishment would remain unchanged in Stage II.

#### 5.4.4 Buildings at the New Site

To achieve economies in the proposed building programme to be financed by IDA/IFAD, the BRS will be moved from its present location to the Seed Farm in 1984. This would allow joint use of the proposed new laboratory and office facilities and greatly increase the total land available for trials, allowing access to land which has lain fallow for many years. The current proposals for the new site comprise the office, store and laboratory complex, a seed processing complex and a shared equipment shed with a floor area of only 60 m<sup>2</sup>, which is judged to be inadequate for the purpose. Accordingly, USAID have been asked to erect a structure which will serve as a multipurpose store and office, until the completion of the new buildings, and subsequently as an equipment shed and seed drying floor.

#### 5.4.5 Transport and Equipment

The transfer of the Research Farm from its present site to the Seed Farm will permit some sharing of equipment. A 30-35 hp row-crop tractor should be supplied together with suitable attachments for inter-row cultivation for work on trials. Additional work and specialist staff with responsibilities for region-wide programmes will increase the transport needs; four more pick-ups and one 7 tonne truck will be needed.

#### 5.4.6 Sub-Stations

There are strong arguments for expanding research activities in Bay Region through the establishment of off-station trials.

- (a) The areal distribution of seasonal rainfall frequently shows wide variation within the region and the spread of trials to a number of sites provides some insurance against complete loss of results in any one season which should reduce the time required to produce conclusive results.
- (b) There are four major types of arable soils in Bay Region which although similar in physical characteristics, should all be included in trial programmes to identify any major differences that could affect management requirements.
- (c) The incidence of pests and diseases is known to show wide differences in areal distribution both within and between seasons and years. Thus investigations on pest and disease control are best carried out at a number of sites.

During Stage II three sub-stations would be established near to the district HQs and cover the three arable soil groups - Amin soils at Qansaxdheere, Uiamo at Diinsoor and Bur Acaba soils at Buurhakaba. The central station at Bonka covers the fourth major soil group, namely the Baidoa soils.

An area of 3-4 hectares of suitable land should be acquired for each sub-station. The area should be fenced to prevent entry by livestock. If necessary the area should be surveyed and any necessary drainage and soil conservation works installed. Each sub-station should be provided with an office/store/shed combination of buildings and equipped with a basic supply of hand tools, scales, measuring tape, containers for seed, traditional threshing and winnowing equipment. For land preparation, the tractor hire services of ONAT would be used.

The programme of work to be undertaken at the sub-station would be directed by the senior research workers from the main Bonka station. The day-to-day operation of the sub-station should be the responsibility of the District Coordinator. The sub-stations aim to provide an effective link between research and extension at the district level.

#### 5.4.7 Socio-Economic Survey

Work has already commenced with the Wyoming Socio-economic Survey, which might provide the economic data against which to measure subsequent change in Bay Region. The methods employed will facilitate the understanding of such phenomena as the grain market, the livestock market, water harvesting, storage and management, but will not complete the picture. By the time the report is published, the Project will only have two years to run. The Consultants propose an additional study on crop marketing and livestock marketing to be carried out towards the end of the survey period, February-April 1984. This would complement the present survey and draw on its data. It would be directed to the agricultural component of the Project and would contain both a full description and analysis of these markets and recommendations for improving market accessibility and efficiency in the regions. A study of water management and its relationship to labour availability would fall more appropriately under the water component.

### 5.5 PROPOSALS FOR INPUT SUPPLY

The Project would support crop production in Bay Region by consolidating work begun in Stage I on the Seed Farm, by strengthening the Plant Protection Department and by organising a pilot scheme by which farmers could purchase farm inputs from retail shops at district level.

### 5.5.1 The Seed Farm

The Seed Farm was originally started in 1976 by MOA/FAO with the specific objective of bulking seed supplies of local varieties as an insurance against shortages in surrounding areas of less reliable rainfall. Under BRADP, more emphasis has been placed on the production of higher-yielding sorghum seed for farmers. The major part of the 81 ha currently under cultivation has been put down to introduced sorghum varieties (dabar and GBR 148), but yields and other characteristics (e.g. pest resistance, storage qualities, stover production) have not been demonstrably better than the traditional variety. Production of cowpea and groundnut seed has been disappointing.

#### (a) Objectives in Stage II

The currently proposed 200 ha development would be reduced to 50 ha, sufficient to meet the needs of Bay Region (see Annex I). The remaining area would be available for research activities when BRS moves across to the Seed Farm site.

The objectives of the Seed Farm would be:

- to maintain the emergency seed supplies of existing crops (primarily sorghum) for distribution to areas which have experienced total crop loss following drought seasons;
- to produce seed of improved varieties of existing crops for distribution to selected farmers for multiplication;
- seed multiplication of exotic crops to assist farmers in crop diversification; annual crops and forage crops ex-BRS.

Until such time as seed of new varieties becomes available from the plant breeder, the Seed Farm should be operated as a production farm, growing the local varieties under conditions of good husbandry. Production could be made available to the ADC who would use this seed to replace their existing stocks which are held to meet emergency situations. The viability of much of the existing stocks is thought to be poor and in need of replacement.

#### (b) Buildings

Three sets of buildings were proposed for the Seed Farm in the IDA Appraisal Report:

- offices and seed laboratories
- seed processing complex (reception, cleaning, packaging, storage, drying floor)
- workshop and material store, equipment shed.

In the revised construction programme, only the seed processing complex has been retained and the Seed Farm will be expected to share office space and equipment sheds provided for adaptive research.

#### (c) Equipment

Despite the large amount of equipment already on the Bonka Seed Farm some additional items are required to facilitate the production of seed on the scale proposed with the maximum degree of security. These items are listed in Annex I.

(d) Staffing

The expatriate Seed Farm Manager is not expected to be fully occupied on seed production activities over the next three years and some changes in his terms of reference may have to be discussed and agreed. These changes might include the adoption of responsibility for the overall direction of field operations for both research and seed production purposes, the participation in the implementation of the research programme, the development of the additional 100 ha of land and related activities.

In the short term the present high level of local staffing on the Seed Farm would be reduced to suit the level of mechanisation. The important posts are specified in Annex I.

### 5.5.2 Plant Protection

(a) Objectives

During Stage II the Plant Protection Department would be formally absorbed by the Project with the purpose of:

- (i) Cleaning up the existing chemical store and disposing of the large quantities of highly toxic chemicals which litter the floor;
- (ii) Providing the resources for the staff of the department and FEAs to control with maximum effectiveness major outbreaks of insect pests (armyworm, grasshoppers and crickets);
- (iii) Providing the equipment and chemicals to enable the FEAs to demonstrate to farmers the benefits of pesticides for the control of the major pests of sorghum (sorghum shoot-fly, stalkborer, aphids, American Bollworm).

(b) Programme

For the control of major outbreaks of insect pests (armyworm, grasshoppers and crickets) which occur only spasmodically, equipment and chemicals would be provided at strategic locations at regional and district levels. The quantity of chemicals would be determined by the staff and equipment available. It would not be possible to make provision to meet every contingency.

The current extension advice provided by FEAs is said to include recommendations on pest control, but staff rarely have the means to demonstrate, nor can supplies of suitably packaged pesticides be obtained by farmers. In Stage II FEAs would be provided with the necessary training and means to give farmers practical demonstrations of pest control and at the same time advise them where to purchase their requisites. FEAs would be supplied through the District Plant Protection Officer at each district centre, supported in turn by the HQ unit in Baydhabo.

(c) Staffing and Organisation

The most urgent task is the safe disposal of toxic chemicals in the MOA's Plant Protection store in Baydhabo. A USAID expert in the handling and disposal of toxic waste is reported to be assisting the Project to clean-up the existing chemical store. His duties include the selection of a site for the disposal and supervision of the handling and transport of the material to the disposal site.

No expansion of the Plant Protection Department in Baydhabo is envisaged, but in-service training should be provided by senior MOA and TA staff in the safe application of pesticides and the handling and repair of spraying equipment. Similar training should be provided for District Plant Protection Officers (new posts) who should be agricultural high school graduates.

(d) Buildings and Equipment

Provision should be made for the rehabilitation of the existing offices and store in Baydhabo and for the construction of stores (25 m<sup>2</sup>) at the three district headquarters. Four tractor-mounted boom sprayers (10 m booms), one per district, would be provided for attachment to ONAT tractors, which are expected to be generally available following the peak land preparation period. The Project would provide four motorised knapsack sprayers, one per district and 75 hand operated knapsack sprayers, to be allocated one per year to 25 FEAs for demonstration work.

(e) Materials

The materials required for the first year of the Stage II programme are shown in Annex I. For subsequent years, the requirement would be reviewed in the light of experience.

Until now, farmers have been supplied with chemicals free of charge. The amounts have been small and the supply from aid agencies unpredictable. In the short-term, the benefits of plant protection to the individual farmer have to be demonstrated. Thus in Stage II no official charge would be levied by the Project. In the long-term farmers would be expected to purchase materials and equipment themselves. The farm input shops at district level should assist the development of the input market for small farmers. Materials required for the Department to counter major attacks, beyond the resources of individual farmers to control, would be provided free.

### 5.5.3 Farm Input Shops

(a) Objectives and Programme

The Project currently supplies quantities of seed and pesticide to farmers through the MOA's district coordinators. The quantity is small and no charge is made to consumers. Material is delivered in bulk and is often unsuitably packaged and labelled, when distributed to small farmers. In Stage II, the quantity and range of inputs would be increased, properly packaged and labelled. Consumers would be charged for material costs involved and proper stock control and accounting procedures established. One shop would be opened in each district centre.

The objectives of the programme would be to make farm inputs, which could have a significant impact on production, available to farmers and thus develop a market which would eventually be served by the private sector. The objective is not to preempt the private sector with yet another parastatal, but to test and demonstrate the benefits to entrepreneurs and smallholders alike through a pilot scheme of three or four years' duration. The suggestion that private entrepreneurs be invited to provide retail outlets for farm inputs provided by the Project was rejected as impracticable. Because of the uncertainty as to future turnover and profit margins, entrepreneurs would require substantial support, in which case charges of favouritism would be bound to arise and the incentive element would be undermined.

It is unlikely that there will be sufficient volume of business to justify the immediate establishment of these shops and an interval of one to two years should be allowed to build up a comprehensive inventory and stimulate demand. The Project would

arrange the procurement and would staff and supervise the retail outlets at district level through the MOA District Coordinators. Given the uncertainty and fragmentation of the present farm-input import and distribution situation, the most difficult task will be the rapid procurement of the necessary materials. Probably the best short-term solution would be for the Project to contract this aspect of the work to an experienced organisation in the business of supplying small farmers in East Africa. Local importers are unlikely to have the necessary range of experience or established contacts with suppliers in the early stages.

(b) Materials

The retail stock would include pesticides, sprayers and spares, simple veterinary drugs, seeds, hand-tools, animal-drawn equipment, harnesses and possibly miscellaneous items of hardware if not otherwise available in the market place. Chemicals and drugs would be suitably packaged in small quantities with clear directions for application. The Project would provide equipment for the shops.

(c) Staffing

A graduate with training in commerce or business management would be responsible to the Project Director who would coordinate the operation. The Project Director would also be assisted by the Financial Controller of the Project and a short-term consultant with appropriate experience (e.g. of producer cooperatives in East Africa) who would join the Project for two inputs of three months. Four junior staff (agricultural high school graduates) would be recruited to operate the retail outlets in the district centres. Ancillary staff would be provided from within the existing establishment of the PMU/MOA district offices.

(d) Revolving Fund

The Project would finance farm inputs for retail sale with an initial injection of foreign exchange which would be replenished seasonally from sales. The foreign exchange required to match local currency for re-ordering of imported items would be obtained through IDA/IFAD in the same manner as is currently used for veterinary drugs.

## 5.6 PROPOSALS FOR DISTRICT OFFICES OF MOA

It has already been decided by the MOA authorities that, to ensure close cooperation between the two projects, an Extension - Research Coordinator would be appointed by BRADP. The activities of the two projects would be brought together at the offices of the District Coordinators. BRADP would provide office space and storage facilities for all MOA personnel as well as for the District Veterinary Coordinators, if not otherwise accommodated.

Construction of district-level offices has already been completed at Diinsoor and is proceeding at Buurhakaba and Qansaxdheere with PL 480 funds. The office for the MOA Coordinator of Baydhabo District, currently subsumed by the PMU, would be established as a distinct entity, possibly located in the current temporary project offices which will be vacated when the new project offices are constructed. Two 'C' type houses would be constructed in each outlying district, one each for the DVO and MOA Coordinators. These houses would be constructed in up-country areas rather than, as currently proposed, in Baydhabo, as part of the project building programme.

During Stage I, the MOA district-level staff in each of the three outlying districts were budgeted under the heading "non-project activities" together with Plant Protection.

Meanwhile the post of the MOA Coordinator, Baydhabo District lay vacant. Because of their importance in the implementation of proposed project activities in Stage II (e.g. in the Pilot Village Development, supervision of BRS substations, plant protection and retail shops for farm inputs as well as liaison with the local community), the MOA Coordinators and their staff will be formally seconded to the Project. The Project will pay the operating costs at current (Stage I) levels and support the establishment and running costs of the Baydhabo District Office. Staff for this office will be drawn from the PMU.

## **5.7 MARKETING PROPOSALS**

No project support is recommended for crop marketing until the results of the marketing survey proposed in Subsection 5.4.7 have been analysed. There is no evidence to suggest that a vegetable-oil extraction plant, other than the traditional presses currently in use, would be justified within the project term. The small quantity of groundnuts currently produced is quickly absorbed by the local confectionary trade. There is a thriving trade in grain, by-products, live animals and animal products within the region and with Mugdisho. Enforced procurement of farmers' grain has been relaxed since 1982 and ADC now acts as a buyer-of-last-resort.

### **5.7.1 Export Stock Handling Stations**

In view of the requirements for improved control measures for export cattle, two export stock handling stations would be provided at Dabaan and Raydabaktile, that is, one on each of the main livestock trek routes to Mugdisho. Facilities would include a vaccination and handling race, holding pens, spraying unit and an adequately equipped veterinary store with refrigerators. Trade animals would thus be partially prepared for the subsequent 21-day quarantine nearer the port. Unless cattle are trucked to the port, it would not be feasible to upgrade informal holding areas to quarantine stations. Health requirements for export stock are currently under investigation by the MLFR.

## **5.8 COSTS OF THE STAGE II PROPOSALS FOR THE FARMING SYSTEM**

In Table 5.1 the costs of the Stage II programme are summarised. Annex 1 details the capital and operating costs of each element, i.e. adaptive research, input supply, strengthening of district-level operations and livestock marketing.

TABLE 5.1 AGRICULTURE - SUMMARY OF COSTS (Ssh '000)

A. OVERALL FOR AGRICULTURAL SECTOR

	1984	1985	1986
Capital Costs - Buildings	13 890	4 340	-
Agricultural Machinery	2 376	-	-
Other Equipment	1 143	425	-
Vehicles	2 396	258	-
<b>TOTAL</b>	<b>19 805</b>	<b>5 023</b>	<b>-</b>
Operating Costs - Technical Assistance	8 863	9 953	9 953
Local Staff	2 001	2 121	2 121
P.O.L.	772	1 057	1 057
Spare Parts and Tyres	861	1 295	1 295
Farm Inputs and Consumables	7 013	5 676	5 676
Building Costs	300	635	665
Machinery Hire	64	87	109
Stock Purchases	-	3 182	-
<b>TOTAL</b>	<b>19 874</b>	<b>24 006</b>	<b>20 876</b>
Plus 10% Contingencies	3 968	2 903	2 088
<b>TOTAL COSTS</b>	<b>43 647</b>	<b>31 932</b>	<b>22 964</b>
Inflation Factor from 1983	1.08	1.17	1.26
<b>Total Inflated Costs inc. Contingencies</b>	<b>47 139</b>	<b>37 360</b>	<b>28 935</b>
(US\$ '000)	3069	2 432	1 884

TABLE 5.1 AGRICULTURE - SUMMARY OF COSTS (Ssh '000)(Continued)

B. BY COMPONENT		1984	1985	1986
<b>1. Adaptive Research</b>				
Capital costs	- Buildings	3 430	2 940	-
	Agricultural machinery	498	-	-
	Other equipment	-	225	-
	Vehicles	1 585	-	-
<b>TOTAL</b>		<b>5 513</b>	<b>3 165</b>	<b>-</b>
Operating costs	- Technical Assistance	8 709	9 953	9 953
	Local staff	752	752	752
	POL	289	453	453
	Spare parts & tyres	244	447	447
	Farm inputs and consumables	75	75	75
	Building costs	50	150	180
	Machinery hire	-	23	45
<b>TOTAL</b>		<b>10 119</b>	<b>11 853</b>	<b>11 905</b>
<b>TOTAL COSTS</b>		<b>15 632</b>	<b>15 018</b>	<b>11 905</b>
<b>2. Seed Farm</b>				
Capital costs	- Buildings	9 635	-	-
	Agricultural machinery	1 290	-	-
	Other equipment	1 143	-	-
	Vehicles	553	-	-
<b>TOTAL</b>		<b>12 621</b>	<b>-</b>	<b>-</b>
Operating costs	- Local staff	262	262	262
	POL	220	303	303
	Spare parts & tyres	351	551	551
	Farm inputs and consumables	100	100	100
	Building costs	50	250	250
<b>TOTAL</b>		<b>983</b>	<b>1 466</b>	<b>1 466</b>
<b>TOTAL COSTS</b>		<b>13 604</b>	<b>1 466</b>	<b>1 466</b>
<b>3. Plant Protection</b>				
Capital costs	- Buildings	825	-	-
	Agricultural machinery	588	-	-
	Vehicles	258	-	-
<b>TOTAL</b>		<b>1 671</b>	<b>-</b>	<b>-</b>
Operating costs	- Technical assistance	154	-	-
	Local staff	330	350	350
	POL	113	113	113
	Spare parts & tyres	142	142	142
	Farm inputs and consumables	6 358	5 021	5 021
	Machinery hire	64	64	64
<b>TOTAL</b>		<b>7 161</b>	<b>5 690</b>	<b>5 690</b>
<b>TOTAL COSTS</b>		<b>8 832</b>	<b>5 690</b>	<b>5 690</b>

TABLE 5.1 AGRICULTURE - SUMMARY OF COSTS (Ssh '000) (Continued)

	1984	1985	1986
<b>4. Farm Input Shops</b>			
Capital costs - Buildings	-	1 400	-
Equipment	-	200	-
Vehicles	-	258	-
<b>TOTAL</b>	-	<b>1 858</b>	-
Operating costs - Local staff	-	100	100
POL	-	38	38
Spare parts and Tyres	-	31	31
Building costs	-	35	35
Stock purchase	-	3 182	-
<b>TOTAL</b>	-	<b>3 386</b>	<b>204</b>
<b>TOTAL COSTS</b>	-	<b>5 244</b>	<b>204</b>
<b>5. District Offices</b>			
Capital Costs	-	-	-
Operating Costs - Local Staff	657	657	657
P.O.L.	150	150	150
Spare Parts and Tyres	124	124	124
Inputs and Miscellaneous	480	480	480
Building Costs	200	200	200
<b>TOTAL COSTS</b>	<b>1 611</b>	<b>1 611</b>	<b>1 611</b>



# 6

## Veterinary Service

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### 6.1 LESSONS AND EXPERIENCE FROM STAGE I

The Veterinary Service of MLFR was placed under the Project in August 1981 with the objective of increasing its capacity to serve the livestock producers of the Region as well as the traders whose stock pass through it. This was to be achieved by providing the professional manpower, training, buildings, laboratory and field equipment and transport for the service to operate efficiently in all four districts.

An expatriate veterinarian was appointed under an USAID contract in April 1981 and most of the equipment and transport has been provided. Two teams under the control of the regional HQ have been mobilised for a vaccination campaign against Rinderpest and Black Quarter and for the spraying of acaricide. The IDA/IFAD building programme which originally included 13 new dispensaries has been delayed, but progress has been made with the construction of a store and clinic in Baydhabo using PL480 funds.

According to the statistics prepared by the regional veterinary staff, about 140 000 cattle were vaccinated in the first six months of 1983, about 40 per cent of the cattle in the Region. It is hoped that these impressive figures will be corroborated by the blood tests to be carried out in connection with the resumption of cattle export to Saudi Arabia. The regional staff issued about Ssh 400 000 worth of drugs in 1982 and, by June 1983, had dispensed drugs to the value of Ssh 360 000, mostly acaricide and trypanocide.

It would be unreasonable to expect that the secondment of the Veterinary Department staff to the Project and the provision of transport and equipment would transform the performance of the service in two years. There are clearly improvements to be made in the reporting of diseases rather than simply recording drugs dispensed. Much better use could be made of the equipment supplied by the Project to maintain an effective 'cold chain'. District offices and dispensaries still lack the most basic items while sophisticated equipment is lying in the HQ store unused.

Project management recognises the need to tighten up procedures and improve the on-the-job training of staff. The usefulness of the technical assistance provided by USAID has been questioned, but with the return of the RVO with an MS in Veterinary Science from the University of California in 1984, the management of the component is expected to improve.

### 6.2 PROBLEMS AND CONSTRAINTS

The environmental conditions in Bay Region are a serious challenge to the effective implementation of an animal disease control programme. Much of the area used by livestock

is inaccessible, being covered with dense bush through which motor vehicles are unable to pass. For 3 or 4 months of the year, the few motorable tracks are closed to wheeled transport. During the dry parts of the year water for spraying is difficult to obtain. Mains electricity supplies are available only in Baydhabo and even this is uncertain due to periodic oil-fuel shortages.

Added to these problems are the seasonal movements of the livestock which, due to the unreliability of the rains, are difficult to predict. This creates problems in the implementation of vaccination programmes and impedes the understanding of the epidemiology of animal diseases, especially parasitic diseases.

Instances are reported of owners refusing to have their animals vaccinated, or agreeing to vaccination but refusing permission for the internationally-accepted ear-punch. This makes vaccination difficult to monitor and therefore sustain at adequate levels.

Knowledge of the various animal diseases in the region is little better now than it was at the beginning of the Project. This prevents adequate planning of disease control and placement of infrastructure.

There is a shortage of experienced veterinary staff. The veterinary faculty at Mugdisho has been open for only a few years and most veterinarians lack practical field knowledge. There is also a dearth of qualified technicians to carry out tests, maintain and service equipment. All these problems add up to a serious handicap for the implementation of any successful disease control programme.

The evaluation of Stage I concluded that there was an apparent lack of adherence to priorities and that, in Stage II, the programme should be based on the following priorities:

- mass vaccination against Rinderpest and Black Quarter
- disease investigation
- strengthening of curative services provided through the district offices and village dispensaries.

However, this order of priorities, which reflects the needs of the national economy and the livestock producers of the area, is not shared with the veterinarians. Construction of dispensaries and check posts in up-country areas for the distribution of drugs is high on their list of priorities. The MLFR recommends a permanent building together with a house for the dispenser. Seven up-country dispensaries are included in the building programme, but no houses. The TA Veterinarian has provided a list of 19 dispensaries, including check posts, some of which have been approved for construction with PL 480 funds.

The Consultants are informed that, if dispensers are to be relied on to work in remote areas throughout the year, it is better that they be selected by the community they are meant to serve. Dispensers drawn from the locality find a building of traditional construction acceptable and one could be constructed by the people for the purpose. The problem with this approach is that the Veterinary Service would lose control over the distribution system and the benefits which accrue; the flow of drugs might dry up.

### **6.3 RATIONALE FOR SUPPORT TO VETERINARY SERVICES**

If livestock production is to be sustained at present levels, a health programme is essential to reduce mortality rates and prevent a loss in food conversion efficiency.

The export trade with Saudi Arabia is expected to place demands on the Veterinary Service to comply with the International Zoo-Sanitary Code (1976) under which cattle must be quarantined for 21 days prior to shipment and have received vaccinations against Rinderpest, FMD, CBPP and Anthrax. On the other hand, the majority of pastoralists rear livestock primarily as a means of subsistence and request help from the Veterinary Service only in an emergency. The different requirements of subsistence producers and traders must be taken into account when proposing future animal health measures.

Of the infectious diseases threatening livestock in Bay Region, Rinderpest is the most serious. Since the JP15 campaign, Somalia has enjoyed relative freedom from the disease, but it is now present in neighbouring countries and it is vital that full vaccination cover is achieved and maintained. Black-quarter is another killer disease justifying mass vaccination along with Rinderpest. Effective preventative measures against these diseases should be the first priority. Unless an outbreak occurs, other vaccinations may be reserved for trade stock in the proposed export handling stations (Sub section 5.7.1).

Investigation into the epidemiology of the important diseases of the area should be the second priority. According to the records of drugs dispensed, the greatest demand by livestock owners is for control of ticks, trypanosomiasis and pneumonia, foot-rot and helminthiasis in small stock. None of these problems have been studied sufficiently to allow a rational control programme to be developed. Recently a paralytic condition of camels has caused high mortalities in the Yaaq Braawe area. Stock-owners attribute it to a tick that has spread to the region within the last two years. The situation requires investigation.

There is a shortage of reliable information on the incidence, prevalence, morbidity and mortality of the important diseases. Laboratory staff are very inexperienced and unable to carry out the most basic diagnostic work. There is clearly a need for a suitably qualified veterinarian with a background in investigative work and an aptitude for training intermediate technical staff in routine laboratory procedures.

The third priority is for the rationalisation of the curative services in the Region, but in many respects this must await progress on the investigatory side.

## **6.4 PROGRAMME AND BUDGET FOR PHASE II**

### **6.4.1 Organisation of Veterinary Services**

In order to implement an effective health programme that would meet the priority needs described above, the Department would be reorganised. At present, all four veterinarians are based in Baydhabo HQ and of the 17 trained veterinary assistants only one is operating a dispensary. In Stage II, the Veterinary Department in each district would be placed under a qualified, university-trained veterinarian and suitable housing (class C) would be provided for DVOs in the district headquarters.

The post of RVO currently occupied by a TA financed by USAID would be staffed by a Somali Veterinarian from the beginning of 1985 when the candidate returns from postgraduate training in the United States. At that stage a TA Veterinary Investigation Officer would be recruited. Veterinary Assistants would replace dispensers in all newly-constructed dispensaries (seven). The overall staffing in Stage II would increase by 3 veterinarians, 3 VAs, 3 dispensers and 11 auxiliaries.

### **6.4.2 Mass Vaccination**

The two mobile vaccination teams currently attached to the Regional HQ would be

redeployed so as to form four smaller teams, one in each district under the District Veterinary Officer. This should improve supervision and save time mobilising and travelling. District vaccination teams would need logistic support from HQ, two-way radio, additional transport and refrigeration plant. Vaccination equipment is already on order. Vaccine (0.25 M doses per annum each for Rinderpest and Black quarter) would be supplied by MLFR.

#### **6.4.3 Disease Investigation**

The Consultants recommend that Government request USAID to provide a suitably qualified veterinarian to mount an investigation into the epidemiology and incidence of the important diseases in the region. The TOR of the current expatriate veterinarian called for broad professional experience including administrative experience, but in Stage II specific training in technical investigation of diseases would be required. The candidate would also be responsible for commissioning the new laboratory and training laboratory staff. Housing and transport would be provided by the Project.

If it is decided not to proceed with the construction of a new laboratory under the IDA building programme, it would be necessary to upgrade the existing two rooms by providing laboratory benches and hot water, and by supplying equipment (see Annex 2).

#### **6.4.4 Curative Services**

The curative services provided in the Region would be dictated by the results of the investigation programme but as such a programme can take two to three years before useful results are available, interim measures will be required. Proposals are made in Annex 2.

The Veterinary Department has plans for the operation of 19 dispensaries/check points at the sub-district level in Stage II. Seven of these would be housed in newly constructed buildings if the IDA/IFAD funds allocated for the building programme prove sufficient. In the absence of funds for new buildings, the Department would continue to use rented accommodation or dispensaries constructed with local materials. Well-built traditional houses are spacious and cool and could make good village dispensaries. Without electricity and water, concrete or stone buildings offer few advantages over traditional designs. In addition to the operating costs (salaries, rents, materials and supplies), the Project would provide basic equipment for these dispensaries (small table, chair, small cupboard, primus stove, metal dish for sterilising syringes).

In the Pilot Village Development Scheme (Chapter 10), the idea would be tried of voluntary dispensers drawn from the local community, trained by the Veterinary Department and supplied with drugs under the Project. Profits from the sale of drugs be retained by the dispensers in lieu of a government salary. Dispensers would reimburse the Project for the cost of the drugs supplied.

#### **6.4.5 Costs of Veterinary Component**

The total costs of the veterinary proposals for Stage II are some Ssh 27.7 million, or US\$1.8 million. The costs are summarised in Table 6.1 and supporting details are contained in Annex 2.

**TABLE 6.1 LIVESTOCK AND VETERINARY COMPONENT**

**SUMMARY OF COSTS (Ssh '000)**

	1984	1985	1986
<b>Capital</b>			
- Buildings	4 699	-	-
- Agricultural Machinery	-	-	-
- Other Equipment	807	-	-
- Vehicles	1 188	-	-
<b>TOTAL CAPITAL COSTS</b>	<b>6 694</b>	<b>-</b>	<b>-</b>
<b>Operating-</b>			
- Technical Assistance	941	2 086	1 536
- Local Salaries and Wages	1 480	1 490	1 500
- P.O.L.	453	558	558
- Spare Parts and Tyres	345	479	479
- Purchase of Stock Items	630	630	630
- Building Costs	150	240	240
- Consumable and Miscellaneous	470	470	470
- Contingencies	447	595	541
<b>TOTAL OPERATING COSTS</b>	<b>4 916</b>	<b>6 548</b>	<b>5 954</b>
<b>TOTAL COSTS</b>	<b>11 610</b>	<b>6 548</b>	<b>5 954</b>
Inflation Factor for 1983/per cent	1.08	1.17	1.26
Total Inflated Cost Including Contingencies	12 539	7 661	7 502
US\$ '000	816	499	488



# 7

## Roads

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### 7.1 LESSONS AND EXPERIENCE FROM STAGE I

The objectives of this component, as set out by IDA (1979) were to increase the number and quality of access roads in the region in order to facilitate increased agricultural production and improve social infrastructure. Measures to be taken were to include the following:

- the rehabilitation of existing roads;
- the construction of new access and feeder roads;
- the clearing of access tracks; and
- the maintenance of the road network.

Capital equipment for the work was delivered in the second half of 1982. The total value including spare parts came to Ssh 64 million or US\$4.1 million. As a result of technical advice given to the PMU, the equipment ordered differed from that specified in the Appraisal Report.

A technical assistance contract was made with Fintecs Consultants of Cairo in August 1981. The initial team of four was replaced by a new team in March 1983.

The proposed buildings for the roads component have not yet been constructed. Temporary offices have been secured in the former Highways Department in Baydhabo, staff are living in rented accommodation and maintenance is almost entirely carried out in the field using two mobile workshops.

Construction of new roads to date includes approximately 13 km of the Goof Guduud to Qansaxdheere road; 1.7 km of access road to the Seed Farm and almost 50 km of an 'all weather track' from Qansaxdheere to Buur Dhabo on the Jubba river. Very little upgrading or maintenance of the existing road network has taken place.

The clearing of access tracks referred to in the Appraisal Report remains an undefined element of the Project. No firm plans have yet been drawn up for the routing of the tracks, and, in view of the delays in the construction and maintenance schedules, this element has receded from view. The access tracks were originally seen as a means of opening up potentially cultivable areas. This is no longer a major objective.

Setting aside the over-ambitious rate of construction in the IDA (1979) report and the late arrival of the plant, performance of the roads unit has been poor. Not only have the

physical achievements been below target, but the quality of construction has been of a low standard. The Qansaxdheere - Buur Dhobo track is unlikely to last the first rainy season. The Goof Guduud - Qansaxdheere road is better, but inadequate attention to line and level has resulted in the use of excessive quantities of material.

Compaction standards are poor, due to inadequate watering. There is no quality control of the fill material, and there are wide variations in the camber. No drainage ditches have been constructed and the alignment is often unsatisfactory. Record keeping is inadequate and there is a distinct lack of on-site supervision and control. In contrast the standard of plant maintenance and stores control procedures are good, but the procurement back-up for spares very poor. Very little on-the-job training is being provided.

## 7.2 PROBLEMS AND CONSTRAINTS

The poor standard of construction arises from problems of supervision and management. The Civil Engineer is either not exercising his authority as a line manager and/or is not getting the backing he needs. The job description in the Appraisal Report specifies a range of duties which would exercise two engineers under favourable conditions. The result is that planning is neglected due to the urgency of day-to-day problems of operation.

The revised inventory of plant is generally more suited to new construction than routine maintenance. For example, for regravelling the graders would need to be equipped with scarifiers and smaller tankers and trucks would be required. Further, the stone crushing plant and the sheep's-foot rollers are inappropriate for the job in hand. The lack of a properly equipped workshop (to be constructed as part of the project building programme) has not yet been a particular problem but could become one in the near future.

Procurement for the roads component has been constrained by poor or misleading technical advice, delays on the part of funders, suppliers, shippers, and frequent shortages of diesel fuel.

## 7.3 RATIONALE

Circumstances have changed since the Appraisal. The Qansaxdheere - Buur Dhobo road to Jubba River was not included in the original plan and a major inter-regional road is now being constructed across the north-west of the region from Awdiinle to Baardheere. It is not only necessary to consider which roads are the most important to construct, upgrade or maintain, but also the organisational arrangements for carrying out the work.

The PMU and Roads Unit have produced a revised priority list of roads for construction and upgrading; this has been based on an amended version of the original schedule (see Table 7.1). Additional studies have been undertaken in the course of the Mid-term Review. All the vehicular routes in the region have been inspected and their current and future importance assessed in the context of the following:

- the physical condition of the existing road/track
- existing and anticipated traffic, taking account of alternative routes, etc
- nearby population densities
- the agriculture potential of the catchment area
- wet season serviceability
- availability of construction materials.

On the basis of this survey a revised priority list is recommended by the Consultants

**TABLE 7.1 ORIGINAL AND PROPOSED WORK PROGRAMMES (EXCLUDING ROAD MAINTENANCE)**

Class Type	Length of Road Constructed/Rehabilitated (km)		
	IDA (1979)	PMU/FINTEC <sup>1</sup>	Stage II Proposals <sup>2</sup>
New Class II	286	116	131
New Class III	210	153	114
<b>Sub Totals</b>	<b>496</b>	<b>269</b>	<b>245</b>
Re-Gravel	62	95	122
<b>GRAND TOTAL</b>	<b>558</b>	<b>364</b>	<b>367</b>

Notes: <sup>1</sup> For the purposes of comparison the totals shown for 'PMU/FINTEC' are limited to work programmed for completion by February 1987.

<sup>2</sup> See Section 7.4.

(see Table 7.1). It is further concluded that the region would generally have been better served if existing roads had been better maintained. The future road programme should have a maintenance emphasis. This shift in emphasis need not mean a large amount of new equipment since the maintenance objectives can be partly achieved by a re-allocation of existing resources.

Other policy issues are the appropriateness of current training proposals and the future staffing requirements of the regional roads department. It is currently proposed to train four graduate engineers to MS level. Given that there are only two posts to be filled, and that highly qualified staff would probably soon move into senior government positions outside the Region, it is suggested that an intermediate level of training be considered. Such diploma-level training would be more practical in content and be followed up with on-the-job training with a highway authority which was primarily responsible for gravel roads.

The proposed programme of work is due to terminate at the end of 1986 when Phase I funds will run out. However, even if all the construction were completed, there would still be a requirement for maintenance. Well before the end of Phase I, the decision must be taken on the future responsibility for the unit set up under BRADP. If a smooth transfer of project functions is to be achieved, it is better that this should happen when there is a budget and equipment in operating condition.

#### **7.4 PROPOSALS FOR STAGE II**

In order to meet the objectives in the Project Documents, namely to improve the roads to facilitate improved agricultural production and social infrastructure, a thorough reorganisation of the roads component is recommended. The reorganisation includes provision for road maintenance which should receive equal priority to new construction. Vehicles and construction equipment would be allocated between a Road Maintenance Unit (RMU) and a Road Construction Unit (RCU).

##### **7.4.1 Technical Assistance**

To improve the direction and control of the construction and maintenance work, two additional TAs would be recruited, namely a Maintenance Superintendent and a Road Construction Superintendent. Job descriptions are set out in Annex 3.

#### 7.4.2 Additional Equipment

Additional items of equipment required for the proposed RMU would cost approximately US\$600 000. It is also proposed to replace the damaged 25 T semi trailer for use by the RCU (US\$43 000).

#### 7.4.3 Overseas Training

It is proposed that only two engineers be sent for overseas training to Master's level during Stage II and that three 6 - 9 month practical training courses per annum be provided for intermediate staff overseas to gain experience in the construction and maintenance of gravel roads.

#### 7.4.4 Work Schedule

The construction of the Qansaxdheere - Buur Dhubo track should be completed by the end of 1983. Equipment will then be re-allocated to the RMU. One grader and one truck will be transferred to the RCU at work on the Goof Guduud - Qansaxdheere road. Figure 7.1 shows the location of the proposed works and Table 7.2 the physical targets.

TABLE 7.2 SUMMARY OF PHYSICAL TARGETS

(a)	Construction of new Class II roads (20 km of which already built in Stage I)	-	131 km
(b)	Construction of new Class III roads	-	44 km
(c)	Construction of new unclassified road (Construction completed in Stage I)	-	70 km
(d)	Rehabilitation of existing Class II roads (including re-gravelling)	-	122 km
(e)	Upgrading of unclassified road to Class III standard (including re-gravelling for 50 km)	-	70 km
(f)	Total length of gravel road network under regular maintenance	-	344 km

#### (a) New Construction

The rate of progress of the RCU is expected to increase from the 1983 level of 0.33 km to one kilometre per week when the plant is received from the disbanded RCU 2 and the new TAs are operational. By the end of Stage II, the strengthened RCU is expected to complete 175 km of new class II and III road (excluding the Qansaxdheere - Buur Dhubo track). See Table 7.3.

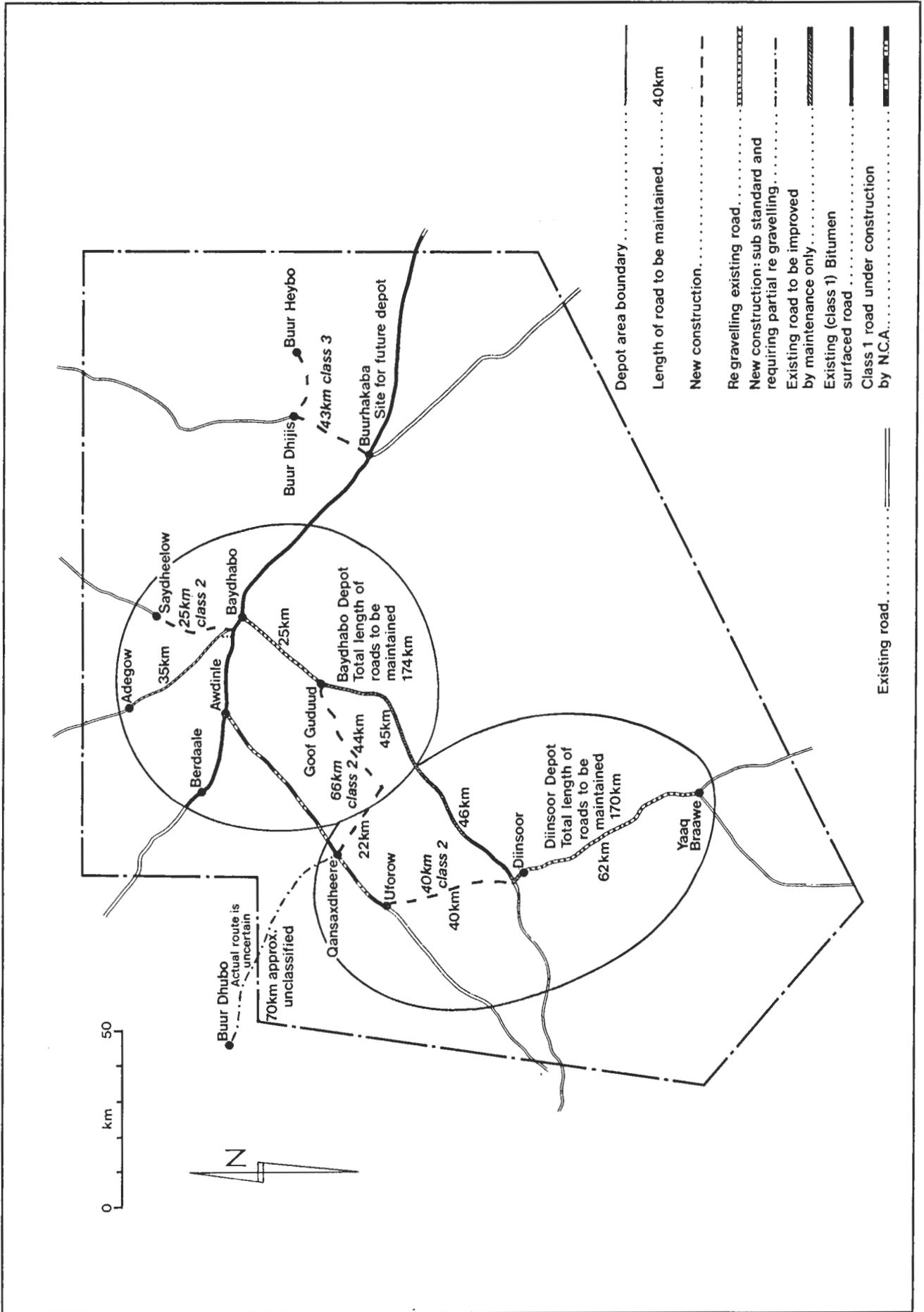
#### (b) Re-gravelling

The RMU is expected to commence re-gravelling operations using equipment from the disbanded RCU by late January 1984. The rate of work is expected to be 0.8 km per week until March 1984, and 1.0 km per week until September 1984, by which time the arrival of more suitable equipment should allow the construction of 1.2 km per week. The routes to be re-gravelled are listed in Table 7.4.

#### (c) Routine Road Maintenance

The RMU works and grading units would not become operational until the new equipment arrives and the depots at Baydhabo and Diinsoor are established. They are

Figure 7.1 Proposed Works



expected to commence work in January 1985 and maintain 1.66 km per week.

## 7.5 COSTS OF ROAD PROGRAMME

The estimated costs of the roads component during Stage II are summarised in Table 7.5. The total cost is estimated at US\$8.6 million.

**TABLE 7.3 PROPOSED CONSTRUCTION IN STAGE II**

Road	Type	km	Irish bridges	Start date	Finish date
Goof Guduud - Qansaxdheere (assumed 20 km completed by 1st January 1984)	A6 B6	7 59	10	1 Jan 84	15 Dec 84
Ufurrow - Diinsoor	A6 B6	16 24	5	1 Jan 85	30 Sep 85
Boonkay - Tagaal	B6	25	5	1 Oct 85	31 Mar 86
Buurhakaba - Buur Dhijis - Buur Heybo	A4 B4	8 36	15	1 Apr 86	31 Dec 86

*Note: Type specification given in Section 1.2 of Annex 3.*

**TABLE 7.4 PROPOSED RE-GRAVELLING IN STAGE II**

Road	Class	Length km	Start date	Finish date
Baydhabo - Goof Guduud	II	25	20 Jan 84	31 Aug 84
Boonkay - Adegow	II	35	1 Sep 84	31 Mar 85
Diinsoor - Yaaq Braawe	II	62	1 Apr 85	31 Mar 86
Qansaxdheere - Buur Dhubo*	n/c	70	1 Apr 86	15 Apr 87

*\*Note: This involves the selective re-gravelling and upgrading of the existing poorly constructed road to Class III standard. Some 50 km would be completed by 31st December 1986.*

TABLE 7.5 ACCESS ROADS - COST ESTIMATES (Ssh '000)

	1984	1985	1986
<b>Capital Costs</b>			
Buildings	4 001	6 803	-
Purchase of new equipment	9 818	-	-
<b>TOTAL CAPITAL COSTS</b>	<b>13 819</b>	<b>6 803</b>	<b>-</b>
<b>Operating Costs</b>			
Wages and Salaries -			
HQ and Support	797	797	797
RCU	716	716	716
RMU	1 146	1 146	1 146
Casual labour	400	400	400
Vehicles and Equipment -			
HQ and Support	1 011	1 011	1 011
RCU	7 527	8 278	7 599
RMU	3 128	6 418	6 696
Technical Assistance	9 216	9 216	9 216
Training	1 959	1 959	1 152
Other Costs		176	176
10 % contingencies	2 590	3 012	2 891
<b>TOTAL OPERATING COSTS</b>	<b>28 490</b>	<b>33 129</b>	<b>31 800</b>
<b>TOTAL ALL COSTS</b>	<b>42 309</b>	<b>39 932</b>	<b>31 800</b>
Inflation Factor from 1983 @ 8% p.a	1.08	1.17	1.26
<b>FINAL TOTAL COST - Ssh '000</b>	<b>45 693</b>	<b>46 720</b>	<b>40 068</b>
<b>US\$ '000</b>	<b>2 975</b>	<b>3 042</b>	<b>2 609</b>



# 8

## Water Supply

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### 8.1 OBJECTIVES

The main water supply objectives of the Project as stated in the IDA Staff Appraisal Report were to improve the supply of potable water in the Region for human and livestock consumption, through the following work:

- (a) drilling and developing about 60 boreholes on the Limestone Plateau;
- (b) an investigation/construction programme in the Basement Complex area involving about 40 drilled boreholes, 10 dug wells and 4 wars;
- (c) testing the availability of groundwater for irrigation in the Limestone Depression by drilling about six boreholes and two test production wells.

Recognising the weakness of the data base, the Appraisal Report stipulated that the early stages of the Project should be concerned with studies of hydrogeology, hydrology and water supply.

At the planning stage of BRADP water development was to be included under the responsibilities of the PMU; however WDA concluded a wider agreement for technical assistance with USAID, covering the whole of Somalia, which also included the water supply work for the Region under WDA in Mugdisho.

### 8.2 EXPERIENCE FROM STAGE I

Important conclusions from the exploratory work conducted in Stage I are as follows:

#### (a) Basement Complex

The investigations have shown that constraints to groundwater development are not only lack of porosity and permeability, but also poor quality of water; much of the groundwater in that formation is saline.

#### (b) Limestone Plateau

The drilling generally confirms that the formation can provide small supplies of moderately good to poor-quality groundwater. However, even on the Plateau, not all the boreholes have been successful in terms of yield or quality. Three of the new wells appear to have very high capacities and their use for irrigation should be considered. None of the new project wells have been equipped with production pumps so far.

(c) Limestone Depression

It has now been established that no irrigation potential by drilled wells exists in that area.

The present status of the drilling and well construction programme and the work still required to meet the IDA Staff Appraisal Report (1979) objectives are given in Table 8.1.

**TABLE 8.1 STATUS OF DRILLING AND WELL CONSTRUCTION**

Area	Work completed		Work to be done	
	Boreholes	Production Wells	Boreholes	Production Wells
Limestone Plateau	22	19	47	41
Limestone Depression	8	1	-	-
Basement Complex	16	4	24	8
<b>TOTAL</b>	<b>46</b>	<b>24</b>	<b>71</b>	<b>49</b>

In general terms the progress of the drilling work in Stage I, though uneven, has been satisfactory. Some of the activities have suffered from delays, but no unsurmountable obstacles are seen to the successful and timely completion of Phase I.

### 8.3 PROBLEMS AND CONSTRAINTS

The water supply work has been seriously hampered by delays in the delivery of various equipment. Drilling in the Basement Complex and the Limestone Depression would have been more effective had they been accompanied by surface geophysical surveys. Delays in the arrival of pumping plant have prevented a comprehensive programme of well testing, which would have provided useful data and facilitated further groundwater development planning. More seriously, the lack of permanent production pumps will have substantially reduced the opportunity to monitor the performance of new wells from which valuable lessons might have been learned.

The main deficiency of the programme of work carried out so far has been the lack of systematic study of surface water sources. It is apparent that much of Bay Region located on the Basement Complex will have to continue to rely on surface water. Work in this critically important area, including further search for sites for drilled and dug wells, as well as experimental works in various regions and the possibility of conjunctive use of these water sources, has not yet been undertaken.

### 8.4 RATIONALE FOR THE STAGE II PROGRAMME

Taking the Bay Region as a whole, water is in very short supply during much of the year. In some areas this situation can be easily remedied by construction of drilled wells, but on the Basement Complex provision of perennial supplies is difficult and expensive. Currently some of the villages in the cropped areas on the Basement are abandoned for much of the dry season as the population moves to some perennial source of water. In many locations all over the Region, people spend a substantial part of their life walking up to 20 kilometres for their water.

Clearly the water supply situation in parts of the Region is unsatisfactory from the point of view of quality of life. It is also argued that lack of reliable water supplies are a

major constraint to increasing livestock and crop production; the enforced migration of farmers with their livestock to perennial water supplies limits the intensity of cultivation and imposes a serious constraint on efficient use of parts of the range. Though some of these contentions are arguable, the quality of life consideration is taken to be over-riding.

A major deficiency in all the water supply planning exercises so far undertaken has been the lack of any attempt to formulate a long-term water supply policy related to water demand and compatible with Somalia's overall water supply policy. At current rates of provision, supply will barely keep pace with the demand arising from population growth. Thus the water supply component of the Project should not be considered as a once-and-for-all-time effort, but part of a continuing programme of water development. There is therefore a responsibility to ensure that institutional development is not ignored. This applies to new construction as well as operation and maintenance of the supplies provided.

Where both groundwater and surface water development are possible, it has been assumed that drilled wells are preferable to wars in terms of reliability and water quality. Because of the high mineralisation of some of the groundwater produced by wells, this assumption can no longer be taken for granted. Therefore a cost comparison of these two sources was made by the Mid-term Review. The results indicate that water from deep wells, pumped by diesel driven pumps is considerably cheaper than other sources; since deep wells provide the most reliable supplies.

Since desalination and base exchange treatment of poor quality groundwater would be extremely expensive, the only practical measure which can be taken is to avoid areas of high salinity in the well installation programme. Bacteriological quality of well water can be easily controlled by proper well siting and sanitary protection.

Water from wars is normally relatively pure chemically, but is usually highly turbid and often badly polluted. Since such water constitutes a health hazard, steps should be taken to improve it. The easiest improvement would be to exclude animals from the war and this is insisted upon by some village communities; animals are watered outside the fence. However, this by itself would not produce clear, safe drinking water and further improvements should be considered and tested at a pilot level during the Project. One treatment which may be practicable under local conditions is the slow sand filter or a method which simulated this process.

## **8.5 PROGRAMME PROPOSALS 1984 - 86**

### **8.5.1 Groundwater**

The recommended work plan in the field of groundwater is basically that needed to complete the programme laid out by the IDA Staff Appraisal Report (1979) with only minor modifications and additions. It would include the following items:

- (a) Field inventory and monitoring of drilled and hand-dug wells in the region;
- (b) Geophysical surveys in the Basement Complex concentrating on the cultivated areas and those areas identified by HTS (1982) as having under-utilised grazing potential;
- (c) Drilling and well construction to meet Phase I objectives (see Table 8.1);
- (d) Dug-well construction as a demonstration of proper installation of such wells for production of water for human consumption.

### 8.5.2 Surface Water

Though the present project cannot hope to make a major impact on water short areas in terms of constructing sufficient wars to significantly improve the water supply situation, it can and should initiate the work which might make such improvement possible. The recommended work programme follows that of the IDA (1979) with major modifications in some areas.

The elements of the proposed surface water development programme are listed as follows:

- (a) Inventory and monitoring of wars in the Region;
- (b) Outline design of experimental wars based on the above surveys, to provide potable perennial water supplies for small agricultural communities;
- (c) War site selection for construction of four wars including 2 or 3 in Buurhakaba District;
- (d) Detailed design and construction in 1985-86 of the four wars, which would require purchase of plant by the Project;
- (e) Rehabilitation of existing wars (government and traditional) in cultivated areas.

### 8.6 COSTS

The estimated capital and operating costs for the proposed water supply developments in Stage II are estimated to be US\$11.7 million, or Ssh 180 million (Table 8.2). Problems arise in allocating costs between groundwater development in Bay Region and other regions covered by CGDP. The costs are therefore indicative. The proposed surface water investigations, on the other hand, are entirely aimed at Bay Region.

It is recognised that the development proposals for both groundwater and surface water will be considered in the course of an overall appraisal of CGDP by GOS and USAID. It is to be expected that resources will be provided for the satisfactory completion of the groundwater work started in Stage I, but there is some uncertainty about the funding of surface water development in areas where groundwater is absent since this aspect was neglected in Stage I which is of concern to those wishing to see an integrated approach to the development of water supplies in the Region.

**TABLE 8.2 WATER COMPONENT - SUMMARY OF COSTS (Ssh '000)**

	1984	1985	1986
<b>Capital Costs</b>			
Equipment for well construction	34 113	3 588	1 006
Equipment for war construction	8 324	-	-
<b>TOTAL</b>	<b>42 437</b>	<b>3 588</b>	<b>1 006</b>
<b>Operating Costs</b>			
Technical assistance			
- Wells	21 760	21 760	5 632
- Wars	1 152	5 120	4 096
- Irrigation	512	1 280	-
Local staff costs			
- Wells	1 422	1 422	437
- Wars	38	549	254
- Irrigation	50	50	-
Operating costs of machinery			
- Drilling	6 299	6 299	1 574
- War construction	75	557	634
- Pumps	2 072	3 461	4 166
Training	3 150	3 150	-
<b>TOTAL</b>	<b>36 530</b>	<b>43 648</b>	<b>16 893</b>
Plus 10% contingencies	7 897	4 724	1 790
<b>OVERALL TOTAL</b>	<b>86 864</b>	<b>51 960</b>	<b>19 689</b>
Inflation factor @ 8% per year	1.08	1.17	1.26
<b>TOTAL INFLATED COSTS (Ssh '000)</b>	<b>93 813</b>	<b>60 793</b>	<b>24 808</b>
(US\$ '000)	6 108	3 958	1 615



# 9

## Pilot Village Development

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During Stage I the Project had very little contact with the rural people of Bay Region. A major objective for Stage II is to develop a field presence and achieve a measurable improvement in the living standards of the intended beneficiaries of the Project. It is recognised that unless this can be achieved, finance for a Phase II project (i.e. after 1986) would be difficult to justify. The proposed initiative recognised that there are insufficient human and material resources and experience of successful rural development techniques to achieve measurable progress in the Region as a whole and that initially some concentration of effort is justified to build confidence amongst staff and develop the appropriate methods for the area. At this stage, it is not possible to formulate a detailed programme. This can only be done by sitting down with the officials and community representatives at the village level. Such techniques of programme building are increasingly used in mobilising local support for participatory development programmes.

Pilot Village Development (PVD) would be a joint undertaking by BRADP and AFMET, with possible involvement of the USAID Health Project as well. The purpose would be to bring together the full range of services (adaptive research input supply, extension, veterinary, water supply) at village level in an attempt to obtain a significant impact on rural living standards. Reasonably accessible representative villages (about 250 households) would be selected in each district, ideally where NMEF has already obtained some data and/or boreholes have been drilled e.g.

Village	District	NMEF Pilot Survey	Borehole
Awshini	Baydhabo	Yes	Yes
Tirrka/ Dure Cali Qaale	Qansaxdheere	Yes	Yes
Kurman	Diinsoor	No	Yes
Totoorow	Buurhakaba	Yes	No

The PVD would be on sufficient scale to throw up real problems of rural development and to generate worthwhile increases in agricultural production. The programme should not be so demanding of management, supervision, materials and equipment that it would not be replicable over a wider area at a later date.

The PVD should provide useful information for planning Phase II support. The nature of government support would be to offer technical and other help which people could reject or accept. The success of the programme would therefore depend on the use of community development techniques; the people themselves would be involved in the planning and the implementation of the actions necessary to satisfy their needs. Rural development staff would be exposed to an intensive training course in community development methods. The course would be conducted in the pilot areas with the village people by TAs brought in for the purpose (see Sub-Section 10.4.6).

Among the useful work which could be done as part of the PVD programme are the following:

(a) Producer-level testing of farm and village technology

Farm technology:

- varieties of crops
- recent crop introductions
- cultivation practices
- pest control
- conservation of byproducts
- tick and internal parasite control
- poultry feeding

Village technology:

- grain storage
- hand pumps for wells and wars
- pump maintenance
- animal-drawn scoops for desilting wars
- improved sanitary practices

(b) Farming systems research; measuring the impact of intensified extension and veterinary support on production and living standards; evaluating the economics of recommended practices under farm conditions.

(c) In-service and induction training of the mostly urban youths recruited for rural development work; familiarisation with local farming systems, village organisation, extension methods and community development work.

Costs would be absorbed in the operating costs of participating agencies. No special infrastructure would be provided in addition to the pumps to be installed in the tubewells. Accommodation of traditional type (as currently used by NMEF enumerators) would be provided for any resident or visiting staff.

The scheme would not require extra brief inputs of staff in so far as many staff are currently underemployed. Technical Assistance would be required in each year to launch the programme and maintain the necessary impetus.

# 10

## Organisation and Management

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### 10.1 LESSONS AND EXPERIENCE OF STAGE I

BRADP was seen as Somalia's first experiment with decentralised integrated development and, as a condition of credit effectiveness (paragraph 7.02, IDA, 1979), a special management structure was created for the purpose. This placed most of the regional-level agencies and departments, which were involved in crop and livestock production, as well as roads and water supplies, under the control of the PMU, responsible to the Minister of Agriculture.

The administrative reorganisation of the PMU has not proceeded entirely as anticipated. The willingness of the various agencies and departments within Bay Region to be directed by the Project has depended on the benefits accruing to them. For the National Extension Service there was little or no inducement to accept direction from the PMU as it was entirely funded from a separate source under the USAID 0101 and 0112 agreements. The TAs and much of the equipment and labour for the water supply component were also financed under a separate project (USAID 0104) and the leverage exerted by the Project Director over WDA was similarly limited. While NRA were prepared to accept vehicles and salaries for guards, they have been reluctant to provide the technical support envisaged in the project documents.

When proposing that the PMU take over the activities of the MOA in the Bay Region, the IDA Appraisal Report overlooked several of its current responsibilities; for example, the Plant Protection Unit and the district staff under the MOA's Regional Coordinator who was absorbed by the PMU. Other necessary facilities were also overlooked, namely the need to maintain a separate office in Mugdisho and the stores, mechanical workshop, fuel station, etc., in the Project H.Q.

The Monitoring and Evaluation Section of the Project, headed by the former Regional Coordinator, was established in 1982. Since then, the Unit has attempted a baseline survey of the proposed PADUs which has provided a good opportunity for the enumerators to learn about the farming system and acquire investigative skills. However, the Unit has lacked technical guidance and the monthly system of management briefing envisaged in the Appraisal Report has yet to be established.

### 10.2 PROBLEMS AND CONSTRAINTS

The PMU has yet to establish itself as an integrating force in the rural development of Bay Region because the administrative reorganisation has diverted management from the purpose of the Project. It has become so encumbered with functions, staff and equipment that management has been engaged solely in self-administration.

Many of the problems have been beyond the power of management to control and arise from basic deficiencies in the design of the Project, especially the organisational aspects, which were either ignored or glossed over in the project documents. They disregard some of the principles of management, e.g.:

- (a) Unity of Command: Water supply under two directors.
- (b) Authority Matched to Responsibility: Project Director of BRADP responsible for agricultural development in the Region without the authority to control the extension programme.
- (c) Limited Span of Control: Project Director directly responsible for numerous departments and administrative functions.

Lack of attention to this last item has had serious implications for the smooth running of the Project. The project documents clearly stated that a major problem was the shortage of qualified manpower, particularly managers. Yet the organisation chosen for the implementation of the Project actually increased the requirement for middle-level managers. The BRADP structure is a typical "flat" project structure with a wide span of control; the Project Director is directly responsible for at least nine departments. Such an organisation which encourages the exercise of initiative and self-direction at the lower levels because close supervision by the Project Director is impracticable assumes that sufficient people capable of independent decision-making are available. They were clearly not available at the beginning of the Project. This deficiency was to be overcome with the recruitment of TAs, but they were very late in arriving and, when they did come, their role (managerial or advisory) was not clear.

Thus many of the difficulties faced by BRADP in the initial period have their roots in project design or in the desultory performance of the donors in assigning TAs or in procurement.

#### 10.2.1 Internal Constraints

Given the seriousness of the external constraints, it is creditable that many of the objectives of the first three years have been achieved. However, there are deficiencies which clearly need attention, if the ambitious goals of the Project are to be realised. These deficiencies can be classified under three headings relating to the principal functions of management: Communicating, Decision-making and Control.

##### (a) Communicating

The objective of the integrated approach was to achieve a more significant impact than through uncoordinated sectoral programmes. Behind this objective lay the assumption that complementarities existed between components sufficient to outweigh the costs of coordination. The periodic meetings of the Regional Coordinating Committee were to be the main vehicle for achieving functional integration. Their objective was to review plans, evaluate accomplishments and suggest desired changes in direction or project emphasis (paragraph 37, USAID, 1980). It is apparent that this committee has never formally met and it is difficult to avoid the conclusion that an important function of management, i.e. to communicate with staff, officials of other agencies, and with the public, has been neglected.

##### (b) Decision-Making

The project documents devote much space to the objectives of decentralisation and participation and describe various consultative committees by which decision-making would be devolved to the regional and district level. There is little evidence that

these objectives are given high priority by the management of the Project. Participation in decision-making has costs, mainly in time and in organisational effort. The benefits of participation (e.g. community contribution of resources, goodwill towards the Project) have to be set against these costs. The implicit assumption in choosing a non-participatory style for BRADP is that the benefits are outweighed by the costs. The Project Management has preferred to approach the people using indirect methods such as socio-economic surveys. It is also arguable that during Stage I there was little scope for a participatory approach. With the removal of the Extension and Water Supply components from its grasp, there was little reason for the Project to develop any direct contact with the local people.

(c) Control

The IDA Appraisal Report (paragraphs 2.27-2.29) sets out some of the control procedures for the Project, both internal and external. Financial and stock control is another area for concern. The problem is symptomatic of a wider difficulty. Given the managerial resources currently available, the unattractiveness of government pay scales and the organisational structure of the Project, the performance of the PMU may not have much scope for improvement.

### 10.3 RATIONALE

As noted above, BRADP has not developed any direct contact with the rural people. Its contribution is therefore all but invisible to them. There has been a reluctance on the part of some ministries to hand over their regional activities, staff and resources to BRADP. There seem to be valid reasons for the ministries and agencies retaining control over some of their regional resources and programmes, but as long as BRADP is regarded as an agency for managing and implementing a rural development programme it will be criticised for lack of action even though it lacks command over the means of implementation.

The Consultants have examined several alternative organisational options and discussed them with the Project Director. The key decision was whether the Project could best serve the interests of the Region's farmers by merely supporting the activities of the various departments, or whether it should adopt a more active role in implementing various field programmes as the project documents proposed. A possible third choice was to follow a midway path, that is procuring and disbursing in support of the designated government departments with a limited but concentrated direct involvement in agricultural development.

Having carefully weighed the alternatives, the Project Director and the Consultants conclude that the PMU should proceed as originally planned and should be an active agent of development in its own right. This option offered the best prospect of achieving the development objectives of the Project because the sectoral agencies in the region did not have the capacity to takeover in the short term. Another reorganisation would result in delaying a programme which was ready to proceed. Therefore the PMU would continue to direct and coordinate the work of MOA, MLFR, MPW's Department of Civil Engineering and WDA's development work in the region. (An exception is the range component of NRA, for reasons set out in Annex 2). Further the PMU would direct these agencies in support of an expanded programme of agricultural development in the region.

### 10.4 PROPOSALS FOR THE PMU IN STAGE II

The Consultants' proposals for the PMU in Stage II consist of administrative measures designed to improve performance rather than restructure the Unit. Most of these proposals are based upon the suggestions put forward by the management of Bay Region Project.

#### **10.4.1 Regional Coordinating Committee**

Priority would be given to activating the Regional Coordinating Committee, comprising the Project Director, heads of project components and their counterparts. The RCC would also include the Regional Governor, representatives from AFMET and WDA/CGDP. The Chairman would be designated by the appropriate government authority.

The Secretary of the RCC would be the Programme Officer, a new post which, during State II, would be filled by an expatriate. The Programme Officer would prepare monthly progress reports on individual components for the Project Director and assist the implementing agencies in the preparation of standardised monthly reports to the RCC. But for adequate training and experience, this role would have been served by the head of the Monitoring and Evaluation Unit of the Project. The existing enumerators in the Unit would assist the Programme Officer.

The monthly reports of the implementing agencies would be the core agenda of each meeting and a simple, but effective, way of keeping BRADP's immediate targets continuously in view and all participants informed about all aspects of the Project. The main focus of the RCC would normally be the review of short-term tactical problems of the Project rather than its longer-term strategy.

#### **10.4.2 Annual Programming and Budgeting**

Now that the Project is established, more attention would be given to the annual updating of the work programme and budget. Each component would be subject to re-evaluation and reprogramming as appropriate. Implementing officers would actively participate in this process and would be assisted by the PMU in preparing their submission. This would provide the required flexibility to the Stage II programme to modify strategies that were not working and to back out of any dead ends. The Project would draw upon the services of two short-term consultants during two months (November and December) of each year to assist in the preparation of the annual work plans and budgets.

#### **10.4.3 Procurement, Stores and Financial Control**

In order to reduce the workload on the Financial Controller, the newly appointed General Services Officer, employed under the Wyoming contract, would assist in procurement and the operation of a more effective stores control and ordering system.

To speed up the flow of financial information to and from the component managers, the PMU would recruit four SIDAM-trained book-keepers, two for Baydhabo and two in Mugdisho. This would require more spacious accommodation for the financial section, presently crowded into a small office in the MOA compound.

Communication between the Project HQ in Baydhabo and the Mugdisho office would be improved by the installation of a permanent radio link.

The financial control of the Project would be facilitated by the purchase of a micro-computer, related equipment and suitable software. The bulk of the book-keeping operations would still be done manually within each component and the computer would assist the PMU in consolidating the Project accounts and in budgeting and monitoring procedures. Once the management accounts have been adapted onto the computer, its use can be expanded into simple stock control, mechanical plant record analysis, word processing and report preparation, and payroll calculation. An initial technical assistance input of two months would be necessary to install and commission the computer and train staff, and one

month per year allocated thereafter for the installation of new software with appropriate training and for support services.

#### **10.4.4 Vehicle Operation and Maintenance**

A mechanical specialist, newly appointed under a personal services contract, would rationalise the maintenance and repair of project vehicles. New procedures, recently introduced by the PMU, would ensure that vehicles are operated according to government regulations and that the spiralling POL budget is brought under control.

#### **10.4.5 Staffing**

With the exception of the alterations proposed, the staffing of the PMU during Stage II would conform with the establishment shown in the 1983 budget (Table 10.1). The MOA's Coordinator for Baydhabo District and auxiliary staff would be accounted for separately (see Annex I, Subsection 6.3.4).

#### **10.4.6 Training**

The budget includes an additional four months per annum of Technical Assistance for the training of project staff in management and community development techniques, required in the Pilot Village Development scheme (see Section 9.2).

During Stage II three PMU staff per annum would attend short-term (9 month) training courses in the planning and management of rural development projects overseas, e.g. courses are held at Mananga Agricultural Management Centre in Swaziland and at University of Bradford, UK.

### **10.5 COSTS**

Capital costs of the PMU in Stage II (Table 10.2) include the PMU office building, housing for all the project components, replacement of PMU vehicles, a micro-computer and a radio link. Operating Costs (Table 10.3) are based on current PMU costs. Rents for offices, houses and stores are budgeted for 1984 and 1985, by which time the project buildings should have been completed.

TABLE 10.1 PMU SUMMARY OF COSTS (Ssh '000)

	1984	1985	1986
<b>Capital Costs</b>			
Buildings	22 120	22 120	-
Other Equipment	2 475	-	-
Vehicles	2 654	-	-
<b>TOTAL</b>	<b>27 249</b>	<b>22 120</b>	<b>-</b>
<b>Operating Costs</b>			
Technical Assistance	6 076	6 076	6 076
Training	1 652	1 652	1 652
Local Salaries and Wages	1 783	1 783	1 783
POL	403	403	403
Spare Parts and Tyres	415	415	415
Inputs and Consumables	600	600	600
Building Costs	1 430	1 780	1 346
Miscellaneous	800	800	800
<b>TOTAL</b>	<b>13 159</b>	<b>13 509</b>	<b>13 075</b>
<b>Overall Total</b>	<b>40 408</b>	<b>35 629</b>	<b>13 075</b>
<b>10 Per Cent Contingencies</b>	<b>4 041</b>	<b>3 563</b>	<b>1 307</b>
<b>Total Costs</b>	<b>44 449</b>	<b>39 192</b>	<b>14 382</b>
<b>Inflation Factor</b>	<b>1.08</b>	<b>1.17</b>	<b>1.26</b>
<b>Total Inflated Costs Inc. Contingencies</b>	<b>48 005</b>	<b>45 855</b>	<b>18 121</b>
<b>(US\$ '000)</b>	<b>3 125</b>	<b>2 985</b>	<b>1 180</b>

**TABLE 10.2 PMU DETAILS OF CAPITAL COSTS**

(a) Building* (1984 and 1985 only)	Ssh
10 Class A Houses @ 130 m <sup>2</sup>	9 100 000
13 Class B Houses @ 100 m <sup>2</sup>	9 100 000
14 Class C Houses @ 80 m <sup>2</sup>	7 840 000
33 Class D Houses @ 60 m <sup>2</sup>	13 860 000
 PMU Office Building and Canteen @ 620 m <sup>2</sup>	 4 340 000
<b>Sub-Total</b>	<b>44 240 000</b>

*Note \* The capital cost of house construction has been allocated to the PMU although staff from other components will occupy the houses. The total number to be built may be less than indicated.*

(b) Other Equipment	
Furnishing for Houses @ 5%	1 995 000
Additional Office Equipment and Furnishings @ 3%	130 200
Micro Computer and Software	200 000
Radio Link Baydhabo - Mugdisho	150 000
<b>Sub-Total</b>	<b>2 475 200</b>

(c) Vehicles	
9 Station Wagons @ US\$ 16 000 (1984)	2 211 840
+ 20% Spares	442 368
<b>Sub-Total</b>	<b>2 654 208</b>

**TABLE 10.3 PMU - DETAILS OF OPERATING COSTS**

<b>(a) Technical Assistance</b>			<b>Ssh</b>
Financial Controller	@	U\$ 70 000 p.a.	1 075 200
Programme Officer	@	U\$ 105 000 p.a.	1 612 800
General Services Officer	@	U\$ 100 000 p.a.	1 536 000
Mechanical Specialist	@	U\$ 88 000 p.a.	1 351 680
4 man months per year for budget and workplan preparation			500 000
<b>Sub-Total</b>			<b>6 075 780</b>
<b>(b) Training</b>			
4 man months per year of technical assistance in Somalia for Pilot Village Development Scheme Training			500 000
Overseas training of PMU staff - Assume 3 persons on 9 months technical courses each year @ US\$ 25 000			1 152 000
<b>Sub-Total</b>			<b>1 652 000</b>
<b>(c) Local Salaries and Wages</b>			<b>Ssh</b>
1 Project Director	@	72 000	72 000
1 Deputy Project Director	@	55 200	55 200
1 Director of Administration	@	51 600	51 600
1 Deputy Technical Manager	@	51 600	51 600
1 Public Relations Officer	@	46 800	46 800
1 Procurement Officer	@	27 600	27 600
2 Senior Accountants	@	32 400	64 800
2 Secretaries	@	36 000	72 000
1 Secretary	@	26 400	26 400
1 Personnel Officer	@	32 400	32 400
4 Accountants	@	15 000	60 000
4 Book-Keepers	@	14 000	56 000
1 Clerk Typist	@	20 400	20 400
4 Clerks	@	13 000	52 000
9 Messengers	@	9 000	81 000
1 Senior Mechanic	@	28 800	28 800
3 Mechanics	@	19 200	57 600
4 Assistant Mechanics	@	13 000	52 000
1 Mason	@	19 200	19 200
17 Drivers	@	12 000	204 000
2 Doctors	@	12 000	24 000
2 Storekeepers	@	19 000	38 000
1 Fuel Supply	@	12 600	12 600
12 Watchmen	@	8 000	96 000
1 Head of M and E Unit	@	46 800	46 800
7 Enumerators	@	21 600	151 200
1 Typist	@	12 000	12 000
1 Driver	@	14 400	14 400
1 Messenger	@	8 000	8 000
2 Watchmen	@	8 000	16 000
Night Allowances			232 600
<b>TOTAL</b>			<b>1 783 000</b>

Table 10.3 Continued

<b>d) POL</b>			
9 Station Wagons	@	37 500	337 500
1 Truck	@	65 000	65 000
<b>Sub-Total</b>			<b>402 500</b>
<b>(e) Spare Parts and Tyres</b>			
9 Station Wagons	@	33 700	303 300
1 Truck	@	111 700	111 700
<b>Sub-Total</b>			<b>415 000</b>
<b>(f) Inputs and Consumables</b>			
Estimated at Ssh 600 000 p.a.			
<b>(g) Building Costs</b>			
			<b>Ssh</b>
4 Office Rents 1984-1985	@	72 000 p.a.	288 000
3 Houses Baidoa 1984-1985	@	112 000 p.a.	336 000
1 House Mogdisho 1984-1985	@	240 000 p.a.	240 000
2 Warehouse Baidoa 1984-1985	@	72 000	216 000
Maintenance			
		1984	350 000
		1985	700 000
		1986	1 106 000
<b>(h) Miscellaneous</b>			
Estimated at Ssh 800 000 p.a.			



APPENDIX A  
ABBREVIATIONS



## APPENDIX A

### ABBREVIATIONS

ADC	Agricultural Development Corporation
ADF	African Development Fund
AFMET	Agricultural Extension and Farm Management Training Project
BRADP	Bay Region Agricultural Development Project
BRS	Bonka (Boonkay) Research Station
CBPP	Contagious Bovine Pleuro Pneumonia
CED	Civil Engineering Department
CGDP	Comprehensive Groundwater Development Project
DVO	District Veterinary Officer
FEA	Field Extension Agent
FMD	Foot and Mouth Disease
GOS	Government of Somalia
HTS	Hunting Technical Services Limited
IDA	International Development Association
IFAD	International Fund for Agricultural Development
KFA	Kenya Farmers Association
MLFR	Ministry of Livestock, Forestry and Range
MOA	Ministry of Agriculture
MPW	Ministry of Public Works
NMEF	National Monitoring and Evaluation Facility
MTR	Mid Term Review
NRA	National Range Agency
ONAT	National Tractor Hire Agency
PADU	Pilot Agricultural Development Unit
PMU	Project Management Unit
PVD	Pilot Village Development
RCU	Road Construction Unit
RMU	Road Management Unit
RCC	Regional Coordinating Committee
RVO	Regional Veterinary Officer
TFA	Tanganyika Farmers Association
TOR	Terms of Reference
T & V	Training and Visit System of Extension
USAID	United States Agency for International Development
WDA	Water Development Authority



**APPENDIX B**  
**REFERENCES**



## APPENDIX B

### REFERENCES

- |                                    |      |  |
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