

AGENCY FOR INTERNATIONAL DEVELOPMENT  
**PROJECT PAPER FACESHEET**  
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1. TRANSACTION CODE (X) APPROPRIATE BOX  
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2. COUNTRY/REGIONAL ENTITY/GRANTEE  
 Botswana

3. DOCUMENT REVISION NUMBER

4. PROJECT NUMBER 690-11-150-056

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 A. SYNSCL AFR B. CODE 1

6. ESTIMATED FY OF PROJECT COMPLETION  
 FY 81

7. PROJECT TITLE - SHORT (STAY WITHIN BRACKETS)  
 Botswana Crop Production

8. ESTIMATED FY OF AUTHORIZATION/OBLIGATION  
 NO. YR.  
 A. INITIAL 476 B. FINAL FY 79

9. SECONDARY TECHNICAL CODES (MAXIMUM SIX CODES OF THREE POSITIONS EACH)

10. ESTIMATED TOTAL COST (\$000 OR EQUIVALENT, \$1 = R. 868)

| PROGRAM FINANCING      | FIRST YEAR FY 79 |        |          | ALL YEARS |        |          |
|------------------------|------------------|--------|----------|-----------|--------|----------|
|                        | B. FY            | C. L/C | D. TOTAL | E. FX     | F. L/C | G. TOTAL |
| AID APPROPRIATED TOTAL | 240              | 100    | 340      | 1,401     | 341    | 1,742    |
| GOVT                   | 240              | 100    | 340      | 1,401     | 341    | 1,742    |
| OTHER                  |                  |        |          |           |        |          |
| GOVT GOVERNMENT        | -0-              | 544    | 544      | -0-       | 1,717  | 1,717    |
| OTHER CONTRIBUTIONS    | 234              | 282    | 516      | 703       | 765    | 1,468    |
| TOTALS                 | 474              | 926    | 1,400    | 2,104     | 2,823  | 4,927    |

11. ESTIMATED COSTS/AID APPROPRIATED FUNDS (\$000)

| A. APPROPRIATED BY PRIMARY AGENCY | FY 79    |         | FY 77    |         | FY 78    |         | YEARS    |         |
|-----------------------------------|----------|---------|----------|---------|----------|---------|----------|---------|
|                                   | D. GRANT | E. LOAN | F. GRANT | G. LOAN | H. GRANT | I. LOAN | J. GRANT | K. LOAN |
| TOTALS                            | 340      |         | 400      |         | 600      |         | 1,742    |         |
| ESTIMATED EXPENDITURES            | 0        |         | 444      |         | 594      |         |          |         |

12. PROJECT PURPOSE(S) (STAY WITHIN BRACKETS)  CHECK IF DIFFERENT FROM PID/PRP

To increase the capability of the Government of Botswana (GOB) Ministry of Agriculture to develop and expand crop research activities and crop production programs suitable for small farmers; and to increase the capacity of the Botswana Agricultural Marketing Board to store and market grains produced by small farmers. In dealing with these activities, particular emphasis should be placed on major cereals, e.g. millet and sorghum.

13. WERE CHANGES MADE IN THE PID/PRP FACESHEET DATA NOT INCLUDED ABOVE? IF YES, ATTACH CHANGED PID AND/OR PRP FACESHEET.  
 YES  NO

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE: *Charles J. Ward*

TITLE: \_\_\_\_\_

DATE SIGNED: NO. 03 DAY 17 YR. 76

16. DATE RECEIVED IN AID/A, OR FOR AID/A DOCUMENTS, DATE OF DISTRIBUTION  
 NO. DAY YR.

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No. 690-11-150-056

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1/ For Environmental Assessment, see Section III. B., page 35.

PROJECT PAPER  
BOTSWANA CROP PRODUCTION PROJECT  
NO. 690-11-150-056

I. Project Summary and Recommendations

A. Recommendations

Authorization of a grant of \$1,742,000 for the project subject to the following waivers and approvals:

1. A procurement source and origin waiver from AID Geographic Code 000 (U.S. only) to Code 935 for procurement of construction materials and of project vehicles (four 3/4 ton pick-up trucks); and a waiver of the provisions of Section 636 (i) of the Foreign Assistance Act to permit procurement of project vehicles from non-U.S. source and origin.
2. Approval to deviate from policy expressed in AID Handbook 11, Chapter 2, which limits employment of third country nationals for AID-financed construction to 20% of the non-local work force.
3. Waiver of policy set forth in AID Handbook 11 (limiting procurement of grant-financed services to U.S. and local source and origin) to permit procurement of construction services, and equipment maintenance and repair services from Free World firms in equal preference to U.S. and local firms, and/or joint venture of such firms.

B. Project Description

1. Scope

This project will support the Government of Botswana (GOB) to develop and expand crop research activities and crop production programs suitable for small farmers, and will increase its capacity to store and market major grain crops produced by small farmers (e.g. sorghum and millet). Primarily institution building in nature, this project will ✓ support the research, development and implementation of more productive and reliable dry-land farming systems by staffing key positions in the Ministry of Agriculture Research Division and new Crop Division; training local personnel to fill crop-related posts in these divisions; training extension staff associated with these divisions in the new crop technology as it is developed; and constructing five grain storage warehouses for the Botswana Agriculture Marketing Board (BAMB).

2. AID Inputs

AID-provided funding will total \$1,742,000 as follows:

a. Technical Assistance \$1,041,000

AID-provided staffing for the Crop Division will include two persons and consultancies for a total of nine and one-half staff years as follows:

|                        |       |                  |
|------------------------|-------|------------------|
| Chief of Crop Division | 3-1/2 | staff-years      |
| Crop Program Officer   | 3     | staff-years      |
| Consultants*           | 3     | consultant-years |

In addition, the project will pick up the services of a Crop Screening Officer, posted in the MOA Research Division and now funded by AID from other sources, for an additional two (2) staff-years.

|                        |   |             |
|------------------------|---|-------------|
| Crop Screening Officer | 2 | staff-years |
|------------------------|---|-------------|

|       |        |             |
|-------|--------|-------------|
| TOTAL | 11-1/2 | staff-years |
|-------|--------|-------------|

b. Participant Training \$ 222,000

Participant training will include twenty-one study-years of overseas training and eight study-years of training in African institutions.

c. Commodities \$ 138,000

Four vehicles, training supplies and equipment, research and laboratory equipment, and office supplies and equipment will be provided.

d. Local Costs \$ 341,000

Local costs include housing for three U.S. technicians, construction of a crop research workshop, budgetary support for the Crop and Research Divisions, in-service training programs, and funds to assist the GOB in building five grain storage warehouses.

e. GRAND TOTAL \$1,742,000

\* Consultants will address a variety of problems including, but not necessarily limited to (a) projecting the demand for major crops over the projected life of project (i.e. Phase I of institutional development and a proposed Phase II of production campaigns); (b) preparing farm management studies; (c) preparing social science research; (d) collecting base-line data, (e) preparing agronomic research tasks; (f) preparing a crop storage program suitable for small farmers; and (g) performing project evaluations. The farm management studies will, inter alia, address the need for credit and production inputs and will serve as the basis for an examination of alternative methods for meeting these needs.

### 3. Implementation

By focusing upon the Crop Division, the project will draw together the various crop-related activities within the MOA so that these may evolve into a general crop production program. BAMB will complement this program by insuring that adequate market incentives exist to promote acceptance of the new farming systems and increase cereal production.

Technical staff positions and consultancies will be filled through a contract with a U.S. institution. These personnel will supplement GOB research efforts to develop better crop systems, prepare crop production programs, assist in training extension personnel who will implement these programs, and will work with BAMB in determining the location of storage warehouses and in preparing and evaluating BAMB's marketing, storage and grain-price stabilization programs.

Participant training program development will be the responsibility of the MOA. Participants may be selected from present MOA staff or from other sources with training as their first assignment.

Construction of the grain storage warehouses, housing, and a crop research workshop to facilitate the work of the Crop Screening Officer will be contracted locally. Financing will be handled on a fixed amount reimbursement basis following AID procedures and controls already established. Required details will be included in the project agreements (ProAgs).

Other local costs for operational support to the Crop and the Research Divisions will be handled on a reimbursable basis. Again, procedural details will be included in the ProAgs.

### 4. End-of-Project Status ✓

At the end of the project, Botswana will have (1) specific crop production programs designed for small-scale farmers; (2) an innovative Crop Division continuing to develop, coordinate, implement and evaluate crop production programs in an efficient and creative manner; (3) a technological base from which such programs can be developed; (4) a long-term crop development plan which is being implemented; (5) an extension staff which is trained in the new technology developed and in the use of improved techniques in the process of assisting rural people to easily and quickly use these innovations; and (6) an effective and efficient crop storage and marketing program suitable for small farmers. These achievements will contribute significantly to the development and spread of more productive and reliable crop systems. It is expected that the project activities discussed herein will be supplemented by follow-on MOA efforts and/or subsequent donor projects to further promote acceptance and adoption of the new systems. Widespread adoption of this new technology will ultimately lead Botswana towards self-sufficiency in grain production and increase small farmers' income.

C. Summary of Findings

An analysis of the various findings in Parts III and IV herein confirm that the project is ready for implementation. Findings showed that:

1. The dry land farming systems being developed by a U. K. - funded team are technically sound and will have few, if any, negative effects on the environment.
2. Several sociological constraints still exist in the systems but do not appear to be insurmountable. MOA has a full time Rural Sociologist and the project design included consultants in Rural Sociology to help devise methods to overcome these constraints.
3. The technical design and cost estimates are reasonable and adequately planned.
4. Marketing problems stemming from South Africa's cereal policies are being alleviated through activities of the recently created Botswana Agricultural Marketing Board (BAMB).
5. Acceptance of the new cropping systems, even at their current stage of development, can substantially increase small farmers' output and income.
6. The Government of Botswana is strongly committed to the success of the project and to increasing cereal production.
7. The recent reorganization of the MOA allows adequate flexibility among and between line and staff operations to plan and implement ~~programs.~~
8. Timing and funding of project activities are appropriately scheduled; and
9. Periodic evaluations and an independent review of the project during the fourth quarter of FY 1979 are planned to assess progress and

suggest possible revisions to the project design if felt necessary.

D. Project Development and Issues

At the request of the MOA (see Annex IV), OSARAC prepared a Project Identification Paper (PID) -- Crop Production and Marketing -- in January 1975. It proposed that USAID provide technicians to staff a newly-created Crop Division within the MOA; support a participant training program to reduce Botswana's dependence upon expatriate donor-supported staff; assist the newly-created Botswana Agricultural Marketing Board; and continue support of the cereal variety screening activity.

In April 1975 a Project Review Paper (PRP) was prepared. Its findings built largely upon the PID but stressed extension of a bare-fallow cropping technology. This dry land farming system (see Part III); developed in 1970-73 as a U. K. -funded project, was widely promoted by the World Food Program (WFP) in 1973. Almost 1,700 farmers accepted the practice after being given a food allotment. As the scheme provided considerable extra output at no extra risks or out-of-pocket costs, it seemed acceptable as the center of focus for a crop production program. To determine how farmers were retaining the practice, the PRP advised that a follow-up farm survey be made. The PRP also recommended a participant training program, institutional development of the Crop Division, and assistance in building storage warehouses for BAMB. Both the PID and PRP recommended about the same level of AID support, somewhat less than two million dollars.

The PRP review in June-July 1975 endorsed the intent of the project -- to support crop promotion in Botswana -- but questioned the basic emphasis; i. e., is this an institution building or production activity? Issues also arose regarding suitability of technology and the need for U. S. technicians. These are addressed in the detailed description of the project below.

A project team arrived in Botswana in November 1975 comprised of the following members:

- ✓ Martin H. Billings, Agricultural Economist, REDSO/EA
- Robert C. Fickett, Agronomist, Purdue University
- ✓ Allan Sheppard, Cereal Technologist, University of California
- ✓ Jerry Oweis, Agricultural Economist, AID/W
- ✓ Peter Weisel, Rural Sociologist, AID-Funded Contractor
- ✓ Forrest Duncan, Economist, REDSO/EA

The project which emerged varied in emphasis from that envisaged in the

FRP. A survey to determine the acceptability of the bare-fallow technology was undertaken as part of the team's research. Although not conclusive, the findings strongly argued that early emphasis on diffusion of the system was premature; that additional research, trials and demonstrations were needed; and that early creation of a strong Crop Division was a vital prerequisite to any long-term production program.

Field findings argued for a project developed within a deliberate time frame. Activities would include institutional development, intensive participant training, and continued field trials as initial and immediate steps followed by field testing of technology and communication methodology. Only at a later date, and possibly post-project, could diffusion begin on an extensive scale.

A five-year project is recommended; a four-year period of intensive development, with the last year being a changeover period when participants return and begin to assume operational responsibility of the Crop Division. The team and the GOB prepared the following project.

## II. Project Background and Detailed Description

### A. Background

#### 1. Crop Development

Although a food deficient country, Botswana has the potential for cereal self-sufficiency in all but the most extreme dry years. The Government is now taking steps to realize this potential.

To accomplish this task several tools are needed, including:

- More productive and reliable dry land farming systems acceptable to small farmers;
- Extension personnel trained in improved cropping practices;
- An organization to support cereal marketing, storage and prices;
- Trained staff to fill crop-related posts in the MOA; and
- An institution capable of combining all of these tasks as part of a long-term crop production program.

a. Crop Research

Dry land crop system research has been underway since the late 1960's, supported by Great Britain. By the end of the first project period, 1973, some very promising cropping practices had been adapted to Botswana conditions; in particular, a post harvest bare-fallow and early plowing system to conserve moisture and scarce animal draught power. The British are continuing work, presently through a farm equipment improvement project stressing animal equipment, a follow-on crop study, and a local demonstration scheme in southern Botswana. A Canadian voluntary agency is also developing improved animal traction equipment. All these projects will continue to the end of the decade.

At present USAID involvement is limited. The Agency has funded for and will support a crop screening specialist through 1978. Too, the Agency is supporting BSC degree training for two agronomists in the U. S. These will return to Botswana by 1979.

b. Extension Personnel

Botswana is unusual among African countries in the possession of a large extension network, the farmer-agent ratio being one of the lowest, 200:1. However, extension workers now largely focus on live-stock programs and have comparatively little to do regarding cereal improvement.

c. Botswana Agricultural Marketing Board (BAMB)

In 1974-75 the first steps were taken towards a national cereal marketing and storage system with the creation of the Botswana Agricultural Marketing Board (BAMB). This organization is assembling a staff, has begun grain purchases, and is recommending marketing and storage policies. However, it is critically short of storage capacity. The UNDP provides its director.

d. Staff

The MOA trains agriculture workers through the Botswana Agriculture College (BAC). However, trained personnel above the junior grades are extremely scarce. As a consequence, as much as 90% of the MOA's senior staff positions are filled by expatriates. To localize middle and high level technical positions, an extensive training program is needed. Strong USAID support for participant training is seen by MOA as the only 'window' open to them in this regard.

e. Crop Division

All these efforts, important in themselves, remain undirected by any central body responsible for long-term crop program development. The GOB has recognized the need. In 1975 it reorganized the MOA along more functional lines away from the rigid and technically divided system common in many countries. In addition, and for the first time, a Crop Division was established. USAID has been asked to help staff this division and develop crop production programs.

2. Need for Assistance

a. Domestic Resources

Although well-endowed with largely untapped minerals and a well-established cattle industry, Botswana remains a very poor country. Public revenues have suffered in recent months due to (1) a recent deterioration in the country's customs revenue base, and (2) setbacks in the rate of mineral exploitation (see Economic Analysis, Part II). No money is now available or will likely become available for the next few years to support an ambitious cereal production program; nothing will be possible in this regard without donor assistance on a rather generous scale.

b. Eligibility

Botswana qualifies for USAID support based on the criteria established by congressional guidelines. It is food-poor, but has potential. Its public policy regarding development stresses social justice. Although the population is not large by world standards, its density is high given the extent of arable land (650,000 people on 165,000 hectares, or 4% of the total land -- 30 persons per Km<sup>2</sup>). Moreover, this population is growing at about 3% annually. Per capita incomes are low, about \$225. Most of the 65,000 farm families live under subsistence conditions on very marginal land under the constant threat of drought -- a single bad year can drastically reduce production and exhaust reserve supplies.

Botswana has approached the United States (see Annex IV) to support its efforts to improve the MOA's capacity to plan, manage, and improve crop production programs and minimize the risk of crop failure. The project outlined herein will complement and support on-going and prospective GOB and donor activities in this area.

B. Project Description

### 1. Goal

The long-term goal of the GOB is to develop a crop system, with particular emphasis on cereals, primarily sorghum, that will be more productive per unit of input and minimize risks. The system will be one accessible to resource-poor farmers and one they will be able to adopt. The institution needed to continue and direct crop development along these lines will exist as a result of this project. Assuming government continues its emphasis on cereal production and promotes economic policy to encourage crop production and marketing, conditions will permit the extension of new technologies to all arable areas within Botswana. Continued donor support will be needed to promote adaptive research and rapid diffusion of improved technology.

### 2. Purpose

The purpose of the project is to increase the capability of the GOB, MOA to develop and expand crop research activities and crop production programs, and to increase the capacity of the BAMB to store and market grains (with particular emphasis on major cereals - e.g. sorghum and millet). Achievement of these targets will require the following outputs.

### 3. End of Project Status and Outputs

#### a. Crop Division

By the end of 1981, Botswana will have specific crop programs suitable for small farmers and will have the institutional capacity to identify and react to opportunities in dry land crop development. This Crop Division will have the following responsibilities:

- 1) Recommend (a) policies and programs related to crop production; (b) crop-related experiments, studies, and analyses; and (c) policies and programs in support of Botswana's needs for seed multiplication activities;
- 2) Prepare and implement a long-term crop development plan;
- 3) Coordinate and provide liaison with other donor-funded activities related to crops, the Agricultural Research and Field Services Divisions, BAMB, and international crop research institutions;

- 4) Assemble the necessary staff from the Ministry as a task force -- to address particular problems and design and support execution of projects;
- 5) Support the training of field staff in crop production operations; and
- 6) Evaluate crop-related activities.

Technical job descriptions of the Chief Crop Improvement Officer (CCIO), Crop Program Officer (CPO), and Crop Screening Officer (CSO) are included as Annex V.

b. Crop Research Base

Botswana will have a substantial research base, proven in trials and demonstrations in many parts of the country, on which to build a national cereal and crop program. This technology will be institutionalized into extension training.

c. Trained Technicians

A basic core of trained technicians will be assigned to crop-related positions in the MOA. Although expatriates may continue to fill senior posts after the project ends, this nucleus of trained local technicians will eventually staff all positions.

d. Five 1,000-ton capacity grain storage warehouses will be constructed in the most heavily populated rural areas. Consultants provided in this project will work with the BAMB to develop a crop storage and marketing program suitable for small farmers, and will evaluate this program at the end of the project. Personnel completing a USAID-supported, in-country training program in storage management will be managing these facilities. This additional storage capacity will assist BAMB in its efforts to stabilize grain prices. But, more important, it will provide the marketing incentives needed to encourage small farmers to accept new cropping practices and increase production.

Attainment of the above outputs will require good managerial control of the inputs outlined below:

4. Inputs

- a. USAID will contribute the following (FY 76 - FY 80):  
(000 US\$)
- |  |         |
|--|---------|
| 1) Technical Assistance<br>(See Chart I) | \$1,041 |
|--|---------|

|    |  |       |                |
|----|--|-------|----------------|
| 2) | Participant Training<br>(See Chart-II) |       | \$ 222         |
| 3) | Commodities                            |       | 138            |
| a) | Four Vehicles                          | \$40  |                |
| b) | Training Supplies<br>and Equipment     | \$35  |                |
| c) | Research and<br>Laboratory Equipment   | \$25  |                |
| d) | Office Supplies and<br>Equipment       | \$20  |                |
| e) | Contingency                            | \$18  |                |
| 4) | Other Costs                            |       | \$ 341         |
| a) | Housing for three<br>families          | \$ 72 |                |
| b) | Crop Research<br>Workshop              | \$ 15 |                |
| c) | Storage Warehouses<br>(5)              | \$120 |                |
| d) | Inflation Factor                       | \$ 20 |                |
| e) | Budget Support (Crop<br>Division)      | \$ 80 |                |
| f) | Contingency                            | \$ 34 |                |
|    | Total                                  |       | <u>\$1,742</u> |

In direct support to this project the GOB will provide (FY 76-80):

|    |   |                |
|----|---|----------------|
| 1) | General Services Support                    | \$ 151         |
| 2) | Agricultural Research<br>Division Support   | 124            |
| 3) | Agricultural Extension<br>Service Support * | <u>1,442</u>   |
|    | Total                                       | <u>\$1,717</u> |

Although not a joint project with the U. K. and/or the UNDP, the objectives and goals of their crop-related projects are the same or similar to those of this project. Therefore, their inputs are included below to reflect all resources available to the GOB in crop production activities.

The United Kingdom is sponsoring three major crop

\* This figure represents that proportion (10%) of the projected budget for all agricultural extension service support (i.e. both livestock and crop service) which will be directed to crop-related extension service.

research projects as follows during approximately the same period:

|    |   |                |
|----|---|----------------|
| 1) | Dry Land Farming Research                       | \$ 283         |
| 2) | Evaluation of Farming Systems<br>and Implements | 183            |
| 3) | Integrated Farming Pilot Project                | <u>920</u>     |
|    | Total   | <u>\$1,386</u> |

The United Nations will fund the salaries  
of BAMB personnel, \$ 82

A more detailed description of the above inputs is included  
in the "Explanatory Notes" to Annex VI. Project papers describing the U. K.  
programs are also available.

Table I  
TECHNICAL SERVICES TIME PHASING<sup>1/</sup>  
Botswana Crop Production Project  
(000 US\$)

| U. S. Specialists                             | U. S. FISCAL YEARS |         |       |      |      | Staff<br>Months   |
|---|--------------------|---------|-------|------|------|-------------------|
|   | 1976               | 1977    | 1978  | 1979 | 1980 |                   |
| Chief Crop<br>Improvement Officer             |                    | ←-----→ |       |      |      | 42                |
| Crop Program Officer                          |                    | ←-----→ |       |      |      | 36                |
| Crop Screening<br>Officer <sup>2/</sup>       |                    | ←-----→ |       |      |      | 24                |
| Consultancies <sup>3/</sup><br>(Staff-Months) | ---                | ( 10)   | ( 10) | ( 9) | ( 8) | 37                |
| Total Staff-Months                            | ---                | 16      | 34    | 45   | 44   | 139 <sup>4/</sup> |
| Obligations                                   | 138                | 242     | 602   | 59   | ---  | \$1,041           |

Notes:

1/ Prepared February 1976 by OSARAC/REDSO staff.

2/ ----- Provided by Southern Africa Development Personnel and Training Project (SADPT).

3/ For farm management studies, social science research, studies to establish baseline data, agronomic research and evaluations.

4/ 139 S/M = Approx. 11.6 man-years.

Table II  
Participant Training Schedule<sup>1/</sup>  
 Botswana Crop Production Project  
 (000 US\$)

U. S. Degree Participants

| US FISCAL YEAR   | 1976             | 1977               | 1978 | 1979 | 1980 | 1981 | TOTALS  |
|--|------------------|--------------------|------|------|------|------|---------|
| Departures   |                  |                    |      |      |      |      |         |
| Agronomy   | No. Participants |                    | (2)  |      | 2/   |      |         |
| Agronomy   | 2                |                    |      | (2)  |      |      |         |
| Farm Management  | 3                |                    |      | (3)  |      |      |         |
| Extension  | 2                |                    |      | (2)  |      |      |         |
| Returned Participants (Cumulative)                             |                  |                    |      | 2    | 9    |      | 9       |
| Study-Months (Excluding SADPT)                                 |                  | 21                 | 84   | 84   | 63   |      | 252     |
| Funding Obligations (\$10,000 1st Year,<br>\$ 8,000 following) | \$10             | \$68 <sup>2/</sup> | \$56 | \$48 |      |      | \$182.0 |

13.

<sup>1/</sup> Prepared February 1976 by OSARAC/REDSO staff.

<sup>2/</sup> Two three-year agronomy participants (1976 departure) funded by SADPT project.

Table II Continued

U. S. /Third Country Diplomate Participants

| US FISCAL YEAR                            |                         | 1976 | 1977               | 1978 | 1979 | 1980 | 1981 | TOTALS  |
|---|-------------------------|------|--------------------|------|------|------|------|---------|
| <u>Departures</u>                         | <u>No. Participants</u> |      |                    |      |      |      |      |         |
| Agronomy                                  | 2                       |      |                    | (2)  |      |      |      |         |
| Post Harvest                              | 2                       |      |                    |      | (2)  |      |      |         |
| <u>Returned Participants (Cumulative)</u> |                         |      |                    |      | 2    | 4    |      | 4       |
| <u>Study Months</u>                       |                         |      | 24                 | 48   | 24   |      |      | 96      |
| <u>Funding Obligations (\$5,000/Year)</u> |                         |      | \$10               | \$20 | \$10 |      |      | \$ 40   |
| <u>TOTAL FUNDING PARTICIPANTS</u>         |                         | \$10 | \$78 <sup>1/</sup> | \$76 | \$58 |      |      | \$222.0 |

14.

<sup>1/</sup> Total FY 77 obligations of \$78,000 for training differs from the figure of \$88,000 presented in the CP. The former figure is the correct one and the additional \$10,000 will be forward funded to FY 78, the appropriate year.

## 5. Assumptions

At the input to output level uncontrollable factors are relatively few. Achievement of outputs is largely a matter of good managerial control of inputs, namely insuring that the GOB, contractors, suppliers and shippers make inputs available on time as required. Beyond this level, the ability of project management to predict and control events diminishes and external factors become more important. Among the assumptions listed in the Logical Matrix Framework (Annex II), the following may be singled out as being particularly critical to project success:

### a. GOB Support

GOB support of the Crop Division and its programs in terms of funding and personnel support will be essential. This applies both during the project and after it ends.

### b. MOA Coordination

Inter-MOA coordination and successful employment of the inter-disciplinary tasks force concept will be required for effective planning and implementation of crop programs.

### c. Other Donor Support

Continuation of the crop research projects funded by the U.K. will be a critical factor towards developing a more productive and reliable dry land crop system acceptable to small farmers.

### d. Economic Incentives

Cereal price and market policies designed to provide realistic incentives will be vital to promoting acceptance of the new crop systems and increased production.

## C. Phasing of Inputs and Linkages

The phasing of project outputs in juxtaposition with one another is examined in Part IV (Planned Performance Track analysis). Here each will be examined separately.

### 1. Crop Division

The fundamental output of the project will be an institution, the Crop Division. This unit will provide intra-MOA linkages and, using

these, produce a long-term crop development program. The AID-supported core of the division, the CCIO and CPO, will arrive at post ten-twelve months after the letting of the contract. At the time of their arrival, housing will have been completed, four vehicles will have arrived, and the first deliveries of other supplies and equipment will have been made.

## 2. Work Plans and Evaluations

The CCIO will prepare a long-term work plan for the project and see that yearly work plans are prepared by each officer. The long-term plan will embrace all activities of the division and related research staff. It will include the work of the CPQ and CSO as well as the progress and plans of other donor-funded, crop-related projects.

Technical, social, and economic evaluations required in preparing the work plans will be performed annually by consultants and MOA technical services at the CCIO's request. The first of these will be in May, 1978. This evaluation and its conclusions will become an input to the next annual division program and plan of work. The process will be repeated again the following crop year, 1978-79, when a similar evaluation will be undertaken. At the end of the third crop year, a long-term plan will be completed in which specific courses of action and policy recommendations will be made.

## 3. Research

The CCIO should arrive at post five months prior to crop year 1977-78. This will afford ample time to coordinate with the Research Division in their preparation of varietal research. Research performed in previous years will be a base on which to build.

The number and variety of farm level demonstrations will increase, year to year, utilizing both crop developments and findings from other crop production activities. By the end of the second crop year, demonstrations will have been completed, embracing most, if not all, of the arable portions of Botswana. The CSO, in cooperation with the Research Division, will have tested upwards of a hundred varieties of sorghum. In addition, the division is expected to have completed additional trials of millet and pulses. The program of the Research Division is expected to include an analysis of all factors of production in addition to those noted above.

## 4. Extension

The CPO will be involved with the various projects, trials, etc., from which extension training programs and materials will be prepared.

Beginning in crop year 1977-78, these materials will be used on a pilot basis to test both demonstration methods and acceptability at the farmer level. By the end of crop year 1978-79, the CFO will have an experience base from which training systems can be devised which are sensitive to the problems of rural acceptance. Large-scale training of extension cadre will begin in crop year 1979-1980.

#### 5. Participant Training

In 1976, two Botswana crop technicians will be sent to the United States for three years' professional training in technical agriculture. These will be funded under a separate AID-financed activity (SADPT). These trainees will return in mid-1979. Employment of these technicians in crop screening activity will permit the CSO to undertake a more ambitious program of trials and demonstrations.

Seven additional three-year participants will depart in 1977 and will return in 1980. They will engage in area-wide, large-scale demonstrations as extension workers or fill other crop-related posts in the MOA.

In 1977 two two-year trainees will be sent for training in technical agriculture to African institutions. They will return in 1979. Two additional trainees will be sent in 1978.

Thus, by the end of 1981, nine three-year participants and four two-year participants will be trained in various subject areas of technical agriculture related to crop production.

#### 6. Grain Storage Warehouses

Funds will be provided to assist BAMB in the construction of five grain storage facilities of 1,000-ton capacity and in-country training of storage managers. Two storage units will be completed by September 1977 and the remaining three by July 1978. An in-country training program will be conducted in 1977 prior to completion of the first two AID-financed facilities.

#### 7. Local Costs

The Crop Division will have an annual AID-supported budget for three years in support of operational needs. In addition, funds are provided for support of selected research activities, principally sorghum. Budget for the utilization of these funds will be included in the Project Agreement.

## II. Project Analyses

The following analyses were done in accordance with the requirements of AID Handbook 3. Though all are not directly pertinent to the institution-building nature of this project, they do provide justification for the longer time goal this and other crop production activities address.

### A. Social Analysis

The following analysis focuses upon two general areas of concern, the acceptability of the new technology and the intended beneficiaries. Part I looks at

- the traditional methods of sorghum production among small farmers in Botswana;
- the behavioral changes necessary if farmers are to adopt a proposed new technology;
- possible constraints or problems faced by farmers in adopting the new techniques; and
- suggestions for the design of a crop production program that will minimize these constraints.

The second section

- identifies the intended beneficiaries;
- discusses the role of women;
- explains why this group was selected and how and when they are expected to benefit from the project;
- describes the beneficiaries' participation in the project; and
- makes a final judgment as to whether there are any social impediments which may endanger the success of the project.

### 1. Traditional/Proposed Techniques of Sorghum Production

#### a. Technology Presently Used and its Rationale

Sorghum is the principal food crop grown in Botswana. The technology for its production, as is the case with staple food crops throughout much of the world, has evolved over considerable time and has been well adapted to the resource base available to the large number of Botswana farmers who are producing not far above subsistence. The traditional technology used by most can be summarized as follows: farmers move from their homes in the villages to their farms (referred to as "the lands" and often a number of miles from the villages) after the spring rains have begun -- normally in October/November -- to begin plowing. Seedbed preparation is accomplished with the use of mould-board plows pulled by draught animals (primarily oxen) and can begin only after the ground, hardened through the cold winter, is softened by the spring rains. Plowing and planting are generally done as one operation: seeds are broadcast and plowed under; considerably less than 50% of the farmers have access to a planter. Weeds, grown high during the period from the previous harvest, are likewise plowed under. Land is a relatively abundant resource and is plowed extensively. The amount plowed is determined by the constraints of labor and draught power, and in drought periods by the amount of land sufficiently softened by the rains to allow plowing. Weeding is done by hand largely by women, and is carried on throughout the growing period. Because extensive areas of land are plowed, labor for weeding is generally a constraint, resulting in perhaps only one weeding of the entire planted area during the growing season. Harvesting is done by hand between May-July. After harvest farmers commonly return to their villages for the winter.

This system, as noted above, is well adapted to the resource base available to farmers and is aimed at minimizing risks to ensure subsistence and meeting necessary social obligations. The primary constraints faced by most are a shortage of labor, shortage of draught power, and extreme variability of rainfall. The technology described above, in effect, maximizes the return from these scarce resources. Extensive land cultivation ensures some return regardless of how clean the fields are kept. In effect, the choice is made to utilize draught power to its fullest (and so extensive plowing), to guarantee a minimum level of output as opposed to plowing smaller areas, and expending a greater effort on the exceedingly arduous task of weeding by hand.<sup>1/</sup>

At the same time, the historical division of labor between male and female influences the choice of technology used.<sup>2/</sup> Men are responsible

1/ Weeding by hand can be thought of as a high labor cost element in the sense that it is exceedingly strenuous work and expensive as to time. The choice to plow extensive areas of land in preference to weeding reflects a decision to minimize the use of this high cost input.

2/ A detailed breakdown of time spent by men and women in the various crop production activities is given in C. A. Bond, Women's Involvement in Agriculture in Botswana, November, 1974.

for land preparation and women for weeding, bird watching, and harvesting; while men may help with some weeding, relative to women their input is small. By extensive land preparation maximum use is made of male labor, and at the same time women work throughout the growing period to keep the lands as clean as possible. Because weeding is slow and strenuous, a farmer's lands are, in fact, rarely kept clean. The system used, far from being inefficient, is the least cost -- in terms of the effort expended -- in order to ensure enough output for subsistence.

In order to make optimal use of the shortage of draught power, a complex system of borrowing and hiring oxen has evolved over time.<sup>3/</sup>

As has been noted elsewhere, upwards of 30% of all farmers have no oxen and probably 50% have insufficient oxen to meet the needs of the technology used (though these percentages are lower when all draught animals are taken into account, e. g., donkeys). This constraint is met within family groups by oxen sharing, often with no reciprocal obligation on the part of the borrower. In addition, a system of long term lending of cattle (mafisa) has developed which entails lending cattle for long periods with defined responsibilities on the part of both the borrower and lender. Commonly the borrower has the use of the cattle for plowing (oxen) as a source of milk, and is entitled to a certain number of calves. The lender, on the other hand, benefits in that others are responsible to graze and tend his cattle. Finally, various arrangements of working on another person's farm in exchange for the use of his oxen and hiring oxen for cash are found.

b. Proposed New Technology and Behavioral Changes Necessary for Farmer Adoption

During the past several years the Ministry of Agriculture of the GOB has been involved in research on an improved system of sorghum production. The system being tested is aimed at substantially increasing sorghum yields; the results to date, though inconclusive, are promising.

In order to determine whether the proposed system might be adopted by low income farmers, it is necessary to examine how ~~it differs~~ from the technology currently being used, i. e. what changes farmers would have to make in order to adopt the new technology.

3/ For a useful discussion of these sharing arrangements which emphasizes their complexity, see Donald Curtis, "Social Organization of Ploughing," Botswana Notes and Records, June, 1972.

The proposed technology is based upon a system of winter fallow and crop rotation. Its elements and presumed benefits can be listed as follows:

- |                  |  |   |
|------------------|--|---|
| 1) Crop Rotation | Divide the land into four equal parts for a planned rotation of four years including a bare fallow, e. g., fallow, sorghum, cowpeas, millet. | Reduction of pest and disease problems. Flexibility in time of plowing, spread of labor demand. |
| 2) Plowing       | Autumn plowing (June-July) using mould-board, disc, or chisel plow.  | Weed control and retention of stored moisture through the winter.                               |
| 3) Planting      | Plant after first heavy rains in the spring (Oct. - Nov.) with planter directly into autumn plowed land. Plant in rows.                      | Early planting benefits from stored moisture. Minimum loss of moisture by plow/ planting.       |
| 4) Weeding       | Machine weed as soon as weeds are visible after autumn plowing. Weed series of times during growing season.                                  | Early and constant weeding to minimize weed competition for moisture.                           |
| 5) Thinning      | Reduce by hand, hand hoe, or cultivation to optimum plant population at 2-3 weeks after emergence.   | Plant population is significant determinant of yield.   |
| 6) Fertilizer    | Top dress with nitrogen.   | Nitrogen is also important determinant of yield.  |
| 7) Cultivation   | Break up smooth, compacted surfaces with cultivator, plow or hand hoe.   | Important for maximum infiltration of few heavy showers.  |
| 8) Harvest       | By hand.   |   |

This system differs from the present one in that it would require farmers to:

- 1) Follow a pattern of crop rotation which has been previously unknown;
- 2) Move the time of plowing from the spring to autumn;
- 3) Plant in rows, a practice presently followed by only a small percentage of farmers;
- 4) Expend more labor time on weeding, though with machine weeding the work would be decidedly less arduous; likewise, more labor time would be required for thinning and harvesting (assuming greater yields per hectare and so an increased labor requirement);
- 5) The acquisition and use of equipment and fertilizer which farmers previously have not had available;
- 6) A considerably delayed return from the lands to the villages in that after harvest farmers would remain there most of the year;

These changes present certain problems in terms of farmer adoption though, as is stressed below, it is possible to minimize their severity.

c. Constraints to the Adoption of the Proposed System of Low Income Farmers

1) Labor Requirements - A study recently completed in the Kanye area<sup>1/</sup> southwest of Gaborone indicates that, if one assumes that the whole family is able to contribute labor, approximately 25% of the families in the area would be unable to meet the labor requirements of the new system from within the family. A more realistic projection would take account of the fact that most families have pre-school children or older adults who are unable to work, thus substantially increasing the percentage of

<sup>1/</sup> See "Information on the Pelotshetla Area". Sociology Unit, Ministry of Agriculture, Government of Botswana, 1973.

families who would be short of labor. When the total labor force of the area was compared with labor demand under the new system it was found that 17% of the families would have a labor shortage (this assumes that extensive labor hiring from outside the family would take place). There is no significant correlation between family size and income, and thus no reason to believe that poorer farmers would face a more severe labor constraint than those who are better off.

While the Kanye case can not be generalized to the entire country, it is sufficiently representative to give an indication of the magnitude of the problem faced.

2) Timing of the New System - Under present technology April-July is a high labor and oxen use time. Harvesting is being carried out and can extend into July. Oxen are being used to carry grain from and water to the lands (often long distances) for both human and animal consumption. The new system requires plowing and so greater use of both labor and oxen at the very time when they are presently fully utilized. In effect, the new technology would compound existing constraints. Unless time taken for harvesting can be reduced or harvesting dates moved back, it hardly seems possible for farmers to plow at the recommended time.

3) Draught Power - The constraint on oxen noted above is somewhat mitigated by the fact that the new system is, on balance, oxen saving in comparison to present technology. Autumn plowing requires fewer oxen due to the fact that the soil is much less compressed at that time than in the spring. In the Kanye case it is estimated that using present technology approximately 50% of the families have insufficient draught power; under the proposed system this would be decreased to 33%. The new technology thus primarily assists the poorer farmers, i. e., those who possess few cattle.

4) Oxen Sharing - As described earlier, there exists a complex system of oxen sharing, a system which has developed to help alleviate an oxen shortage. It is important that with the new technology this system or some modification of it be continued, for the poorer farmers will remain dependent upon the wealthier for draught power. From a sample of approximately 30 farmers interviewed in the course of this project review there were indications that farmers would resist lending oxen in the autumn (the proposed new plowing time); they fear a weakening of their oxen due to increased work just before the cold winter. If this should happen the poorer, cattleless farmers would suffer. Given the exceedingly high economic and social value placed upon cattle, this issue could become important.

5) Equipment - As a minimum the new technology requires a plow, hoe, and cart for carrying fertilizer to and crops from the lands. A more sophisticated variant requires a toolbar with improved plow, a planter, and a cultivator. In Kanye 75% of the farmers did not use a hoe or cultivator in 1975, and 58% did not have access to a cart.

6) Movement Between the Lands and the Villages Historically farmers have moved to the lands in the spring and returned to spend the winter in the village. The new technology requires, at the least, farmers to remain at the lands longer in the autumn and preferably to remain throughout the year in order to carry out all of the needed tasks related to crop production. In the Kanye study reasons given for returning to the village emphasized the lack of schools, clinics and shops at the lands, as well as various social obligations in the villages. Similar responses were given by the farmers interviewed for this project review. It seems clear that there are important reasons for farmers to leave the lands for a portion of the year.

7) Water Availability - The most important source of water at the lands is small, privately owned dams. In the autumn after harvest and throughout the winter this source is dry. To suggest autumn plowing or that farmers remain at the lands the entire year raises the serious problem of finding reliable sources of water. Unless this problem is addressed the new technology has little chance of being adopted.

8) Storage and Markets - Little sorghum is presently sold and there are clear indications that farmers aim at producing sufficient for their subsistence and little more (if substantial surpluses are grown in one year the following year farmers typically grow less -- they attempt to grow the amount needed for family consumption). If surplus sorghum is to be produced, a necessary condition is a reliable market (presently non-existent) and adequate storage.

9) Compression of Soil During Fallow - Autumn plowing and winter fallow require that cattle be kept off the plowed land during the winter to avoid compression of the soil. This requires fencing the land, something which only a small percentage of farmers presently do.

10) Risks of Adopting the Complete Technological Package - There is a trade-off between the level of risk assumed by a farmer in adopting the new technology and what he might receive in increased output. If a farmer were to make but one change in his present practices, e. g. change the date of plowing, he would minimize his risks but his possible increase in output would be relatively small. As he

adopts more of the proposed "package", i. e., additional equipment, the application of fertilizer, remaining on the lands the entire year, his risk increases as does his possible return. The types of problems summarized in items 1-9 above represent some of the risks which the farmer will have to assume if he uses the new technology. For any hope of large numbers of low income farmers adopting it, these problems -- risks -- must be minimized.

d. Suggestions for Overcoming Potential Problems

1) Labor - The demand for labor could be reduced by abandoning thinning altogether. Such would be possible and a reasonable plant population still maintained if a simple planter could be devised (several simplified planting devices are presently being tested by the MOA -- using tubes through which seeds are dropped, using empty beer cans). Likewise, alternative methods of weeding which fall short of using high cost cultivators could reduce labor time needed in this operation, e. g., utilizing a small blade attached to the plow. Simple, low risk alternatives are necessary if low income farmers are to be reached.

2) Timing of the System - If a farmer were to autumn plow only a small part of his lands the first year, a bit more the second, etc., it would be possible to minimize the increased demand for his labor at that time. Each year, as the land area he plows in June and July increases, the area requiring harvesting labor at that time decreases. Therefore, the change in the plowing-harvesting pattern can be made without creating excessive strains on labor and oxen.

3) Oxen Sharing and Water Availability - If farmers had some assurance that their cattle would remain strong during autumn plowing the risk of lending would be reduced. One principal factor related to this is provision of adequate water. Likewise, the availability of water is necessary (though likely not sufficient) requirement to encourage farmers to remain on their lands later into the autumn than has historically been the case. Borehole drilling should be a component of a program to encourage changes in dry land farming practices.

4) Equipment - The greater the degree of sophistication of equipment introduced and the higher the investment required, the greater are the risks that farmers will be required to take. If large numbers of small farmers are to adopt the technology simple, low cost changes in current equipment need to be the focus, e. g., simple planting devices and a blade attachment to the plow for weeding (as suggested above).

5) Movement Between the Lands and Villages - In

the Kanye study 20% of the respondents gave lack of physical facilities as a major reason for not remaining on the lands throughout the year. Again, provision of such facilities would not be sufficient to keep a high percentage on the lands, but it is likely a necessary condition. Social obligations would still exist in the villages, but as more and more stayed on the lands over time such obligations may well be fulfilled without returning to the villages. The MOA is examining what would be feasible re developing a greater infrastructure, e. g. service centers, in the lands areas.

6) Storage and Markets - The extension of on-farm storage technology will be part of the proposed AID-assisted project. A cereal marketing board, largely latent to date, is receiving considerable pressure to establish stores and buying agents throughout the country. Continued pressure, along with assistance in storage construction, is necessary.

7) Compression of Soil During Fallow - Fencing is essential for the winter fallow system to be effective. Low cost fencing using local materials (as is currently done by some) must be one component of the new technology.

8) Minimizing Risk - If risk is to be minimized the components of the proposed technology need to be adapted to the local environment -- social and economic -- of the farmer. A systematic attempt to do this is being carried out through the Integrated Farming Pilot Project of the MOA. Soon this project will test alternative technologies for dry land farming among 387 farm families in an area just south of Gaborone.

To summarize, there remain several constraints which must be dealt with before the new crop systems are fully acceptable to small farmers. Over the next few years, research and experimental efforts will continue to address these. Some suggestions for overcoming them are already given above, and it is felt that by the end of the project period, adequate solutions will have been found for each. They are not insurmountable; and the Crop Division will play a significant role in guiding and coordinating activities to overcome them.

## 2. Beneficiaries

### a. Characteristics

The intended beneficiaries that will ultimately be affected by this project are Botswana's resource-poor small farmers who toil against formidable odds each year to satisfy their subsistence needs.

Ninety percent of the rural population in Botswana live in the rural sector and farm holdings number about 65,000, ninety percent of which have less than 10 hectares of land. This land is very arid and is subjected to drought an average of seven years out of ten. Due to these Sahelian conditions, it is estimated that no more than 30% of the country's farms are able to satisfy subsistence needs in a typical year.

Cattle ownership is another significant characteristic of the target group. The traditional cropping system requires a herd of at least 20 animals to provide sufficient traction to manage even 10 hectares of land given the soil conditions which prevail at the present plowing time. However, 30% of the land holders own no cattle and almost one-half of all holders have fewer than 10 animals. An agriculture survey in 1971/72 indicated that half of the farmers planting sorghum produced only 19% of the crop, and 90% of these farmers employed cattle-drawn plows.

b. Role of Women

Still another interesting characteristic of the intended beneficiaries is the fact that a large proportion are women. Women play an important role in a wide range of farm activities in Botswana. As described above, they are responsible for carrying out many of the cropping operations. In a recent sample of over 2,000 households in rural areas, it was found that 42% of these had no resident male head of family (27% were headed by widows or spinsters, the balance were households where the male was away working).

c. Basis for Selection

This group of resource-poor farmers -- those with less than 10 hectares of land and less than the minimum number of cattle to provide necessary traction power -- has been selected as the intended beneficiaries not only because they represent that segment of the population the Congress has mandated we direct our assistance, but because it is a national objective of the GOB to promote social justice and reduce the widening gap between rural and urban incomes. By establishing a Crop Division which will ultimately develop a more productive crop system acceptable to the small farmer, these objectives will be met.

d. How and When Small Farmers Will Benefit

The extent to which small farmers can benefit from the technology being developed is indicated in the farm budget discussion of the Economic Analysis. It is likely that these benefits will not begin until towards the end of the project period and beyond. This is due to the

fact that the project is essentially an institution-building one with the ultimate goal -- development of a more productive crop system acceptable to small farmers -- being reached in the third or fourth year. Thereafter the rate of spread effect will be largely influenced by the efforts of the extension personnel. When farmers become aware of the ease with which the new technology can be adopted, and the fact that no major extra costs are involved, the rate of spread will accelerate.

e. Beneficiary Participation in Project Formulation

The target group has been actively involved in the formulation of the project. Interviews with farmers participating in the Food for Farming experiment discussed above revealed that constraints still exist in the new technology being developed by the U. K. team (see Part I). These findings, in fact, suggest that early emphasis on diffusion of the system was premature and led the project design team to recast the project as basically an institution-building one. Periodical interviewing and surveying of the intended beneficiaries will be an integral feature of the project to insure that the crop system being developed will meet the small farmer's needs.

3. Conclusions

It may be concluded from the above analysis that the intended beneficiaries will utilize and benefit from the project without undue difficulty. Again, constraints have been identified but it is felt that solutions are available to overcome or minimize them.

The beneficiaries' awareness of the need for change is evidenced by their participation in earlier trials of the systems and their valuable evaluations of the same. The participation of 387 farm families in the Integrated Farming Pilot Project mentioned above attests to their continuing interests.

The question of whether project outputs will lead to the project's twofold purpose as a result of an initial positive social impact is awkward to answer. Because of the institution-building nature of the project, there will not be a direct social impact on the ultimate beneficiaries. However, since support of the U. K. team's crop research is a subordinate purpose, and development and acceptance of improved crop systems is the project goal, consideration must be given to the social impact these new systems will have.

As discussed above, trial systems have been introduced

and consequently have already had an "initial impact". A follow-up survey on this impact by the design team's rural sociologist indicated that a strong emphasis on extending the current systems was premature and needed further development. For this reason the project is primarily an institution-building one while at the same time continuing efforts are being made to enhance the acceptability of the new systems.

Therefore, in terms of the institutional aspect of the project there will be no social impact. But in terms of the project's secondary purpose and goal, the output will overcome and minimize those constraints already identified. Through demonstrations, and spread effects, a positive impact will be made and both the purpose and ultimate goal will be accomplished.

## B. Technical Analysis

### 1. Technology

The Social Analysis provides a description of the traditional cropping system, problems associated with it, and suggestions to minimize them. Efforts of the U. K. Research Team to develop an improved dry land farming technology are described in the background section of Part II. These efforts will be complemented by the Crop Division primarily through the Crop Screening Officer. Another area in which the division will have a significant technical input is the post harvest technology. Consultants will (1) assist in extending an on-farm storage technology devised earlier by a British storage specialist and (2) participate in the development of an appropriate milling technology for Botswana.

A summary of the findings and proposals of the project design team's agronomist are presented below. The cereal technician's findings regarding storage and milling are then discussed. The analysis concludes with an appraisal of the suitability of the technology, a technical cost design analysis, and an environmental impact statement.

### 2. Agronomist's Findings and Recommendations

#### a. Major Crops

Except for maize meal found in the cities, sorghum is the primary food cereal in most of the country. It also plays an important role in the local production of beer (home brew). The second most important crop, maize, is largely grown in the southeast corner of Botswana where rainfall is most favorable. Millet is also raised but primarily in the drier northeast region where it is the preferred staple cereal. The major pulse or edible legume crop is cowpeas. They are an important component of the diet and represent a small but significant cash crop for small farmers.

#### b. Natural Constraints

1) Drought - The primary natural constraint to crop production in Botswana is drought. Average yields of the major cereals have been low in good years, 400 Kg. /ha. and far less or down to 50 Kg. /ha. in bad years. Crop production totals also have a wide range of almost tenfold from dry to wet years. An analysis of rainfall records for four major producing areas over the past 13 years indicates the following: (1) variations in rainfall from under 8 inches in bad years up to 40 inches in good, (2) length

of effective rainfall ranging from two months to seven months, and (3) gaps in the effective rainfall season varying from less than two weeks in some years to over a month in others.

2) Weeds - These consist of both broadleaf and grassy types and are devastating in the moisture loss they cause from the time of harvest on through until planting. Weed control experiments outside Gaborone show that yields of sorghum grain can be increased from 400 to 700 Kg./ha. simply through weed control after seeding.

3) Birds - The two worst species in Botswana are the Quelea and the Laughing Dove. These can be devastating on sorghum and millet crops in Botswana although maize is more resistant. This resistance has encouraged several farmers to grow more maize. However, in dry years the maize may die, and the relative drought-resistance of sorghum and millet becomes invaluable.

4) Insects - The yellow sorghum aphid is the worst sorghum pest, but the bollworm is also severe on sorghum as well as on millet, maize, and cowpea. The chilo stalk borer, sorghum midge, and maize aphid are other troublesome pests. Studies on the extent of field losses to each of these are necessary along with monitoring the populations of these and new pests.

5) Diseases - Diseases are less severe on the cereal crops in Botswana than in the more humid areas of the world. Nevertheless, the major crops should be observed for disease incidence and damage since the present situation may change.

6) Soil Fertility - Most soils are very deficient in phosphorus and nitrogen although potash is sufficient. Some phosphorus may be necessary to grow any crop but is certainly required for legumes. Legumes grown in rotation can help supply the nitrogen. A GOB extension and training publication entitled "Growing Crops in Botswana - New Methods of Dryland Farming" is highly recommended reading for findings regarding crop rotations as well as timeliness and waste of land and labor considerations.

#### c. Man-Induced Limitations -- Tillage and Seeding Methods

Because of the long dry season and hard soils, the farmer has traditionally waited until spring (November-December) to till and seed his field. By this time the soil is wet and the oxen have regained their strength. However, this waiting wastes much rain in the spring and increases the risk of immature crops when the rains cease in the fall (April-May).

In 1969 the British Dry Land Farming Research Team began research to develop the post harvest "system" described in the Social Analysis. The system is technically good and refinements are now being worked on in Phase II of the project. Experiments to date show yields of 3,415 Kg. /ha. for sorghum, 3,864 Kg. /ha. for maize, from zero to 5,040 Kg. /ha. for millet, and 1,368 Kg. /ha. for cowpea. Current estimates are that farm yields of 3,000 Kg. /ha. under better conditions and 1,500 Kg. /ha. under poor conditions are "feasible". These are potential yields when input factors are coordinated. The problem remains to get a practical economic level of inputs that farmers can and want to manage.

d. Proposals

In addition to the "system" or factors outlined by the Dry Land Farming Research Team, others are needed as follows:

- 1) Better seedling vigor to allow quicker and stronger emergence;
- 2) Better leaf canopy to shade out weed competition and reduce heat and evaporation;
- 3) Improved drought resistance per se and use/development of varieties with
  - a) More extensive and efficient root systems;
  - b) Waxy bloom on the leaves and stems;
  - c) Ability to close leaf openings on stomata and go dormant when moisture is deficient, and to recover and grow again when moisture is again supplied;
- 4) Soil fertility information other than the need for phosphorus and nitrogen is a missing element. Micro-nutrients such as zinc, sulphur, and others are needed on some soils but more investigations are needed;
- 5) Research officers should continue to be located in Gaborone but tests should be packaged, planned, and distributed to trained cooperators at other locations. After two or three years, big "splashy" demonstrations of varieties and systems that really work should be planned for each of the areas.

- 6) The labor involved in effective weeding has apparently stopped effective weed control to date. It is suggested that less land be worked, weeds be really controlled, and the land be kept fallow in between crops. The good stands produced through employing this work-saving technique should be effectively demonstrated.
- 7) Effective control and other programs must be introduced as fast as they become available to reduce the losses to birds.
- 8) The relative place of each crop should be constantly assessed and retested. Late plantings and drier years would appear definitely to put more priority on sorghum, millet, and cowpeas in that order as the season progresses.

### 3. Storage

The on-farm storage technology is already available and contained in a "Handbook of Crop Storage" prepared by a British grain specialist working in Botswana from 1968-70 under the auspices of the Freedom from Hunger program. The project design team's post-harvest specialist found the technology to be both sound and appropriate for the needs of the small farmers.

### 4. Milling

Development of an appropriate milling technology will play an important role in improving the marketing of sorghum in Botswana. Due to the availability, convenience, and low price of maize meal, consumption of sorghum has practically disappeared in the urban areas. However, 90% of the population still live in the rural sector where sorghum is the primary cereal and is milled in the traditional mortar and pestle manner. As urbanization and the marketing/distribution system improves, though, it becomes more important that an appropriate milling technology be developed to reverse or at least retard the trend towards maize meal consumption. The findings of the design team's cereal technician are discussed below.

Two distinct types of milling for sorghum may be considered for use in Botswana: high-extraction and refined product milling.

#### a. High-Extraction Milling

This method is simple and requires simple equipment.

Only the pericarp (fibrous outer tissues of the kernel) is removed in an abrasive mill and the decorticated kernel reduced to any desired particle size (flour, meal, etc.) in a hammer mill (alternates may be considered).

The product from high-extraction milling will not have a shelf life adequate for it to be used as a replacement for a refined product (such as sifted maize meal). However, a small scale milling operation serving a small area would not require such extended shelf life.

There are numerous advantages to high-extraction milling. As indicated from its name, the quantity of product will be greater, about 90% in contrast to perhaps 75% for a refined product. At the same time, the nutritional value of the product will be greater because all that is removed from the grain is the pericarp which is high in fibre. The germ and aleurone are retained on the kernel and milled into the flour. The germ contains fat, which increases the calories, and the protein of both the germ and aleurone are of higher quality than the balance of the grain. The higher yield and higher quality are important considerations toward increasing food supplies and combatting malnutrition.

As envisioned for Botswana, small local mills will be installed near strategic reserve storage facilities and serve a small local area so that a product of limited shelf life will suffice. The advantages of such dispersed small-scale milling are the short hauls to and from the mill and the reduction of packaging costs because delivery would be from bulk into the consumer's container. Production would be readily geared to demand.

The Director of the Botswana Agricultural Marketing Board (BAMB) has recently negotiated with the International Development Research Center (IDRC) to install and test simplified equipment for village-level milling at Fitsane. If an acceptable and marketable product is produced, the IDRC mill will serve as a prototype for the introduction of milling facilities at village locations.

Equipment recommended by IDRC includes a "Hill" abrasive disc mill and a "Micronizer" mill. This method requires a sorghum with flinty grain, preferably white. It can have a colored pericarp but it must not have an inner integument. Sorghums meeting these requirements are commonly grown in Botswana along with other types.

#### b. Refined Product Milling

To mill a flour or meal from sorghum similar to the maize product which is being sold in the urban areas, a more elaborate mill than that described above is required to assure a comparable product with

adequate shelf life. Due to the higher price of sorghum (see Economic Analysis), it does not seem feasible at this time to consider large scale milling of a refined sorghum product, packaged and distributed as maize meal is. Nevertheless, refined milling will be explored by IDRC when it begins its milling study, and should the situation change to bring price equality between sorghum and maize, or should the GOB decide it is in the interest of self-sufficiency, refined milling will certainly be considered.

#### 5. Appropriateness of Project/Technology

The basis for creating the Crop Division and supporting the Dryland Farming Technology is well established. Food self-sufficiency has become an aim of national policy in Botswana and the crop production project will be the government's major instrument to promote increased production.

The technology under development is well suited considering the environmental conditions that exist in Botswana. The findings of the design team's agronomist show that the dry land farming "system" being developed by the British is technically good. But in addition, other factors (see proposals above) are suggested that might be added to round out a more complete program. Successful experiments already undertaken by the U.K. team also attest to the appropriateness of the technology.

Finally, the suitability of the project is evidenced by the host government's support. The MOA has already established permanent positions for the division so that it will be maintained after the USAID technicians are gone.

#### 6. Implications of Technology

Employment effects and the suitability of the technology for use and replication/diffusion are treated in the Social Analysis.

#### 7. Environmental Examination

As the project at this stage is primarily an institution-building one, it does not constitute a major action significantly affecting the physical environment. But since the ultimate goal is to deliver an improved crop system, an analysis of the environmental implications associated with the technology being developed is in order.

It is felt that the new practices in crop production now envisioned will have few if any negative effects on the environment. If the new tillage methods are adopted, soil would be more resistant to both wind and water erosion. Pesticides will be procured in accordance with AID Pesticide Regulations.

## 8. Technical Cost/Design Analysis

### a. Technical Description

As described in Part I, the project is primarily an institution-building one designed to fill the key positions with MOA's recently created Crop Division. This unit will coordinate all crop-related activities so that an integrated general production program can be developed and implemented. The secondary purpose of the project is to support the continuing research efforts of the U.K. team to develop new dry land farming systems. These focus on variety screening and the testing and trials of varieties under different micro-environment conditions. USAID will also assist the Botswana Agricultural Marketing Board (BAMB) by financing the construction of storage facilities. Other important technical inputs by other donors include the extension of an on-farm storage technology devised under an earlier World Food Program project and the development of an appropriate milling technology for sorghum.

### b. Cost Estimate

The USAID-supported project described above is estimated at a total cost of \$1,742,000. An itemized breakdown of these costs and explanatory notes are presented in Annex VI, A.

### c. Technical Design

Considering the suitability of the project in terms of time and place (discussed above), and the goal and purposes for which it is devised, the technical design is felt to be reasonable and adequately planned. Likewise, the cost estimates have received vigorous examination and are considered reasonably firm.

### d. Facilities

A detailed review of the preliminary plans and cost data confirms that (1) planning is adequate to define the final product and (2) a reasonably firm estimate of the project costs under construction conditions in Botswana has been made. The project meets the requirements of Section 611(a) of the Foreign Assistance Act of 1961, as amended.

## 9. Summary Conclusion

The design team's findings concerning dry land farming, storage, and milling indicate that work done to date and that envisioned for the near future is technically sound. However, a number of areas were identified where more emphasis should be placed and the Crop Division will play an important role in addressing these.

### C. Financial Analysis and Plan

1. The purpose of this section is to determine the adequacy and firmness of the financial plan and the overall financial soundness of the ~~project~~. A summary of total project funding based on detailed cost estimates presented in Annex IV is shown below. The sources and uses of these funds are analyzed next (Table IV) and measured against project outputs (Table V). The section concludes with an assessment of the GOB capability to fund the Crop Division's recurrent expenditures after the project is scheduled to end.

#### 2. Funding Summary

Table III

Botswana Crop Production Activities  
FY 1976 - 80  
(000 US\$)

| <u>Donor</u> | <u>Foreign Exchange</u> | <u>Local Currency</u> | <u>Total</u>          | <u>Percent of Total</u> |
|--------------|-------------------------|-----------------------|-----------------------|-------------------------|
| USAID        | \$1,401                 | \$ 341                | \$1,742               | 35%                     |
| GOB          | --                      | 1,717                 | 1,717                 | 35%                     |
| */ UK        | 621                     | 765                   | 1,386                 | 28%                     |
| */ UN        | 82                      | --                    | 82                    | 2%                      |
| <b>TOTAL</b> | <b><u>\$2,104</u></b>   | <b><u>\$2,823</u></b> | <b><u>\$4,927</u></b> | <b><u>100%</u></b>      |

\* Although not a joint project with the U.K. and UNDP, the objectives and goals of their crop-related programs are the same as USAID's. For this reason, funding of their projects is considered in this section to present a total, more comprehensive analysis of all financial resources devoted to crop production activities.

#### 3. Cost Estimates

Detailed cost estimates broken down by donor type of financing are included as Annex VI, A. Accompanying explanatory notes show how these were derived. Other supporting documents are also available including house plans, a technical description of the storage warehouses, and project papers describing other donor crop-related programs.

#### 4. Sources and Uses of Funds

Table III indicates the relative significance of each major program element in terms of costs and who will be financing them. A column is also included to show the distribution of costs within the AID component itself. In both the AID portion and the total funding scheme, technical assistance represents about half of the inputs. Training (13%) follows as the next most significant element in the AID component, whereas general services (22%) is second in order of total financing. The latter is funded for the most part by the GOB and U. K. in support of the U. S. and U. K. projects respectively. Commodities, budget support, and assistance to the Marketing Board account for the balance of resources.

#### 5. AID Obligations and Expenditures by Fiscal Year

Annex VI, B, provides a "Financial Summary of AID Obligations by fiscal year". A similar presentation on an expenditure basis is included as Annex VI, C. Funding is timed to meet the sequence of events programmed in the Planned Performance Tracking Chart (Annex III). Except for the high level of obligations for technicians in FY 78, cost items are generally obligated on a declining scale reflecting the phasing out of AID inputs as GOB allocations increase to ultimately fully support the Crop Division.

#### 6. Costing of Project Outputs/Inputs

In Table V project outputs are measured against total inputs. The figures show that financial resources are properly allocated toward achieving the project purpose with 91% of total funding supporting the institution-building (53%) and research activities (38%) of the project.

#### 7. Adequacy and Assurance of Meeting Recurrent Cost

As noted in the Technical Analysis, the cost estimates shown in Annex VI, A, are felt to be reasonable and adequately planned. After AID's disbursements to the project are scheduled to end, the MOA will fully fund the division's activities. At that time major costs will be those for salaries, implementation of crop production programs, and general services.

The MOA has already begun to prepare for this responsibility. Although presently funded at only nominal rates, budgeted positions for the division's technicians have already been established. If acceptable to the GOB at the time the ProAg is prepared, it will be proposed that the GOB pay the basic salaries for these positions in FY 1977 and during project life. However, instead of such salaries being paid directly to the AID-supported staff, this local currency will be deposited into a Trust Fund.

Table IV

Summary Cost Estimate and Financial Plan<sup>1/</sup>  
 Botswana Crop Production Activities<sup>2/</sup>  
 (US\$ 000)

| SOURCE                            | AID Project |     |       |      | Host Country Cost to AID Project |       | UK/UN <sup>3/</sup> |     | Total |      |
|-----------------------------------|-------------|-----|-------|------|----------------------------------|-------|---------------------|-----|-------|------|
|                                   | FX          | LC  | Total | %    | FX                               | LC    | FX                  | LC  | \$    | %    |
| USE:                              |             |     |       |      |                                  |       |                     |     |       |      |
| A. Staff and Consultants          | 987         |     | 987   | 57%  |                                  | 763   | 404                 | 25  | 2,179 | 44%  |
| B. General Services Support       |             | 72  | 72    | 4%   |                                  | 515   | 477                 |     | 1,064 | 22%  |
| C. Commodities                    | 120         |     | 120   | 7%   |                                  |       | 207                 | 240 | 567   | 12%  |
| D. Budget Support (Crop Division) |             | 95  | 95    | 5%   |                                  | 240   |                     |     | 335   | 7%   |
| E. Training                       | 222         |     | 222   | 13%  |                                  | 62    |                     |     | 284   | 6%   |
| F. Market Board                   | 18          | 120 | 138   | 8%   |                                  |       | 82                  |     | 220   | 4%   |
| G. Inflation Factor               |             | 20  | 20    | 1%   |                                  | 137   |                     |     | 157   | 3%   |
| H. Contingency                    | 54          | 34  | 88    | 5%   |                                  |       | 10                  | 23  | 121   | 2%   |
| Total                             | 1,401       | 341 | 1,742 | 100% | --                               | 1,717 | 1,180               | 288 | 4,927 | 100% |

1/ Based on estimates prepared February 1976 by OSARAC/REDSO.

2/ Assistance noted is in overall support of Crop Production goals.

3/ All UK assistance except UN contribution of \$82 for Market Board.

Table V

Costing of Crop Production-Related Outputs/Inputs<sup>1/</sup>  
(In US\$ or equivalent)

| Project Inputs                | Project Outputs <sup>2/</sup> |                        |                     |                     | TOTAL                   |
|-------------------------------|-------------------------------|------------------------|---------------------|---------------------|-------------------------|
|                               | No. 1                         | No. 2                  | No. 3               | No. 4               |                         |
| AID Appropriated<br>(Percent) | 1,010<br>58%                  | 346<br>20%             | 222<br>13%          | 164<br>9%           | 1,742<br>100%           |
| Host Country<br>(Percent)     | 1,501<br>87%                  | 148<br>9%              | 68<br>4%            | --                  | 1,717<br>100%           |
| United Kingdom                | --                            | 1,386                  | --                  | --                  | 1,386                   |
| United Nations                | 82                            | --                     | --                  | --                  | 82                      |
| <b>TOTAL<br/>(Percent)</b>    | <b>2,593<br/>(53%)</b>        | <b>1,880<br/>(38%)</b> | <b>290<br/>(6%)</b> | <b>164<br/>(3%)</b> | <b>4,927<br/>(100%)</b> |

1/ Based on estimates prepared February 1976 by OSARAC/REDSO staff at Mbabane. (See Annex VI, A.)

2/ Project outputs as follows:

No. 1 - Institutional capacity

No. 2 - Research Base

No. 3 - Trained Technicians

No. 4 - Storage Facilities, Botswana Agriculture Marketing Board.

If agreeable to the GOB, this Trust Fund will be used to support crop-related activities which are jointly agreed upon by MOA/OSARAC representatives during project life. In any event, project implementation will not be adversely affected in the absence of a Trust Fund arrangement although, if acceptable, such a system could facilitate operations.

Funding of other recurrent expenditures by USAID will decline over the project period. However, at the same time, these decreases will be compensated by increases in GOB support such that by the end of the project the MOA will be capable of funding all categories of recurrent expenditures.

#### 8. Conclusion

Based on the analyses set forth in this section, it is felt that the financial plan is adequate and firm and that the project is financially sound.

## D. Economic Analysis

The Economic Analysis is divided into three sections. These are concerned with (1) macro-economic considerations, (2) cereal policies in Botswana and South Africa, and (3) farm management budgets. The macro discussion will present a brief overview of the economy, identify key problem areas, and assess GOB development planning as it relates to the agriculture sector and the crop production project. The policy section will be concerned with national marketing and pricing policies of both Botswana and the Republic of South Africa. Concluding the analysis will be a presentation of farm management budgets reflecting the benefits possible from using an improved dry land farming technology.

### 1. Macro-Economic Considerations

#### a. The Economy - A Transformation

From 1885 to 1966 Botswana was governed as the British Protectorate of Bechuanaland. During that period, traditional cattle-raising and subsistence cropping dominated economic activity, and economic progress was relatively static. In 1966 the nation was transformed through exploitation of its mineral resources into one of rapid growth. From 1967/68 to 1973/74, GDP rose about 18 percent per annum in real terms while per capita income rose from about US \$85 to US \$225.

Over the same period the agriculture sector's contribution to GDP fell from 46 percent to 30 percent while the mining sector's share rose from 1 percent to 11 percent. The agricultural sector grew at an annual rate of about 3 percent per annum in real terms compared to a population growth rate also estimated at 3 percent.

Instrumental to this growth was (1) investment during the period 1970-73 in a diamond mine and a copper-nickel mine totalling US \$350 million, more than double the country's GDP in 1970 and (2) a substantial increase in customs revenue resulting from renegotiation of the South African Customs Union Agreement in 1969. Revenues generated from the mining sector and Customs Agreement rose from 18 percent of recurrent budget receipts in 1969 to 92% in 1975 (est.).

But while on the surface this rapid growth seems impressive, underneath there are problems:

(1) Artificial Growth - The recent surge of growth is artificial in that (1) the current engine of growth is the extraction of

irreplaceable resources and (2) the nation has become heavily dependent on imported manpower and capital to manage its greatly expanded mineral and government sectors. How to generate sustained growth in the non-mining sector is a challenge government planners must tackle in the years ahead.

(2) Widening Income Gap - In contrast to real GDP growth of 18% from 1967/68 to 1973/74, the annual growth rate in the rural sector was only 3%. The gap between urban and rural incomes has grown wider and wider due in large part to the recent rapid development of the mining sector and urbanization.

(3) Manpower - Botswana's requirements for skilled manpower have grown far beyond the nation's capability to supply them. A survey in 1972 showed that expatriates held 76% of both public and private jobs requiring a university degree. Today, most of the government's key technical and professional positions are filled by imported skilled labor.

(4) Urbanization - From 1964 to 1974 migration to the townships quadrupled rising at an annual rate of 15%. At the same time, heavy demands have been placed on the Central Government to support this growth. In 1974/75, three times as much was spent in the urban sector and half as much in the rural sector as was planned. The difference in standards of living that have developed between rural and urban areas must be brought more into balance.

b. Recent Setbacks

Aside from these basic difficulties, the momentum of progress is now being retarded by other difficulties. In fact, the very factors that put the economy into motion, mining development and the new Customs Agreement, are now creating severe restraints likely to moderate its growth.

(1) Mining Output Uncertain - A 42% drop in copper prices over the past year, costly technical adjustments in major equipment at the copper mine complex, long delays in negotiations for the opening of a second diamond mine, and a general lack of funding has caused planners to reconsider future years' growth prospects in this vital sector. Disappointing developments have already resulted in the mining sector's 1974 contribution to GNP being revised downward from 21 to 11%.

(2) Erosion of Customs Revenue Base - The South African Custom Union tax base has eroded in recent years because levies are specific rather than ad valorem and have not risen with import prices. Whereas Botswana has been receiving revenues equivalent to about 20% of its customs revenue base, this take will soon fall to about 14%, an annual loss of about R10 million or roughly 15% of total recurrent budget receipts.

c. Economic Relationship to South Africa

Any discussion of Botswana's economy cannot be made without reference to its relationship with the Republic of South Africa. The customs revenue problem noted above serves to highlight the close economic ties Botswana has with South Africa and the conflict of interests that may occur. In addition to its membership in the Customs Union, Botswana's official currency is the South African Rand; 70% of its imports are from South African distributors; the largest single source of foreign investment is from the Republic; as many Botswana (7% of its population) find cash employment in South Africa as do South Africans find in Botswana; and Botswana depends heavily on the Republic's rail, air, and telecommunication services for its outward communications.

Though Botswana benefits in many respects from this close relationship, it often finds itself limited in policy instruments normally available to independent countries. In an effort to gain more independence in monetary matters, the GOB will establish its own central bank and begin circulating its own currency, the Pula, in the fall of 1976. Other efforts are being made to diversify trade and production; development manpower, and mobilize more resources within Botswana. These decisions demonstrate the country's desire to take a more independent stance in managing its economy. Yet, at the same time, the GOB recognizes the advantages of its proximity to a wealthy market and is unlikely to make decisions that would jeopardize these.

Another consideration which must not be overlooked is Botswana's political relationship with the Republic. The GOB is closely aligned with Black Africa in this arena and should tensions in the area erupt, the economic rationale of Botswana's economic relationship may become of secondary importance.

d. GOB Development Planning

In recent months, the GOB has reviewed its National Development Plan (NDP) III, 1973-78 in light of the developments discussed above, and are preparing a new NDP IV, 1976-81 to be more in tune with the new economic realities. The objectives of the plan are:

- 1) Rapid economic growth
- 2) Social justice
- 3) Economic independence
- 4) Sustained production

To meet these objectives the government's strategy is "to rapidly obtain large returns from mining and other viable modern industries, and to invest the revenues in education and training, in agriculture,

in labor-intensive manufacturing activities, and in improving rural services".

The objectives cited all are commendable but often policies designed to reach one objective may be inconsistent with those to accomplish others. The most obvious example of this in Botswana has been the focus on rapid growth in recent years at the sacrifice of social justice. Unquestionably, growth has been impressive, but the poorer segments of society have received very little, if any, direct benefits. Millions of rand have been spent in the mining and urban sectors while development in the rural sector has remained almost static. GOB planners now recognize that the objective of growth must be balanced against other national targets.

According to the Senior Planning Officer of the GOB, the emphasis of planning over the next few years will be directed more towards reducing the widening income gap between the urban and rural areas and the rich and poor. Though it is recognized that investment in the rural sector will not maximize returns in terms of growth, the GOB is prepared to accept lower aggregate growth rates in return for a more equitable distribution of income.

Other key elements of the GOB's development approach are the following:

- 1) Benefits derived from the modern sector will be invested in the non-mining sectors to create a more diversified economy capable of self-sustaining growth.
- 2) Due to an expected reduction in the growth rate during the latter half of the 80's, the government "establishment" will grow less and recurrent expenditures will be gauged by growth in the non-mining sector.
- 3) Government subsidization of the urban sector will be discouraged. Such investment in the urban sector often eventually leads to simply an increase in consumption. Rather funds should be used more productively in the rural sector where the potential for creating more employment is also higher.
- 4) More economic independence will be sought by increasing educational output tailored to the needs of the economy; limiting expatriate recruitment to only essential fields; diversifying production and trade patterns; promoting agricultural and local enterprises; establishing a central bank; and mobilizing more resources within Botswana.

#### c. Economic Prospects

Having considered the present economic situation as well as the GOB's future planning efforts, it appears likely that growth in the

second half of the seventies will be less dramatic than that during the first. Real growth will probably increase at a rate closer to 10% than to 20. This is not only because of the financial difficulties noted earlier but also the result of channeling investment into the non-mining sectors where returns are not as high in the aggregate but are more fair in terms of equity.

Due to this shift of interest to the non-mining sectors, growth and development in the agriculture sector will likely improve despite the lower aggregate growth rate. The urban sector will no doubt continue to grow but again not so visibly as in recent years. In short, the economy will enter a "breathing spell" during which time the GOB will reshape and rebalance the economy in accordance with the priorities and objectives it has set.

#### f. Conclusion

In view of this scenario, the economic environment appears encouraging for the Botswana crop production project. With more stress being placed on income distribution the project should receive high government priority. Successful implementation will also contribute towards reaching two other national objectives -- those of economic independence and sustained production. If self-sufficiency in cereal production is eventually achieved, the country will not be dependent on imports and will be assured of adequate supplies. In terms of national development priorities and the economic outlook, it appears that the project could not be offered at a more opportune time.

### 2. Cereal Policy in Botswana and South Africa

National cereal and marketing policies are a major consideration to any project concerned with increasing production. Sufficient price incentives must exist if the farmer is expected to produce beyond his own needs, an adequate storage and distribution system is required to insure that supply meets demand in terms of time and place, and markets must exist to maintain effective demand.

This section is concerned with these considerations as they apply to cereal policy in Botswana and South Africa. Due to the countries' proximity to each other and the magnitude of difference in their economic strength, the policies of one are not always compatible with those of the other. A sketch of production, consumption, and marketing patterns is presented for each country below, areas of conflict are noted, and the implications of these conflicts are assessed.

#### a. Botswana

##### 1) Production

The annual cereal requirement for the Republic

of Botswana is about 80,000 tons. In a good year, the country is able to produce 50,000 tons. The balance is imported. Due to the lack of moisture, sorghum is the traditional subsistence crop. However, substantial quantities of maize are grown in the southeast where there is usually more rainfall, and some millet is grown in the drier northeastern part of the country.

Table VI indicates the relative significance of these grains in terms of hectareage planted, yields, and production. The past two years have been exceptionally good due to better than average rainfall. As shown, maize production reached record levels. Although some maize is milled in Botswana to supply urban markets, a large part is exported to South Africa. Comparatively little reaches the rural areas.

The yearly grain harvest is largely a function of rainfall. The higher the moisture content in the soil, the higher the yield. The historical pattern of rainfall shows that on the average seven years out of ten are dry years, with one severe drought occurring about once every decade. Therefore, production fluctuates erratically from year to year.

## 2) Consumption

As already noted, sorghum is the traditional subsistence food grain in Botswana. However, since the early 60's there has been a growing shift in consumption away from sorghum and towards maize. The reasons for this change are urbanization, availability, convenience and price.

From 1964 to 1974 the urban population grew from 20,000 to 80,000. As the urban sector grew so did the demand for maize meal. Urbanites find it convenient to buy this already processed product from their local grocer rather than mill it themselves. Moreover, the price is low as much of the meal is imported from South Africa where maize is highly subsidized. Local producers must offer maize at about the same low price; otherwise they would not find a market for their grain.

Aside from convenience and price, the main reason for consumption of maize meal in the townships is simply availability. Sorghum is only milled in the rural areas using the traditional mortar and pestle technique. There is little demand for sorghum meal in South Africa, and the Botswana mill at Lobatse cannot produce an acceptable product.

## 3) The Botswana Agriculture Marketing Board (BAMB)

In 1974 the Government of Botswana (GOB) established the Botswana Agriculture Marketing Board (BAMB) "to secure, for

producers and consumers alike, a stable market for scheduled produce and to ensure efficient and fair distribution thereof throughout Botswana at prices that are, in all the circumstances, equitable, avoiding any undue preference or advantage". Therefore, this organization basically determines GOB cereal pricing policies and is responsible for promoting an effective marketing system within the country.

Prior to the establishment of the Board, Botswana's marketing system for grains was a costly one. In years of drought, prices were high simply as a result of supply and demand, and grain had to be imported. In years when yields were good, farmers exported grain to South Africa at low prices but bought it back several months later at higher prices to replenish dwindling supplies. In effect, the farmer and consumer were paying the South African dealer storage fees equal to the difference between the selling and purchase price.

In good years, small farmers in the more remote regions without access to export markets simply had to accept the low harvest prices. They often react by not planting as much the following year because he simply did not have an incentive to do so.

Recognizing this plight of the grain producer, BAMB was established to stabilize the market and offer the farmer a better deal. The Board began functioning in the fall of 1974 at the close of perhaps the best harvest in the nation's history. Traders were paying only R2.50 to R3.50 per 90 Kg.-bag. Most of the purchases of the Board were from small producers: 40% were farmers with less than 10 bags to sell and 75% were from those with 30 bags or less. Had the Board started buying earlier in the harvest, the General Manager felt BAMB could have bought three times the 6,500 tons it purchased.

#### 4) Functions of BAMB

BAMB serves to stabilize the markets in Botswana through its purchasing, selling, and storage activities. The Board buys grain at purchasing points which have been established or will be established at six locations; five along the North-South rail line, and one at Maun in the north-west. The rail line facilities are at Fitsane, Gaborone, Mahalapye, Palapye and Francistown.

Prices are determined largely by prices in South Africa -- in a typical year the Republic produces 500,000 - 600,000 tons of sorghum whereas Botswana produces only 50,000 tons. Botswana is a member of the Southern African Customs Union and there are virtually no restrictions on trade between the two countries. If sorghum or maize is

priced higher in Botswana than in the Republic, grain will flow into Botswana and vice versa if priced lower.

As a result of this relationship, the floor prices paid to farmers in Botswana are the South African prices, less the transport and handling costs between the two countries. The Board's selling prices or "release" prices are set at "prices which are, in the prevailing circumstances of the market, reasonable". The selling price includes the Board's operating costs. Floor and release prices for the years 1974 and 1975 are shown in Table VII.

Storage is another of the Board's functions. Storage facilities in Botswana are limited and there has been little effort for this development due to the access to South African markets. Apart from stocks owned by one mill, there is no commercial storage capacity intended exclusively for grains. Eventually, facilities will be built by the Board at each of its purchasing points. The Board plans to have a total capacity of 14,000 tons during Phase I of its operations. A 4,000-ton unit has already been completed at Pitsane and one of five 2,000-ton units is almost completed at one of the other locations.

Once these facilities are completed, BAMB intends to enter expansion Phase II whereby five or six 1,000-ton units will be established in the interior. Sites selected thus far include Kanye, Molepolole, Serowe, Mochudi, and Mmadinare. These purchasing points should be particularly beneficial to small farmers who do not have the means to transport their grain to the railroad depots. Moreover, these units are located in the heart of the population centers and can facilitate grain distribution in times of drought.

In addition to its purchasing, selling, and storage activities, BAMB is exploring the possibilities of milling sorghum. Negotiations have been made with the International Development Research Center (IDRC) to assemble a simple prototype mill in Pitsane. Should the project prove successful, the Board will encourage local entrepreneurs to operate small mills in the main population areas.

#### 5) Market Prospects

The prospective markets for sorghum producers in Botswana are encouraging. It is hoped that by (1) guaranteeing the farmer a market for his grain and (2) establishing a distribution/storage system to facilitate marketing, the Board can stabilize erratic price movements and encourage increased production. Aside from meeting its subsistence needs,

future demand is likely to develop in the following areas:

a) Urban sector demand may be generated should a sorghum meal comparable in price and quality with maize meal be produced.

b) The beer plant now under construction outside Gaborone will likely purchase sorghum for malting.

c) There is a very high potential for the use of sorghum as a feed grain in Botswana. Only recently has there been interest, but feedlot feeding has already started.

d) The breweries in South Africa offer an export market which may take on added significance when Botswana introduces its own currency, the Pula, and starts building up foreign exchange reserves.

Thus the potential demand for sorghum in Botswana appears almost unlimited. Hopefully, through improved production technologies and an improved marketing system, the small farmer will be able to supply these markets in the not too distant future. The problems of quantifying and projecting the demand for major crops will be addressed by consultants provided in this project.

Consideration will now turn to South African cereal policies.

b. South Africa

1) Production

In contrast to Botswana's average annual sorghum production of 30,000 - 50,000 tons, the Republic of South Africa produces about 500,000 - 600,000 tons. The differences in maize output is still much more pronounced due to the more suitable climatic conditions that exist in the Republic. A good year will produce only about 40,000 - 50,000 tons of maize in Botswana, whereas the annual output in South Africa is between 9 and 11 million tons. Production is again largely a function of rainfall, but even in a relatively dry year South Africa can produce enough to feed its population. Because of this great magnitude of differences in grain production, cereal policies in South Africa heavily influence those in Botswana. The problems that this presents to Botswana are discussed in the concluding paragraphs.

2) Consumption

a) Sorghum - While sorghum is a major subsistence food crop in Botswana, it plays a comparatively insignificant

role in South Africa where the main staple is maize. Sorghum is used primarily in malting, mixing in stock feeds, and is exported when there is a surplus. The figures in Tables VII and IX illustrate the utilization pattern of sorghum in a typical year.

b) Maize - Maize is the primary staple in South Africa and consumers enjoy low prices through the operations of the South African Maize Board. It is also used as a feed grain and large quantities are exported each year. The pattern of utilization in a typical year is indicated in Table IX. There is a trend away from human consumption of maize and towards rice and potatoes as incomes rise, but maize will likely remain a major grain product due to alternative uses and attractive international prices.

### 3) South African Maize Board

a) General - The functions of the South African Maize Board are basically identical to those of the Board in Botswana. Each season it buys and sells grain at predetermined floor and release prices, and generally serves to facilitate marketing and storage of food grains.

In the case of maize, the Board is the sole buyer and almost completely controls the marketing functions. On the other hand, comparatively little sorghum is bought by the Board as traders usually offer a price more attractive than that paid by the Board.

b) Price Policy - As already noted, maize is the country's main staple and for this reason it is highly subsidized. The high prices earned from exports enable the Board to support the low domestic floor prices. Sorghum prices, on the other hand, are not subsidized. When sorghum is used in beer production, it also must pay a malting levy. South African floor and release prices are shown in Table VII.

### 4) Summary and Conclusions

In comparing the patterns of cereal production and consumption between the two countries, one readily finds a conflict of interests when it is recognized that Botswana's policies must be formulated in terms of those in South Africa. Whereas in Botswana, sorghum is the main subsistence food crop, it is a comparatively insignificant one in the Republic. Maize, on the other hand, is South Africa's main staple and is subsidized. In Botswana the ready availability of this low priced maize meal imported from the Republic is creating a demand for a grain Botswana will probably never be able to produce in sufficient quantities to feed its population. Except for a small area in the southeast corner of the country, Botswana's

climate is simply not suited for maize.

Certainly South Africa cannot be expected to change its cereal policies to satisfy Botswana's interests nor can Botswana formulate pricing policies that vary significantly from the Republic's. The answer to the dilemma would be for Botswana to produce a sorghum meal comparable in price and quality with South African maize meal. However, at today's price difference between sorghum and maize -- R5.20 per 90-Kg. bag sorghum vs. R2.60 per bag maize -- this does not seem feasible. Only should prices become more equal or should Botswana become seriously intent on self-sufficiency could justification be made for producing a refined sorghum meal.

Again, though it must be pointed out that the question of producing a highly refined sorghum meal is basically an urban sector problem due to the availability, convenience, and low price of maize meal. In the rural areas, if the consumer were presented with a choice between a maize and sorghum meal, he would choose sorghum due to taste preference. Therefore, it is important that the factors which led to the urban shift in consumption to maize meal do not occur in the rural areas as they become more urbanized and open to modern society.

It is likely that this will not happen. Sorghum is readily available and what is consumed is largely produced by the consumer. The missing element is convenience. Therefore, it is important that adequate "custom" milling facilities be available to compete with the convenience factor associated with maize meal. As already noted, BAMB has negotiated with IDRC to assemble a simple prototype mill at Pitsane. Should the project prove successful, the convenience requirement can likely be met.

Table VI

Annual Variations in Hectarage Planted  
Yields and Production of Chief Crops  
Republic of Botswana  
1968/69 - 1974/75

| Crop    | (Estimates)                       |         |         |         |         |         |         |
|---------|-----------------------------------|---------|---------|---------|---------|---------|---------|
|         | 1968/69                           | 1969/70 | 1970/71 | 1971/72 | 1972/73 | 1973/74 | 1974/75 |
|         | Hectarage Planted (1000 hectares) |         |         |         |         |         |         |
| Sorghum | 103                               | 120     | 161     | 180     | 90      | *       | 94      |
| Maize   | 42                                | 26      | 38      | 26      | 19      | *       | 100     |
| Millet  | 30                                | 18      | 29      | 24      | 15      | *       | *       |
|         | Average Yield (Kg/hectares)       |         |         |         |         |         |         |
| Sorghum | 289                               | 65      | 455     | 379     | 260     | *       | 375     |
| Maize   | 303                               | 56      | 435     | 390     | 332     | *       | 600     |
| Millet  | 223                               | 64      | 114     | 251     | 101     | *       | *       |
|         | Production (1,000 metric tons)    |         |         |         |         |         |         |
| Sorghum | 30.3                              | 8.1     | 73.4    | 68.3    | 10.3    | 55.0    | 40.0    |
| Maize   | 27.0                              | 2.7     | 18.0    | 10.3    | 2.2     | 45.0    | 60.0    |
| Millet  | 6.8                               | 1.2     | 1.2     | 6.0     | 0.6     | *       | *       |

Source: GOB Ministry of Agriculture, Agricultural Statistics Unit; Estimates for 1973/74 provided by Botswana Agriculture Marketing Board.

Table VII

Floor and Release Prices for Sorghum and Maize  
1974/75 - 1975/76

(South African Rand per 90-Kg. Bag)

|   | 1974         |                | 1975         |                |
|---|--------------|----------------|--------------|----------------|
|   | <u>Floor</u> | <u>Release</u> | <u>Floor</u> | <u>Release</u> |
| A. Botswana                                 |              |                |              |                |
| 1. Sorghum                                  | 4.75         | --             | 5.20         | 6.65           |
| 2. Maize                                    | 4.60         | --             | 4.80         | 6.25           |
| B. South Africa <sup>1/</sup> <sub>2/</sub> |              |                |              |                |
| 1. Sorghum <sup>1/</sup> <sub>2/</sub>      | 5.25         | 5.90           | 6.05         | 6.75           |
| 2. Maize                                    | 4.90         | 4.60           | 5.20         | 5.00           |

<sup>1/</sup> South African prices are based on quotes per M/T plus R .39 per bag in 1974 and R .48 per bag in 1975. Floor prices include transport and handling costs from South Africa to Botswana. Release prices do not.

<sup>2/</sup> Prices do not include R 2.00 per M/T tax.

Source: Botswana Agriculture Marketing Board.

Table VIII

Sorghum Utilization  
Republic of South Africa  
1972-73  
(000 tons)

|                              |  |     |            |
|------------------------------|--|-----|------------|
| A. Total Available           |  |     |            |
| B. Domestic Consumption      |  |     | <u>528</u> |
| 1. Malting                   |  |     | <u>291</u> |
| 2. Meal                      |  | 162 |            |
| 3. Mixed into baby food      |  | 13  |            |
| 4. Mixed into stock feed     |  | 3   |            |
| 5. Sales of grain sorghum    |  | 85  |            |
| 6. Physical losses           |  | 24  |            |
| C. Exports                   |  | 4   |            |
| D. Carry-Over to next season |  |     | <u>179</u> |
|                              |  |     | <u>58</u>  |

Source: Report on Grain Sorghum and Buckwheat, 1974,  
South African Maize Board

Table IX

Sorghum and Maize Utilization  
 Republic of South Africa  
 1974-75  
 (000 tons)

|    |                           | <u>Sorghum</u> |       | <u>Maize</u>  |
|----|---------------------------|----------------|-------|---------------|
| A. | Total Supply              | <u>722</u>     |       | <u>11,570</u> |
| B. | Domestic Consumption      | <u>304</u>     |       | <u>6,369</u>  |
|    | 1. Food                   | 176            | 3,153 |               |
|    | 2. Feed                   | 123            | 2,650 |               |
|    | 3. Seed, etc.             | 5              | 566   |               |
| C. | Exports                   | <u>204</u>     |       | <u>3,209</u>  |
| D. | Carry-Over to next season | <u>214</u>     |       | <u>1,992</u>  |

Source: Agriculture Attache, U. S. Embassy, Pretoria

### 3. Model Farm Budget

The economic rationale of the dry land farming technology now under development can be illustrated by means of a model farm budget analysis. The model is based on the Dryland Research Scheme of 1971/74 funded by the United Kingdom. Two farming systems are employed to demonstrate the additional output possible. The first system utilizes animal power and existing implements already owned by the farmer such as the mould-board plow. The second uses animal power and improved implements, including a chisel plow attached to a wheeled tool carrier. Six or eight oxen are required to pull a mould-board plow under System I. In System II, a maximum of four oxen are required although most operations can be done with only two.

Common elements between the two systems are as follows:

- Fall plowing and fallowing to improve penetration into the soil and to make early planting possible;
- Planting with the first rains to make optimum use of the few heavy showers that do fall and of available nitrogen which is rapidly lost from the soil;
- Row planting to enable timely weeding, and cultivation during the growing season to avoid surface compaction.

It is felt that adoption of these systems can substantially increase sorghum yields from the current averages of 235 Kg./hectare to a

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Republic of South Africa  
1974-75  
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maximum of 1,350 Kg. /ha. under System I and 2,250 Kg. /ha. using System II.

It should be noted that research is continuing to further improve the technology and its acceptability. Therefore, benefits could be revised to the extent that further developments may affect yields. A description of the model follows.

a. Improved Arid Land Production Technology: A Model Farm Budget

1) Draft Requirements

The introduction of crop rotation requires fall (June-July) plowing. With a four-season rotation incorporating a one-year fallow, the proportion of land for which plowing is time critical is reduced by 25% compared with non-rotational systems, assuming the same cropped area. Plowing in the fall reduces the problem of animal draft shortage in the spring (November-December) by shifting the heavy operation to a time when animals are better fit.

Under System I, plowing methods require about ~~ix~~ oxen and plowing time is 10 hours per hectare using the mould-board plow. The ~~two-row~~ animal-drawn toolbar system requires two-four oxen and two and a half-three-hours per hectare.

The opportunity cost for a team of four oxen is estimated at R 200 annually including interest on borrowed capital and extra maintenance expenses. This is a high estimate and assumes the farmer has livestock available for the commercial market. Systems that allow this cost to be spread over a greater productive area have an advantage. The cost of draft plowing for the two systems is shown in Table XIII.

2) Labor Requirements

Labor requirements are estimated at 30 man-hours per hectare per week. Under System I, limited weeding labor may reduce the yield potential in some years despite the improved row planting. Harvest labor is not a constraint with the four-season, two-crop (sorghum, cowpea) rotation, except where the cowpea area exceeds 60% of the total area planted.

For System II, labor becomes much more of a constraint except perhaps in very wet seasons. Harvesting labor, in particular, becomes a limiting factor when the cowpea area exceeds 15% of the

total area planted. For systems that cover large areas, it may be necessary to substitute other crops with lower harvest requirements, e. g., sunflower, into the rotation system.

### 3) Farm Budgets

Seventeen non-itemized budgets are given in Table XII. An itemized breakdown for one of these is presented in Table XIII. The budgets show that if the farmer continues to employ the traditional system, ~~in a typical year~~ he will fail to meet even his subsistence needs. This is primarily ~~due~~ to the high opportunity cost of his oxen team. In effect, the farmer's oxen are subsidizing his cropping operations.

System I allows him to make a respectable margin over subsistence. By increasing his input costs 45% he is able to raise the value of his output by 224% or realize an incremental benefit-cost ratio of 2.8:1. However, with System II 6 ha. an increase in investment of 60% gives a 411% rise in output or an incremental benefit cost ratio of 3.9:1.

Though System II obviously offers substantially higher returns, it is felt that either system provides sufficient economic incentive to encourage small farmers to adopt the new systems. Due to the added risk of purchasing a tool bar, it is likely that System I would initially be the relevant one for the resource-poor farmers this project ultimately hopes to benefit.

Regardless of which system the farmer adopts, though, a higher level of costs is involved and in the first season a cash deficit is incurred. For this reason, a credit program should be considered, and will be addressed by consultants provided in this project.

Credit has so far played a minor role in crop development. The National Development Bank (NDB), in cooperation with the Extension Service, is the principal institutional source of credit for the traditional agricultural sector. But since the bank's policy has been to minimize risks, few farmers are eligible borrowers. NDP loans are normally for three-five years at 8% or 6% if the loan is under R 500. To reach small farmers, longer repayment terms, lower interest rates, and a refinancing provision in case of crop failure would be necessary.

### 4. Conclusions

Based on the above analysis, it is felt that the project objective is economically sound. Despite lower anticipated growth over the next few years, the Government's concern towards developing the agriculture sector and attaining greater social justice, lends strong host government support to

the project. Marketing problems stemming from South Africa's cereal policies are being alleviated through the activities of the Botswana Agricultural Marketing Board. And, assuming agricultural credit is available to finance the farmers' initial cash outlays, adoption of the new cropping systems can substantially increase his output and income. Therefore, the findings of all analyses -- social, technical, financial, and economic -- indicate that the project is ready for implementation.

Table X

Draft Animal Requirements  
Dry Land Crop Production Systems  
(SA Rañd)

| <u>Costs</u>            | SYSTEM I<br>(Mouldboard Plow, 6 ha.) |                       | SYSTEM II<br>(Tool-Bar, 12 ha.) |
|-------------------------|--------------------------------------|-----------------------|---------------------------------|
|                         | <u>6 Oxen</u>                        | <u>4 Oxen</u>         | <u>4 Oxen</u>                   |
| Draft Animals           | R 300                                | R 200                 | R 200                           |
| Equipment <sup>1/</sup> | <u>9<sup>2/</sup></u>                | <u>9<sup>2/</sup></u> | <u>72<sup>3/</sup></u>          |
| Total                   | <u>R 309</u>                         | <u>R 209</u>          | <u>R 272</u>                    |
| Total/Hectare           | R 51.5                               | R 35                  | R 23                            |

Notes: <sup>1/</sup> Annual repayment on five-year loan at interest rate of 6%.  
<sup>2/</sup> The price of a mouldboard plow is assumed to be R 40.  
<sup>3/</sup> The price of a tool-bar is assumed to be R 300.

Source: GOB Ministry of Agriculture, "Dryland Crop Production in Botswana: A Review of Research 1969-74.

Table XI  
Average Projected Yields for Major Crops  
Dry Land Crop Production Systems  
(Kg/Hectare)

| <u>Crop</u>                       | <u>Season</u> |            |            |                               |
|-----------------------------------|---------------|------------|------------|-------------------------------|
|                                   | <u>1st</u>    | <u>2nd</u> | <u>3rd</u> | <u>4th and<br/>Subsequent</u> |
| A. First System - Mouldboard Plow |               |            |            |                               |
| 1. Sorghum                        | 540           | 810        | 1,080      | 1,350                         |
| 2. Cowpeas                        | 360           | 450        | 540        | 675                           |
| 3. Sunflower                      | 180           | 315        | 450        | 540                           |
| B. Second System - Tool-Bar       |               |            |            |                               |
| 1. Sorghum                        | 675           | 1,305      | 1,800      | 2,250                         |
| 2. Cowpeas                        | 450           | 720        | 900        | 1,080                         |
| 3. Sunflower                      | 225           | 540        | 765        | 900                           |
| 4. Castor                         | 225           | 540        | 765        | 900                           |
| 5. Groundnuts                     | 450           | 990        | 1,350      | 1,620                         |

Source: GOB Ministry of Agriculture, "Dryland Crop Production in Botswana: A Review of Research, 1969-74".

Table XII

Farm Budgets  
Dry Land Crop Production Systems  
(SA Rand)

|                            | Season:<br>Rotation: | <u>SYSTEM O</u> | <u>SYSTEM I, 6 ha.</u> |            |            |            | <u>SYSTEM II, 6 ha.</u> |            |            |            |
|----------------------------|----------------------|-----------------|------------------------|------------|------------|------------|-------------------------|------------|------------|------------|
|                            |                      | -               | 1st<br>(i)             | 2nd<br>(i) | 3rd<br>(i) | 4th<br>(i) | 1st<br>(i)              | 2nd<br>(i) | 3rd<br>(i) | 4th<br>(i) |
| Gross Output               |                      | 66              | 134                    | 190        | 239        | 295        | 166                     | 299        | 400        | 484        |
| Variable Costs             |                      | 11              | 47                     | 51         | 55         | 59         | 54                      | 64         | 72         | 78         |
| Fixed Costs                |                      | 105             | 105                    | 105        | 105        | 145        | 115                     | 115        | 115        | 132        |
| Margin                     |                      | <u>-50</u>      | <u>-18</u>             | <u>34</u>  | <u>79</u>  | <u>91</u>  | <u>-3</u>               | <u>120</u> | <u>213</u> | <u>274</u> |
| Margin over<br>Subsistence |                      | -90             | -58                    | -6         | 39         | 91         | -60                     | 60         | 153        | 234        |

|                            | Season:<br>Rotation: | <u>SYSTEM II, 10 ha.</u> |            |            |             | <u>SYSTEM II, 14 ha.</u> |            |            |             |
|----------------------------|----------------------|--------------------------|------------|------------|-------------|--------------------------|------------|------------|-------------|
|                            |                      | 1st<br>(i)               | 2nd<br>(i) | 3rd<br>(i) | 4th<br>(ii) | 1st<br>(i)               | 2nd<br>(i) | 3rd<br>(i) | 4th<br>(ii) |
| Gross Output               |                      | 277                      | 498        | 666        | 831         | 388                      | 699        | 933        | 1,164       |
| Variable Costs             |                      | 90                       | 107        | 120        | 117         | 154                      | 178        | 196        | 201         |
| Fixed Costs                |                      | 229                      | 229        | 229        | 264         | 229                      | 229        | 229        | 264         |
| Margin                     |                      | <u>-12</u>               | <u>162</u> | <u>317</u> | <u>149</u>  | <u>5</u>                 | <u>292</u> | <u>508</u> | <u>699</u>  |
| Margin over<br>Subsistence |                      | -27                      | 177        | 332        | 499         | 20                       | 307        | 523        | 749         |

Notes:

1. Yields are taken from Table XI.

Table XII Continued

| 2. Price of crops: | <u>Sorghum</u> | <u>Cowpeas</u> | <u>Sunflower</u> |
|--------------------|----------------|----------------|------------------|
| Per Kg.            | R .05          | .11            | .11              |
| Per Bag (90 Kg.)   | R 4.50         | 10.00          | 10.00            |

3. Variable costs for all holdings include: seed, fertilizers, sacks, hired labor, and machinery.

4. Fixed costs include depreciation and capital allowances on all equipment including small tools. The cost of maintaining draft animals has been estimated at lower levels in earlier seasons and at a high level for the fourth season.

5. Family labor is equivalent to 210 man-hours per week.

6. Rotation: i) Sorghum, Cowpeas, Sorghum, fallow.  
ii) Sorghum, Cowpeas, Sunflower, fallow.

7. Margin is the return to the farm family's labor and management. If the margin figure is negative, it implies that livestock is subsidizing cropping.

8. Margin over subsistence is the gross output less all costs except draft, less the value of the family's subsistence requirement. This is assumed to be 1,800 Kg. sorghum and 360 Kg. cowpeas, with a total value of R 130.

Source: GOB Ministry of Agriculture, "Dryland Crop Production in Botswana: A Review of Research, 1969-74".

Table XIII  
Farm Budget  
Dry Land Crop Production System

(System II, 10 ha. animal-drawn, tool-bar, family,  
four-season rotation, three crops, one fallow)

| <u>Crop</u>  | <u>Sorghum</u>  | <u>Cowpea</u>    | <u>Sunflower</u> |
|--|-----------------|------------------|------------------|
| Yield, 90 Kg. bag/ha.  | 25 (2, 250 kg.) | 12 (1, 080 kg.)  | 10 (900 kg.)     |
| Gross Output (Rand)  | R 112. 50       | R 120. 00        | R 100. 00        |
| Less:  |                 |                  |                  |
| Variable Costs   | - 19. 68        | - 14. 92         | - 14. 88         |
| = Gross Margin   | <u>R 92. 82</u> | <u>R 105. 08</u> | <u>R 85. 12</u>  |
| x Area (2. 5 ha.)  | 232. 00         | 263. 00          | 213. 00          |
| = Total Gross Margin   |                 | <u>R 708. 00</u> |                  |
| Less Fixed Costs:  |                 |                  |                  |
| 1) Tool-bar, R300 over<br>5 years at 6 percent                   |                 | - 72. 00         |                  |
| 2) Draft Animals (4 oxen<br>at high opportunity cost)            |                 | - 200. 00        |                  |
| 3) Small Tools, etc.   |                 | <u>- 12. 00</u>  |                  |
| = Margin to cover family labor<br>and management                 |                 | R 424. 00        |                  |
| Less subsistence, approximately<br>20 bags sorghum and 4 cowpeas |                 | <u>- 130. 00</u> |                  |
| - Surplus  |                 | <u>R 294. 00</u> |                  |

Source: GOB Ministry of Agriculture, "Dryland Crop Production in Botswana: A Review of Research, 1969-74".

#### IV. Implementation

##### A. Administrative Arrangements

##### 1. Ministry of Agriculture (MOA)

##### a. Organization

The Ministry of Agriculture is divided into three departments (see Organization Chart): Agriculture Research; Agricultural Field Services (AFS); and Veterinary Services. The AID-supported Crop Division will be situated within the Field Services Department (FSD), which has within it additional divisions including Livestock, Extension, and Land Utilization. All technical divisions are expected to support the extension activities of the department. The Field (Extension) staff of the FSD report directly to the FSD chief officer while, in a parallel line, and in a staff and service role, the technical elements of the FSD, noted above, also report to the FSD chief officer. The Crop Division, therefore, while having no extension or field staff of its own, will implement crop programs/projects. It develops cooperatively with other MOA agencies through the FSD extension staff.

##### b. Extension Network

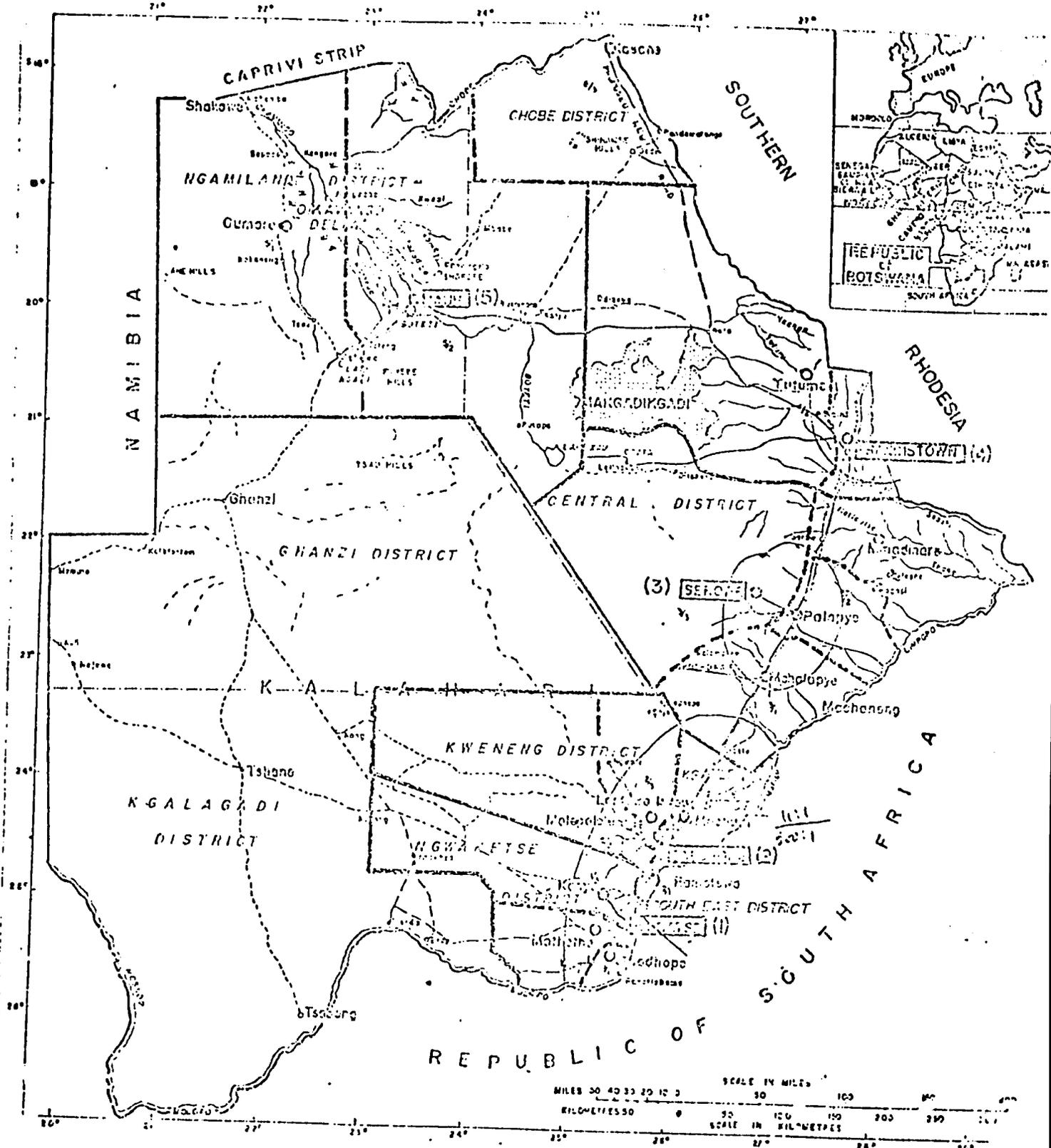
Botswana is divided into regions and districts (see map) for purposes of MOA extension activities. Located within the districts are varying numbers of agricultural demonstrators. The demonstrator-to-farm family ratio is one to two hundred. In the past and at present, demonstrators tend to concentrate on so-called pupil-farmers -- ones who adopt and follow recommended practices. The ratio in this instance is about 1 to 11. The MOA is changing the concentration of effort from the pupil-farmer group to a broader-based, general farmer approach. This effort will necessitate a reallocation of time for newly programmed activities and should improve field staff effectiveness.

Due to the lack of clerical services, district level supervisors are now unable to provide needed administrative support to field staff. At present no technical staff is posted at the district level.

Only recently have such staff been appointed at the regional level. Regional technical staff can keep close contact with developments in the districts and draw upon AFS for additional technical support if needed.

# MINISTRY of AGRICULTURE

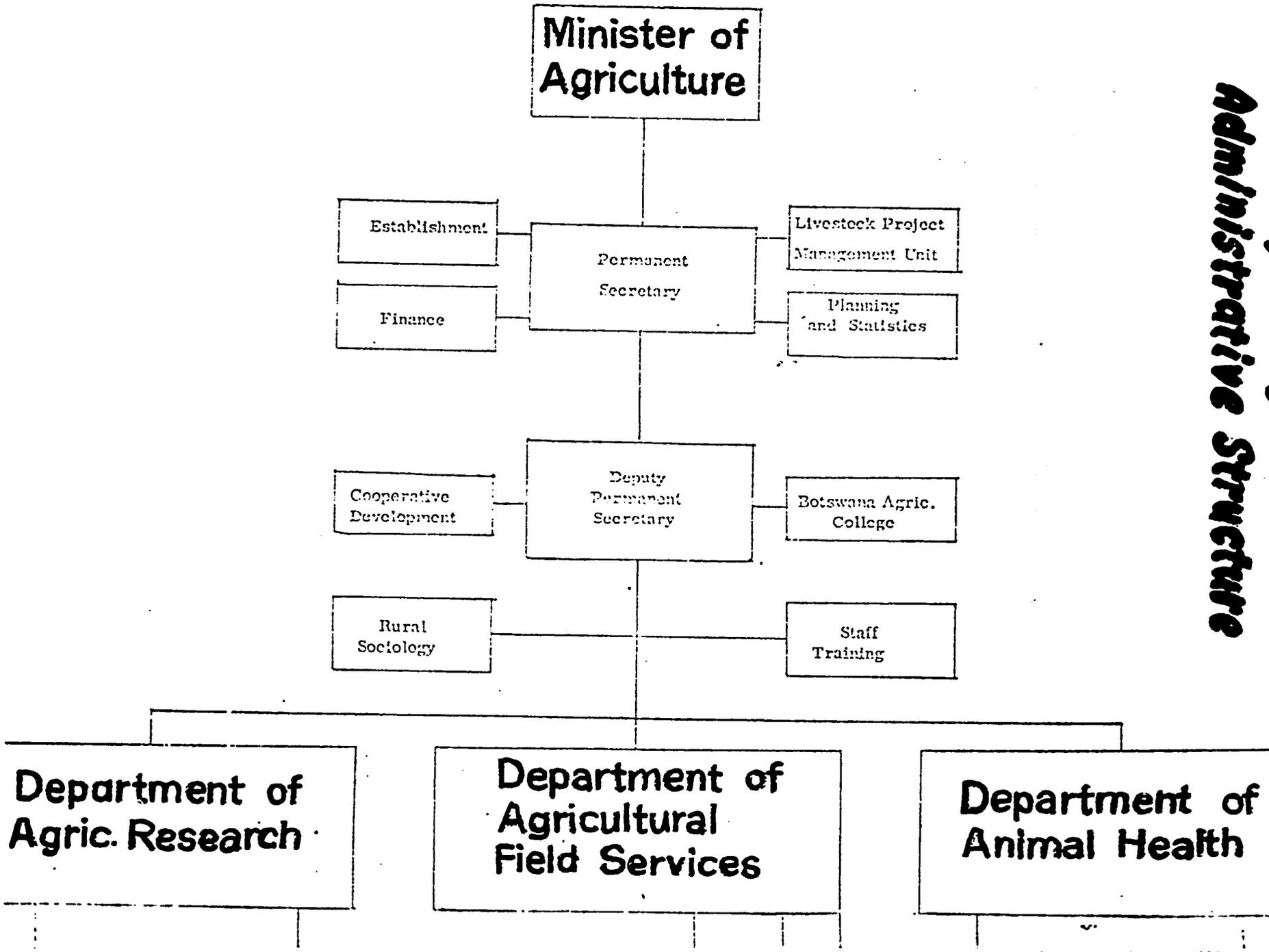
DIVISION OF AGRICULTURAL EXTENSION

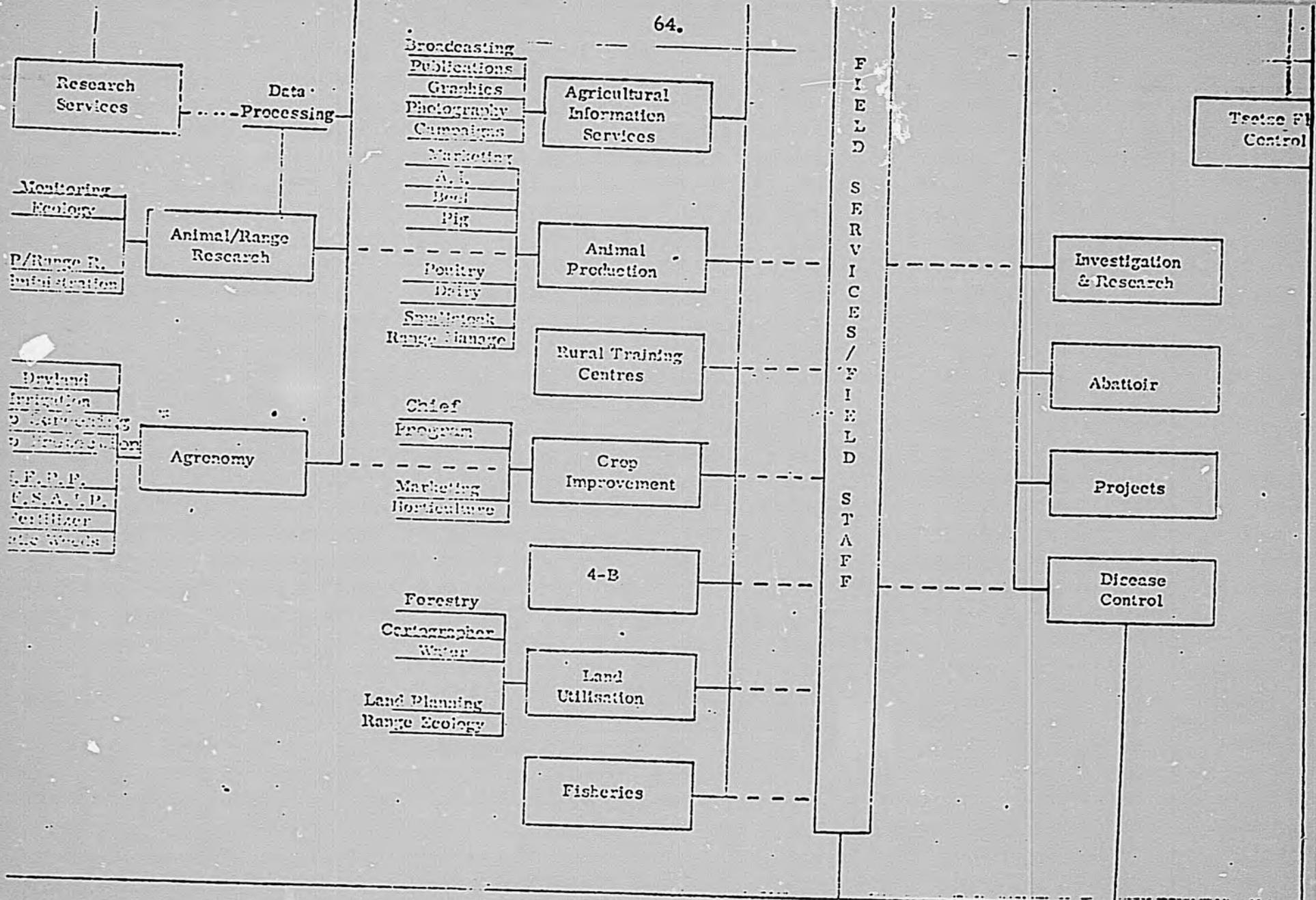


Regional and District Boundaries (Extension)

- Regional Boundary
- District Boundary
- Rural Training Centre
- Divisional H.O. / District H.O.
- Agric. Information Services of Gaborone.

**MINISTRY OF AGRICULTURE  
Administrative Structure**





# Farming Public

c. Lines of Communication

In addition to the formal line relationships between divisions and among departments, horizontal lines of communication flourish as well. These provide the day-to-day working associations needed to promote the smooth flow of ideas, information, etc. Indeed, the total MOA establishment is small enough to permit this arrangement to operate effectively. The MOA is accustomed to the use of the intra-departmental 'task force' concept which permits technicians from any relevant office to participate in a given activity. The AFS staff, for example, can request assistance of the MOA's statisticians and rural sociologist. With the consent of department heads, the CCIO or any other agricultural officer can assemble such technicians from other divisions as required to resolve problems and plan programs.

2. Crop Division

a. Organization

The present table of organization for the Crop Division calls for a staff of three persons in addition to the CCIO. These include the CPO, a horticulturalist and a crop marketing officer. As stated above, the CCIO can request economic and statistical support from the Planning and Statistics Unit. However, their workload is sufficiently great that they cannot spend more than a small portion of their time with any particular MOA program or project. For this reason a substantial amount of consultant time is funded during the Crop Division's formative years for providing economic, social, and technical expertise not provided in full-time project staffing. It is expected that upon completion of the project, the MOA will have sufficient resources to meet these needs.

b. Intra-MOA Coordination

Each officer in the Crop Division is expected to build professional relationships with his colleagues; the CPO with both research and extension personnel, as well as with the various technical staffs working with donor-supported crop projects. Similarly, the CCIO must establish, from the outset, a very wide net of contacts with MOA senior staff.

c. Responsibilities

Within the organizational arrangement of the MOA, the Crop Division will be responsible for the design of crop promotion programs and will support their implementation. The division, as a service organization, must concern itself with all crops grown in the country. However, this project has, as its main priority, a focus on sorghum.

### 3. Reaching Beneficiaries

Development of a field services staff responsive to small farmers' crop production problems will be a major concern of this project. In-service training of extension personnel will focus on teaching new crop technology as it is developed and determining the most effective ways of encouraging small farmer acceptance of improved practices.

### 4. Management

#### a. MOA

The GOB, due to the shortage of skilled local management, must staff a large share of its senior technical positions with expatriates. With this heavy expatriate staff it must be recognized there is always a chance that when things go poorly, issues can become "tribalized." AID-provided staff must guard against this possibility.

On a day-to-day basis, the Government is small enough to permit rather easy, informal contacts, both intra- and inter-ministerial. Divisional and departmental lines are not a serious problem insofar as information and feedback are concerned. In the course of project preparation, the degree of intra-MOA participation was impressive, which speaks well for the success of an inter-disciplinary activity such as this project plan.

Assuming that the CCIO will establish an active, supportive and creative division; that the present fluidity of relationships within the ministry persist; that the apparently good international associations continue among the various donor groups; and that the assumptions relating to GOB actions are realized; one would feel confident that this project will be successful in terms of GOB-MOA management.

#### b. Project Internal Management

The GOB at present has indicated that it does not want an operation involving a formal team complete with leader and internal chains of command and responsibility. The Government desires an approach whereby personnel function as if they were Botswana civil servants, subject to the management of their respective division chiefs. However, AID's experiences in providing personnel in this manner tend to argue for this team concept interacting with Government civil servants to ensure that the personnel maintain a "project focus" and together achieve project outputs. For these reasons the team of project personnel will be provided through a U.S. institution which will enter into an agreement with the GOB and AID as to the specific lines of communications, and division of responsibilities. The Chief of the Crop Division will be the team leader and his authority over contract staff not in his division will be spelled out in this agreement.

c. AID

OSARAC will monitor and manage the project through the AID Operations Officer (AOO) posted in Gaborone. The AOO will be supported with regular visits by OSARAC technical staff. The AOO will maintain communication with the CCIO; note and take action to assure the GOB is performing its agreed-to services; and keep close watch on performance indicators, recommending corrective action in the event of slippages. It is expected that OSARAC will continue its present style of operation with MOA which includes regular working meetings with the Permanent Secretary, Deputy Permanent Secretary, and department and division chiefs.

Upon signature of the ProAg prepared by OSARAC, steps will be taken to initiate required construction contracts and services. These will be monitored and receive required approvals by REDSO/EA. In addition, necessary project implementation orders will be prepared by OSARAC.

AID will disburse funds for local costs on a reimbursable basis following procedures to be defined in Project Agreements. Funds in support of the modest construction component of the project will be handled on a fixed amount reimbursement basis and if advances are necessary, procedures will be spelled out in the ProAg.

B. Implementation Plan

1. Planned Performance Tracking Chart

This section is a narrative interpretation of the Planned Performance Tracking Chart (Annex III). This chart illustrates the phasing of actions with a financial plan, evaluation plan, and three separate calendars -- the calendar year, the fiscal year, and the crop year. The latter is important in the phasing of crop activities.

Two types of tracks appear. Solid lines represent activities undertaken by the technicians. Dotted horizontal lines depict commodity flows and construction progress. Conjunction of activities and commodities is not shown by meeting lines but must be read vertically by month. By way of illustration, the activities in May 1977 include the arrival of two technicians, vehicles and other commodities. Completion of housing, offices and workshop construction, and the end of the crop year 1976-77 takes place during April 1977.

A digital tracking code is used to mark each important event.

The left hand number represents the activity; the right, the particular event.  
The code is as follows:

- 1 - 0: CCIO, work plans
- 2 - 0: CCIO, activities in crop trials, etc.
- 3 - 0: CPO, program including demonstrations
- 4 - 0: CSO, program including crop trials.

## 2. Implementation Schedule

The implementation schedule, by activity and event, is as follows:

- Aug. 1976: FroAg signed: OSARAC/GOB
- Aug. 1976: FIO/T prepared: OSARAC
- Sept. 1976: FIO/C prepared: equipment, vehicles, OSARAC
- Sept. 1976: Begin construction program -- announcement, bids, awards, etc. for housing and crop research workshop: OSARAC/REDSO
- Sept. 1976: First FIO/P's: OSARAC/GOB
- Oct. 1976: Contract award.

Reading down the list of activities in the left hand column of the FPT, the following program unfolds:

### a. Technicians

We assume recruitment and arrival takes no less than ten months (April 1977) and no more than twelve months (June 1977). For purposes of this exercise we shall use the earlier date.

#### 1) CCIO

- 1-1 (May 1977) CCIO arrives
- 1-2 (July 1977) Completes 1st year work plan, and this is approved
- 1-3 (June 1978) Completes second year work plan
- 1-4 (August 1978) Plan revised, after evaluation
- 1-5 (June 1979) Completed third year work plan
- 1-6 (August 1979) Plan received and revised
- 1-7 (September 1980) Completes long-term crop development plan
- 1-8 (October 1980) Departure
- 2-1 (September 1977) Establishment of intra-MOA 'task force'

- 2-2 (October 1977) Preparation begins, special trials for CY 77/78
- 2-3 (May 1978) Completion of trials -- submit findings for evaluation
- 2-4 (August 1978) Findings of trial evaluation
- 2-5 (October 1978) Preparation of trial/demonstrations for CY 79/80
- 2-6 (May 1979) Completion of above -- beginning of evaluation
- 2-7 (August 1979) Findings of CY 78/79 evaluation
- 2-8 (October 1979) Preparations of trials/demonstrations for CY 79/80
- 2-9 (May 1980) Evaluation of above -- included in overall program evaluation (1-8)

2) CPO

- 3-1 (May 1977) CPO arrives
- 3-2 (July 1977) Completes first year work plan, reviewed
- 3-3 (August 1977) Begins evaluation of findings from CY 76/77
- 3-4 (September-October 1977) Preparation of pilot training materials
- 3-5 (October-November 1977) Training begins of pilot extension groups to work with trials -- close coordination -- CSO/CCIO/extension/FME.
- 3-6 (May-June 1978) Review of experience CY 77/78
- 3-7 (June-July 1978) Revise training materials
- 3-8 (August-September 1978) Preparation and begin second training program CY 78/79
- 3-9 (October-November 1978) Support extension program training; demonstrations; close coordination -- CCIO etc.
- 3-10 (May-June 1979) Review of CY 78/79
- 3-11 (June-July 1979) Revision of training materials
- 3-12 (August-September 1979) Preparation and begin third training program, CY 78/80
- 3-13 (October-November 1979) Support demonstrations, CY 79/80
- 3-14 (April 1980) Review, final evaluation, departure.

3) CSO

- |      |                             |   |
|------|-----------------------------|---|
| 4-1  | (June 1976-<br>July 1977)   | Continuous field trials by crop screening officer under existing AID contract |
| 4-2  | (August 1977)               | Review state of technology with all groups                                    |
| 4-3  | (August-<br>September 1977) | Begin development of CY 77/78 trials with cooperation of CCIO                 |
| 4-4  | (October 1977)              | Begin trials  |
| 4-5  | (May 1978)                  | Complete all trials, review   |
| 4-6  | (June 1978)                 | Evaluation complete -- prepare two-year test program to support CCIO program  |
| 4-7  | (December 1978)             | Participants return from existing AID project: trained in crop testing        |
| 4-8  | (May 1979)                  | Completion of trials, begin evaluation  |
| 4-9  | (June 1979)                 | Evaluation complete, review test program                                      |
| 4-10 | (July 1979)                 | Review overall crop development program<br>CSO departs.                       |
| 4-11 | (August 1979<br>following)  | Returned participants carry on trials program.                                |

b. Commodities

- |    |                                  |  |
|----|----------------------------------|--|
| 1) | Vehicles                         | Four ordered, as soon as possible after signature of ProAg, by June 1976. Assume ten-month delivery time. Four vehicles arrive April 1977.   |
| 2) | Equipment, etc.<br>(All project) | Assume ten-month delivery time. Orders should be placed as soon as possible after ProAg for first allotment for April 1977 delivery, and at the beginning of each of the fiscal years: 1977 and 1978. All equipment, etc. should have arrived by October/November of 1978. |
| 3) | Training Supplies<br>(CPO)       | Same schedule as above.  |

- c. Housing, Office  
Space, Crop  
Research Workshop Begin bidding process for housing, June 1976. GOB should make lane available by September 1976. Housing should be finished by April 1977. Similarly as regards office space and crop research workshop.
- d. Storage Units  
(BAMB) Begin bidding process for units, January 1977. However, construction must be placed as follows:  
-- construction time nine months --  
Units 1, 2-begin Jan. 1977-complete Sept. 1977; Units 3, 4, 5-begin Nov. 1977-complete Aug. 1978.
- e. Crop Trials  
(see CSO) Performed each crop year: 1976-1977, by existing research staff; 1977-78 and 1978-1979 by CSO -- of this project. 1979-1980, under leadership of returned AID participants.
- f. Extension Training Begin on a pilot basis to support trials at farm level -- CY 1977-78. Materials and programs will be revised each year in light of experience, and new pilot activity will be mounted to correspond with each crop year during the project period.
- g. Participant  
Training 2 three year participants leave in 1976; 7 three-year participants leave in 1977; 2 two-year third country participants leave in 1977; 2 two-year third country participants leave in 1978.
- h. Consultancies Provided in Man-months as follows:  
10 in FY 1977  
10 in FY 1978<sup>1/</sup>  
9 in FY 1979  
8 in FY 1980

1/ To include up to four man-months for evaluation requirements if needed.

2. Points of Reference

The following performance indicators are considered

critical:

a. Contract-technical services. PIO/T signed; June 1976,

b. Technicians. Contractor will recruit two technicians (CCIO, CPO) who will arrive between April 1977 and June 1977. The third person, CSO, will arrive in February 1976. (Funded by SADPT, FY 76 and 78.)

The basic performance indicators of the technicians will be their annual work plans, noted in IV. B. 1. above.

c. Participants. PIO/P signed December 1976/77/78. Participants will leave and return subject to the schedule above.

d. Equipment/Commodities. PIO/C signed June 1976/December 1977/December 1978. Commodities will be ordered and received subject to the schedule above.

e. Housing. Bids will be tendered in June 1976 for housing/research warehouse facility. Completion of units by April/July 1977.

f. Office Space. This is a GOB responsibility.

3. Negotiation Problems

At present no negotiating problems are foreseen by OSARAC and the GOB.

4. Monitoring Plan

Primary monitoring responsibility will lie with OSARAC and particularly the OSARAC AOO in Gaborone. The AOO will monitor performance indicators, request technical, financial and administrative assistance, and signal slippages through the OSARAC office. He will see that the responsible persons and organizations take corrective action and alert AID management of problems.

5. Contract Support

AID/W will let one contract to cover salaries and other generally provided costs and overhead for the three contract technicians and 37 man-months of consultancies.

### C. Evaluation Plan

Two types of evaluations are programmed. The first will function through the life of the project on a periodic basis (at least one per year). Those will produce data for the measurement of progress in quantitative terms. In addition, they will permit modification and redirection of activities to accomplish the project goal.

Periodic evaluations will be performed under the general supervision of the MOA (Planning and Statistics Unit) and supported by OSARAC staff. Limited AID local cost funds (as agreed to between the MOA and project manager) will be available for social science, economic, and technical studies required. The AID Project Appraisal Report (PAR) will be prepared annually in accordance with regular procedures.

An external project evaluation will be carried out during the fourth quarter of FY 1979. It will be undertaken by an AID-funded evaluation team and done with the involvement and cooperation of the MOA. The scope of work will be prepared by AID and the MOA. Team personnel selected will receive the concurrence of both OSARAC and the MOA and may include AID staff from AID/W, REDSO, and/or OSARAC if appropriate. The evaluators will review the entire project activity -- all technical works and their results; work plans and their progress; feasibility of proposed technical packages; and success of the Crop Division as an entity. The evaluation team will also review, comment on and recommend actions which relate to quality, timeliness and overall effectiveness of OSARAC, REDSO, AID/W and contractors' services and performance on project management and support. Based on their findings, the team will make future recommendations as to the course of the project and follow-on activities.

DEPARTMENT OF STATE  
AIRGRAM  
UNCLASSIFIED

DATE SENT: 4-24-75  
TO: AIDTO CIRCULAR A 247  
FROM: AID/Washington  
SUBJECT: Project Committee Comments and Recommendations on Recent OSARAC Project Proposals  
REFERENCE: AIDTO Circular A-208

Subsequent to submission reair, following additional comments/recommendations were made by ECPR members which should be considered as addenda to original message:

II. Swaziland Agricultural Credit and Marketing, add following paragraphs:

I. Are proposed inputs for GOS and for UNDP and UK direct inputs for this project or do the figures simply represent budgets for activities in the area of agricultural credit and marketing? Inputs in paper should be limited to the former and be related to outputs (see para III-J below).

J. Is the project bilateral, or authentically multilateral, for purposes of FAA Section 110(a) cost-showing requirements? More specifically: is this a multi-donor project in which each donor is financing a discrete part of an integral project? Is the project to be financed through a common fund to which each donor makes a contribution? Or is this a discrete AID project in a consultative group setting where other donors are financing other projects?

K. Do any of the proposed GOS (MCC and SDSB) contributions include contributions which were counted for purposes of Section 110(a) in connection with the GOS Agriculture Credit Loan?

L. What is the status of the implementation of the Agriculture Credit Loan? What is the relationship between that loan and this project?

|                |         |           |         |                |
|----------------|---------|-----------|---------|----------------|
| DRAFTED BY:    | OFFICE: | PHONE NO. | DATE:   | APPROVED BY:   |
| AFR/ESA:LPompa | AFR/ESA | 22876     | 4/23/75 | AFR/ESA:OCylke |

|                           |                        |
|---------------------------|------------------------|
| AID AND OTHER CLEARANCES: |                        |
| AA/TA:SButterfield(info)  | AFR/ESA:HKugler(draft) |
| GC/AFR:TMuntsinger(draft) | AFR/DP:RHuesmann(info) |
| AFR/DS:SCole(info)        | PPC/DPRERBobel(info)   |

DEPARTMENT OF STATE  
AIRGRAM (CONTINUATION)

|                   |     |                 |               |   |
|-------------------|-----|-----------------|---------------|---|
| POST:             | NO. | CLASSIFICATION: | PAGE OF PAGES |   |
| AIDTO CIRCULAR A- | 247 | UNCLASSIFIED    | 2             | 2 |

M. What facilities to be constructed at sixteen field locations are referred to in Outputs section; and are the inputs for all such facilities included in Inputs section?

III. Lesotho Agriculture Field Services Development, add following paragraph:

J. For purposes of FAA Section 110(a), GOL contributions must be limited to inputs which will directly contribute to attaining the outputs and specific purposes of this project, as defined by the PRP.

IV. Botswana Crop Production and Marketing

A. Insert after first sentence: How will project focus on small holders?

D. Insert after first sentence: What, if any, specific inputs/costs are proposed for this program?

Add following two paragraphs:

G. With respect to cost sharing, see para II-I, II-J, and III-J above.

H. Existing Agency guidelines state that AID should not commit itself to an undertaking beyond five years. Can the proposed six year life of project be reduced to five years?

KISSINGER

SEND TO:  
OSARAC (Mbabane)  
REDSO/E (Nairobi)

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74b.

DEPARTMENT OF STATE  
TELEGRAM  
UNCLASSIFIED  
STATE 174330

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TO RUEHPCE/AMEMBASSY MBABANE 9399  
RUVQC/AMEMBASSY NAIROBI 2548

AIDAC

E.O. 11652: N/A

TAGS:

SUBJECT: Botswana - Crop Production and Marketing PRP

NAIROBI FOR REDSO

1. ECPR review held July 9. Comments and recommendations follow.
2. While proposed PRP target group and project emphasis are within agency policy guidelines, consensus is that design needs present more analytic rationale for allocation resources to specific target population and crop. Although no consensus, question was raised whether sorghum has comparative advantage over e.g. cattle raising for target group. At micro level, design should demonstrate that increased productivity would, in fact, result in economic benefit to A) target population and B) national economy. Proforma income/expense or cash flow statement could illustrate former. It also necessary demonstrate that sorghum can be raised and sold in competition to the low-priced sorghum coming from South Africa at a price remunerative to target farmer.
3. Review concentrated on two major project purposes: A) transfer to and reception by Botswana farmers of proven production technology; and B) institutionalization of Crops Division within MOA. Committee felt improvements could be made to relate more clearly design inputs to purpose outputs. As drafted, linkage between inputs and desired end of project status not clear.
4. ECPR concerned with definition proven technology, and recommended that definition not be limited to known technologies (cultural practices identified in PRP) but be expanded to include other readily available technologies especially those in neighboring countries such as improved varieties. However, definition should not be so loose as to necessitate basic research as project component. Any technology packages to be proven via adaptive research should be carefully defined during design (identifying particular technologies and outlining research program). Design should include technology verification (there being some skepticism with the validity/adaptability plowing time changes) and explore alternative approaches to technology

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TELEGRAM (CONTINUED)  
UNCLASSIFIED PAGE TWO  
STATE 174330

testing including possible Botswana institutional inputs at one end of spectrum to international network/private research operations at another. In this regard, ECPR recommends that project design include assessment WFP projects in related areas. While ECPR expressed some concern that project limit its focus to production and minimize costs (a concern arising from the time/cost implications of institutionalizing Botswana research capacities), it was agreed that Botswana capacity to receive and disseminate research findings was a legitimate area for design concern. See para 7 below.

5. The dissemination of technology was subject of extensive discussion, with consensus that design needs carefully address all repeat all elements technology including delivery systems and repeat and farmer receptivity systems. In this regard, analysis needs not only examine institutional requirements but other elements such as commodity pricing, markets, farm level economics, farmer attitudes, provisions for farmer participation in project development/evaluation, etc. Believe recent study development alternatives incorporated useful guidance this regard. Copies pouched.

6. Some concern expressed by ECPR regarding statement in PRP that public tastes in Botswana have shifted from Sorghum to Maize and price differential increasing.

Realizing that latter cannot be widely grown in Botswana to substitute fororghum, question should be addressed regarding prospect of developing project to increase sorghum production for which there is diminishing public demand.

7. While the ECPR did not rule out the suggested PRP project purpose of institutionalizing a Crops Division within the MOA, it did recommend that institutional aspects of the project might best arise from the analysis of the delivery/receptivity of technology suggested above. The design should, at a minimum, relate any institutional proposals to the chain. Finally, there was some sentiment amongst the committee that Crops Division institutional objectives may be beyond realization within a reasonable project time frame and that specific personnel requirements might be met more appropriately and economically through the SADPT mechanism.

8. Section B at page 32 quote provision of technical assistance unquote subject to considerable discussion. Believe design needs take careful account technical assistance mechanisms as they relate to project purposes as well as to more generalized GOB preferences.

9. ECPR did not approve 5/21/75 submission in entirety but prepared endorse continuing project design. Suggest as next step REDSO/OSARAC develop detailed scope of work for project design (incorporating or commenting upon ECPR guidance this cable). On basis review scope/timetable, ECPR prepared authorize drafting PP.

KISSINGER

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

AND 10/10/76 (10/76)  
SUPPLEMENT 1

Project Title & Number: Botswana Crop Production Project No. 690-11-150-056

CONTRACT NO. 690-11-150-056  
PROJECT NO. 690-11-150-056  
DATE 10/10/76

DATE OF PROJECT  
STARTED 76 80  
TOTAL COST \$1,742,000  
DATE January 76

| NARRATIVE SUMMARY   | OBJECTIVELY VERIFIABLE INDICATORS   | MEANS OF VERIFICATION   | ASSUMPTIONS   |
|---|---|---|---|
| <p>Program or Sector Goal: The broader objective to which this project contributes: (A-1)</p> <p>Development and spread of a crop system with particular emphasis on sorghum that will be more productive per unit of input and minimize risks.</p> | <p>Measures of Goal Achievement: (A-2)</p> <ol style="list-style-type: none"> <li>1. Area development projects begin to promote adoption of new technology.</li> <li>2. Adoption of recommended technology by a majority of the small farmers.</li> </ol> | <p>(A-3)</p> <ol style="list-style-type: none"> <li>1. MOA records; rural surveys, feedback from extension agents.</li> <li>2. GOB crop production statistics; and BAMB records.</li> </ol> | <p>Assumptions for achieving goal for project:</p> <ol style="list-style-type: none"> <li>1. GOB continues commitment to crop programs.</li> <li>2. GOB provides price and market support.</li> <li>3. GOB continues support of supplementary activities including BAMB, BEDU, training, etc.</li> <li>4. Needed inputs and credit are available and utilized.</li> <li>5. Other donors continue support.</li> <li>6. Economic and political conditions are favorable.</li> </ol> |

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Life of Project: 76 to 80  
From FY: 76 to FY: 80  
Total U.S. Funds: \$1,742,000  
Date Prepared: January 76

Project Title & Number: **Botswana Crop Production Project No. 690-11-150-056**

PAGE 2

| NARRATIVE SUMMARY   | OBJECTIVELY VERIFIABLE INDICATORS   | MEANS OF VERIFICATION  | IMPORTANT ASSUMPTIONS  |
|---|---|--|--|
| <p>Project Purpose: (B-1)</p> <p>To increase the capability of the Government of Botswana (GOB) Ministry of Agriculture to develop and expand crop research activities and crop production programs suitable for small farmers; and to increase the capacity of the Botswana Agricultural Marketing Board to store and market grains produced by small farmers. In dealing with these activities, particular emphasis should be placed on major cereals, e.g. millet and sorghum.</p> | <p>Conditions that will indicate purpose has been achieved: End-of-Project status. (B-2)</p> <ol style="list-style-type: none"> <li>Existence of specific small farmer-oriented crop programs for major cereal crops.</li> <li>Existence of an innovative Crop Division capable of coordinating and implementing crop production programs in an efficient and creative manner.</li> <li>Implementation of a long-term crop development plan.</li> <li>Extension staff trained in production of cereal and allied crops with emphasis on demonstrations.</li> <li>Tried and proven technology and delivery system exists.</li> </ol> | <p>(B-3)</p> <ol style="list-style-type: none"> <li>MOA records; independent project evaluation in fourth quarter of FY 1979.</li> <li>MOA records.</li> <li>MOA personnel records; extension training materials and programs completed; extension agents successfully trained.</li> <li>MOA records; evaluation by CPO, May - June 1980.</li> </ol> | <p>Assumptions for achieving purpose: (B-4)</p> <ol style="list-style-type: none"> <li>GOB continues to fund and staff Crop Division.</li> <li>MOA continues crop development program.</li> <li>GOB and MOA endeavor to provide incentives to extension personnel to work more effectively.</li> <li>MOA continues research programs.</li> </ol> |

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Life of Project: From FY 76 to FY 80  
Total U.S. Funding: \$1,742,000  
Date Prepared: January 78

Project Title & Number: Botswana Crop Production Project No. 690-11-150-056

| NARRATIVE SUMMARY   | OBJECTIVELY VERIFIABLE INDICATORS  | MEANS OF VERIFICATION  | IMPORTANT ASSUMPTIONS  |
|---|--|--|--|
| Project Outputs: (C-1)  | Magnitude of Outputs: (C-2)  | (C-3)  | Assumptions for achieving outputs: (C-4)   |
| <ol style="list-style-type: none"> <li>1. Staffed Crop Division</li> <li>2. Crop Research Base</li> <li>3. Trained Technicians</li> <li>4. Grain Storage Capacity (BAMB)</li> </ol> | <ol style="list-style-type: none"> <li>1. Local personnel assigned to CCIO, CPO and CSO positions by 1980.</li> <li>2. Long-term crop development plan completed by September 1980.</li> <li>3. Crop trials and demonstrations completed under variety microeconomic conditions by May, 1979.</li> <li>4. Personnel trained and assigned to 11 crop-related posts by 1981.</li> <li>5. Five 1,000-ton warehouses completed by July, 1978. Managers trained.</li> </ol> | <ol style="list-style-type: none"> <li>1. MOA personnel records; staff in positions.</li> <li>2. MOA records; plan document.</li> <li>3. MOA records; annual evaluations, reviews.</li> <li>4. MOA personnel records; participants returned.</li> <li>5. MOA construction and personnel records; on-site inspections.</li> </ol> | <ol style="list-style-type: none"> <li>1. MOA budgetary support increases to compensate for declining U.S. contribution so that research efforts and programs are sustained.</li> <li>2. MOA provides adequate coordination so that interdisciplinary task forces can operate.</li> <li>3. Other donor work continues international research utilize.</li> <li>4. Participants successfully complete studies.</li> <li>5. BAMB develops as planned.</li> </ol> |

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Line of Proj. 76 to FY 80  
From FY 76 to FY 80  
Total U.S. Funding \$1,742,000  
Date Prepared January 78

AID 1323-28 (11-73)  
SUPPLEMENT 1

Project Title & Number: **Botswana Crop Production Project No. 690-11-150-056**

| NARRATIVE SUMMARY  | OBJECTIVELY VERIFIABLE INDICATORS               | MEANS OF VERIFICATION  | IMPORTANT ASSUMPTIONS  |
|--|---|--|--|
| Project Inputs: (D-1)  | Implementation Target (Type and Quantity) (D-2) | (D-3)  | Assumptions for providing inputs: (D-4)  |
| <b>USAID:</b> Agronomic and Ag Program Experts Training in Crop-Related Disciplines                  | 11.6 man-years/139 man-months<br>29.0 man-years | U.K. records, Gaborone or GOB/MOF<br>U.N. records, Gaborone or GOB/MOF<br>GOB Budget | GOB, contractors, suppliers, and shippers make inputs available on time as required.   |
| Commodities for Crop Division and Research Activities  | \$138,000                                       |  |  |
| Storage Warehouses (5)   | \$161,000                                       |  |  |
| Crop Research Workshop   | \$ 17,250                                       |  |  |
| Housing (3) for USAID Technicians  | \$ 82,000                                       |  |  |
| Budget Support for Crop Division and Research Activities   | \$ 80,000                                       |  |  |
|  | \$763,000                                       |  |  |
|  | \$954,000                                       |  |  |
|  | \$1,386,000                                     |  |  |
| <b>GOB:</b> Technical Assistance   | \$ 82,000                                       |  |  |
| U.K. 1/ Crop-Related Research Projects (3)   |   |  |  |
| U.N. 2/ Market Board Support (Salaries)  |   |  |  |
| General Services   |   |  |  |
| <u>1/</u> Inputs not directly a part of this project, but related to GOB crop production activities. |   |  |  |
|  |   |  | <u>Beginning of Project Status:</u><br>1. Crop Division in MOA established but not staffed.<br><br>2. Substantial and encouraging dry land farming research performed by U.K. team but requires further development. |



ANNEX IV

D.D. 63/2/1

25th February, 1976

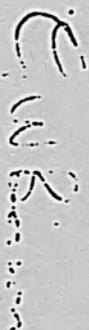
Mr. G. W. Bosson  
 Chief of the Economic Planning  
 Section, Ministry of Finance  
 100, Rue de la Loi  
 Brussels, Belgium

Dear Sir,

COOP PROMOTION OFFICE

Further to the recent discussions between CAAD, the Ministry of Agriculture and the Ministry of Finance and Development Planning, I write to confirm that the Government of Botswana seeks the assistance of your office in respect of activities namely the establishment of a credit promotion division, the provision of additional credit storage facilities for the HFB and the training of Botswana counterparts staff.

Yours sincerely



G. W. Bosson  
 For/Permanent Secretary

cc. P.D., Ministry of Agriculture.

Mr. G. W. Bosson is Chief of the Economic Planning Section,  
 charged with coordinating donor assistance to the GOB under  
 the Permanent Secretary of the Ministry of Finance.

## ANNEX V

Job Descriptions  
U. S. -Funded Technicians  
Botswana Crop Production Project

I. General

The Crop Division's table of organization provides for a Chief Crop Improvement Officer (CCIO), a Crop Program Officer (CPO), a Crop Marketing Officer, and a Horticulturalist. The CCIO, CPO, and a Crop Screening Officer (CSO) to be assigned to the Research Division will be supported by this project.

II. Chief Crop Improvement Officer (CCIO)

The CCIO should be a person of considerable inter-disciplinary development experience. Formal training in agronomy is essential. An advance degree is desirable. Professional experience should include a general knowledge of dry land crop systems with particular emphasis on sorghum. Managerial and developmental project experience and a keen and sensitive understanding of the role of social science in development are necessary and essential. In addition, technical competence is expected.

The CCIO will have the following responsibilities:

- A. Prepare policy proposals and programs in crop development;
- B. See that research findings are translated into practical extension and demonstration activities;
- C. In cooperation with Field Services staff, inform the Research Division of farmer problems requiring attention;
- D. Serve as technical backstop officer to field services on extension programs concerning crop production and other crop problems;
- E. Make recommendations regarding social science, baseline, and evaluation studies;
- F. Prepare requests for consultancies; and
- G. When appropriate, organize and chair a task force of specialists to address crop-related problems.

### III. Crop Program Officer (CPO)

The formal training of the CPO will be in extension and/or vocational agriculture. Training or experience in sociology is desirable. Experience in the preparation of training materials and extension programming is essential. In addition, the incumbent must be willing and interested in developing innovative and unorthodox processes to attract unsophisticated rural people and to cause them to adopt changed systems of crop farming.

The CPO's responsibilities are as follows:

- A. Prepare training materials based on findings of research and crop trials;
- B. Be alert to farmers' problems and needs and maintain close liaison with field services;
- C. Organize and conduct in-service courses for extension service personnel at their request;
- D. Recommend and undertake evaluation efforts into the effectiveness of extension programs as reflected by farmer acceptance of recommended technological changes;
- E. Maintain close liaison with research;
- F. Take part in design and evaluation of field and farm trials; and
- G. Serve as advisor to regional and district extension personnel upon request.

### IV. Crop Screening Officer (CSO)<sup>1/</sup>

~~Crop improvement~~ under dry land conditions has been a major British-funded component to the cereal program. However, crop screening is not covered under their activity. The GOB, aware of the U. S. internationally recognized competency in sorghum technology, has specifically requested AID for assistance in this field.

The Crop Screening Officer (CSO) will work in cooperation with the dry land farming research team. This team consists of an agricultural engineer,

<sup>1/</sup> The term Crop Screening Officer, as used by the GOB, is equivalent to a Field Trials Officer in U. S. research terminology.

a plant physiologist and a crop production specialist.

The CSO will have the following responsibilities:

- A. Screen sorghum varieties, investigate bullrush, millet, cowpeas and maize, as time permits;
- B. Coordinate with international centers working on sorghum and other crops of interest to Botswana;
- C. Establish contact with U. S. research institutions supported by AID; and
- D. Assist the CPO in preparing training materials.

## ANNEX VI

Cost Estimates  
Botswana Crop Production Project  
FY 1976 - 1980  
(000 US\$)

|     |   | <u>Foreign<br/>Exchange</u> | <u>Local<br/>Currency</u> | <u>TOTAL</u> |
|-----|---|-----------------------------|---------------------------|--------------|
| I.  | <del>GRAND TOTAL</del>                      | <u>2,104</u>                | <u>2,823</u>              | <u>4,927</u> |
| S   |   |                             |                           |              |
| U   |   |                             |                           |              |
| M   | (A. USAID                                   | 1,401                       | 341                       | 1,742        |
| M   | (B. GOB                                     | --                          | 1,717                     | 1,717        |
| A   | (C. United Kingdom                          | 621                         | 765                       | 1,386        |
| R   | (D. United Nations                          | 82                          | --                        | 82           |
| Y   |   |                             |                           |              |
| II. | USAID                                       | <u>1,401</u>                | <u>341</u>                | <u>1,742</u> |
| A.  | Technical Assistance                        | <u>1,041</u>                |                           | <u>1,041</u> |
|     | 1. Chief Crop Improvement Officer           | 287                         | --                        | 287          |
|     | 2. Crop Program Officer                     | 246                         | --                        | 246          |
|     | 3. Crop Screening Officer                   | 164                         | --                        | 164          |
|     | 4. Contract Agency's Fee/<br>Technicians    | 68                          | --                        | 68           |
|     | 5. Consultants and Research<br>Coordination | 240                         | --                        | 240          |
|     | 6. Contingency, Item A5, 15%                | 36                          | --                        | 36           |
| B.  | Participant Training                        | <u>222</u>                  |                           | <u>222</u>   |
|     | 1. Seven for 3 years, U. S.                 | 182                         | --                        | 182          |
|     | 2. Four for 2 years, Africa                 | 40                          | --                        | 40           |
| C.  | Commodities                                 | <u>138</u>                  |                           | <u>138</u>   |
|     | 1. Four vehicles @\$10,000 ea.              | 40                          | --                        | 40           |
|     | 2. Training Supplies and Equipment          | 35                          | --                        | 35           |
|     | 3. Research and Laboratory<br>Equipment     | 25                          | --                        | 25           |
|     | 4. Office Supplies and Equipment            | 20                          | --                        | 20           |
|     | 5. Contingency, All Commodities, 15%        | 18                          | --                        | 18           |

|  | <u>Foreign<br/>Exchange</u> | <u>Local<br/>Currency</u> | <u>TOTAL</u> |
|--|-----------------------------|---------------------------|--------------|
| D. Local Costs   |                             | <u>341</u>                | <u>341</u>   |
| 1. Housing for three Families<br>@ \$24,000 ea.                      | ---                         | 72                        | 72           |
| 2. Crop Research Workshop  | ---                         | 15                        | 15           |
| 3. Grain Storage Warehouses<br>@ \$24,000 ea.                        | ---                         | 120                       | 120          |
| 4. Inflation Factor (IF), Item D3:<br>'77-78 = 10%                   | ---                         | 20                        | 20           |
| 5. Budgetary Support   | ---                         | 80                        | 80           |
| 6. Contingency, Items D1, D2,<br>D2, 15%                             | ---                         | 34                        | 34           |
| GOB  | <u>---</u>                  | <u>1,717</u>              | <u>1,717</u> |
| A. General Services  | <u>---</u>                  | <u>151</u>                | <u>151</u>   |
| 1. Serviced Land (Housing)   | ---                         | 15                        | 15           |
| 2. Office Space  | ---                         | 9                         | 9            |
| 3. Vehicle Maintenance (including<br>fuel)                           | ---                         | 33                        | 33           |
| 4. Inflation Factor (IF), Item A3:<br>FY 78-79 = 10%; FY 79-80 = 10% | ---                         | 3                         | 3            |
| 5. Travel and Transportation<br>(In-Country)                         | ---                         | 9                         | 9            |
| 6. IF, Item A5: FY 78-79 = 10%;<br>FY 79-80 = 10%                    | ---                         | 1                         | 1            |
| 7. Clerical (three Secretaries)                                      | ---                         | 10                        | 10           |
| 8. IF, Item A7: FY 79-80 = 15%<br>Wage Increase                      | ---                         | 3                         | 3            |
| 9. Training Support (Participants)                                   | ---                         | 62                        | 62           |
| 10. IF, Item A9: FY 78-79 = 10%;<br>FY 79-80 = 10%                   | ---                         | 6                         | 6            |
| B. Agricultural Research Division<br>Support                         | <u>---</u>                  | <u>124</u>                | <u>124</u>   |
| 1. Salaries  | ---                         | 70                        | 70           |
| 2. IF, Item B1: FY 79-80 = 15%<br>Wage Increase                      | ---                         | 18                        | 18           |
| 3. Services  | ---                         | 25                        | 25           |
| 4. IF, Item B3: FY 78-79 = 10%;<br>FY 79-80 = 10%                    | ---                         | 3                         | 3            |
| 5. Maintenance   | ---                         | 7                         | 7            |
| 6. IF, Item B5: FY 78-79 = 10%;<br>FY 79-80 = 10%                    | ---                         | 1                         | 1            |

|  | <u>Foreign<br/>Exchange</u> | <u>Local<br/>Currency</u> | <u>TOTAL</u> |
|--|-----------------------------|---------------------------|--------------|
| C. Agricultural Extension Service Support          |                             |                           |              |
| 1. Salaries  | <u>--</u>                   | <u>1,442</u>              | <u>1,442</u> |
| 2. IF, Item C1: FY 79-80 = 15%<br>Wage Increase    | <u>--</u>                   | <u>693</u>                | <u>693</u>   |
| 3. Travel and Transportation                       | <u>--</u>                   | <u>35</u>                 | <u>35</u>    |
| 4. IF, Item C3: FY 78-79 = 10%;<br>FY 79-80 = 10%  | <u>--</u>                   | <u>399</u>                | <u>399</u>   |
| 5. Services  | <u>--</u>                   | <u>41</u>                 | <u>41</u>    |
| 6. IF, Item C5: FY 78-79 = 10%;<br>FY 79-80 = 10%  | <u>--</u>                   | <u>215</u>                | <u>215</u>   |
| 7. Maintenance                                     | <u>--</u>                   | <u>22</u>                 | <u>22</u>    |
| 8. IF, Item C7: FY 78-79 = 10%;<br>FY 79-80 = 10%  | <u>--</u>                   | <u>33</u>                 | <u>33</u>    |
|  | <u>--</u>                   | <u>4</u>                  | <u>4</u>     |
| IV. United Kingdom                                 | <u>621</u>                  | <u>765</u>                | <u>1,386</u> |
| A. Dry Land Farming Research                       |                             |                           |              |
| 1. Recurrent Costs                                 | <u>198</u>                  | <u>85</u>                 | <u>283</u>   |
| 2. Capital Costs                                   | <u>167</u>                  | <u>85</u>                 | <u>252</u>   |
|  | <u>31</u>                   | <u>--</u>                 | <u>31</u>    |
| B. Evaluation of Farming Systems and<br>Implements |                             |                           |              |
| 1. Recurrent Costs                                 | <u>36</u>                   | <u>147</u>                | <u>183</u>   |
| 2. Capital Costs                                   | <u>--</u>                   | <u>107</u>                | <u>107</u>   |
|  | <u>36</u>                   | <u>40</u>                 | <u>76</u>    |
| C. Integrated Farming Pilot Project                |                             |                           |              |
| 1. Recurrent Costs                                 | <u>387</u>                  | <u>533</u>                | <u>920</u>   |
| 2. Capital Costs                                   | <u>237</u>                  | <u>325</u>                | <u>562</u>   |
|  | <u>150</u>                  | <u>208</u>                | <u>358</u>   |
| V. United Nations                                  | <u>82</u>                   | <u>--</u>                 | <u>82</u>    |

Explanatory Notes  
Cost Estimates  
Botswana Crop Production Project  
FY 1976 - FY 1980

1. Estimates: Prepared February 1976, by OSARAC/REDSO staff at Mbabane.
2. Conversion Rate: US\$ 1 = R . 868
3. Technical Assistance: Estimates include salaries, travel and per diem for personnel and dependents, applicable allowances (education, transfer, etc.), fees for passports, visas, health examinations, immunizations and vaccinations. Calculated as follows:
  - Technicians - \$90,000 per technician per staff year. Total of 5 man-years.
  - Consultants - \$6,000 per consultant per man-month. Total of 57 staff-months. Includes three S/Ms for local training in warehouse management.
  - Research Coordination - \$18,000 for international travel and per diem.
4. Participants: Three-year trainees calculated at \$10,000 for first year and \$8,000 per year thereafter. Two-year trainees calculated at \$5,000 per year. Per USAID Circular A-322 dated June 4, 1975.
5. Vehicles (4): Six cylinder, 4-wheel drive, 3/4 ton pickup with standard equipment except second spare tire and wheel. No power options, 4-speed manual shift, includes spare parts. Estimate per STATE 13121 dated January 19, 1976.
6. Training Supplies and Equipment: Includes (2) mobile generators, (2) movie projectors, (2) 35 mm. slide projectors, (2) VU-graph projectors, (4) screens, darkroom equipment, film, paper, paints, inks and other supplies and equipment considered necessary by the CPO.
7. Research and Laboratory Equipment: Includes Vogel nursery thrasher, seed cleaner, seed dryers, sanitary scales, commodity scales, floor scales, chemicals, reagents, film, calculator, adding machine, typewriter and other equipment and supplies deemed essential by the CSO.
8. Office Supplies and Equipment: Includes photocopier, mimeograph machine, office furniture, typewriters, file cabinets, and other supplies and equipment considered necessary by the CCIO.

9. Houses (3): Estimate of \$24,000 per unit provided by Botswana Housing Corporation for three-bedroom "Type II" house plus servants' quarters. Includes up to \$2,000 for furniture.
10. Crop Research Warehouse: 500-ton capacity units, 60' x 30' x 12'. Estimate provided by St. Clair Sheet Metal & Steel Structures (Fty.) Ltd., Gaborone, Botswana.
11. Grain Storage Warehouses (5): 1,000-ton capacity units, 90' x 40' x 17'. Estimates provided by St. Clair Sheet Metal & Steel Structures (Fty.) Ltd., Gaborone, Botswana.
12. Budgetary Support: Primarily for implementation of crop production programs. These will be jointly funded such that USAID inputs will be on a declining scale whereas GOB contributions will increase until the latter can fully fund programs after the project is terminated. Includes up to \$10,000 for in-service training in warehouse management.
13. Contingency Costs: To cover changes found necessary during the actual work phase. These particularly apply to commodities as the technicians may very likely identify needs in addition to those considered by the estimators.
14. Serviced Land: \$5,000 per lot. Estimate provided by Botswana Housing Corporation.
15. Office Space: Office space will be the same as that provided to GOB staff of comparable rank. Estimate provided by GOB/Ministry of Finance (MOF).
16. Clerical Support (3): \$1,380 per year, '77-79, plus '79-80 wage increase =  $1.10 \times \$1,380 = \$1,518$ . Total =  $(6 \times \$1,380) + (3 \times \$1,518) = \$13,008$ . Per GOB/MOF estimate.
17. GOB Training Support: Three-year trainees at \$2,925 first year, \$2,400 the second year and \$2,650 the third; two-year trainees at \$1,600 first year and \$1,320 the second. (Funded at 100% the first year and 75% for subsequent years.) Per GOB/MOF.
18. GOB Salaries: Based on proportion of time spent on crop-related activities.
19. Services (ARD): Soil and plant analysis, seeds and fertilizers for crops.
20. Maintenance: Pro-rated share of cost for maintaining equipment, buildings and grounds.

21. Travel and Transportation (AES): Pro-rated share of extension personnel travel related to project activities.
22. Services (AES): Includes industrial class, stores, extension materials, shows and prizes.
23. UK Budgets: Includes FY 1974/75 and FY 1975/76 funding for the Dry Land Research and Evaluation projects. These funds are included in the financial analyses to fully reflect other donor contributions and more accurately show the relative significance of crop-related project activities in terms of costs. Allowances for price increases and contingency costs are imputed in the figures shown.
24. UN Contributions: For direct support (salaries) Botswana Agriculture Marketing Board. For UN Representative, Gaborone.

Financial Summary of AID Obligations by Fiscal Year\*  
Botswana Crop Production Project  
FY 1976 - FY 1979  
(000 US\$)

|  | <u>FY 76</u> | <u>FY 77</u> | <u>FY 78</u> | <u>FY 79</u> | <u>FY 76-79</u> |
|--|--------------|--------------|--------------|--------------|-----------------|
| A. Technical Assistance                                | <u>138</u>   | <u>202</u>   | <u>372</u>   | <u>329</u>   | <u>1,041</u>    |
| 1. Chief Crop Improvement Officer                      | 135          | -            | 90           | 90           | 315             |
| 2. Crop Program Officer                                | -            | 95           | 85           | 90           | 270             |
| 3. Crop Screening Officer                              | -            | -            | 90           | 90           | 180             |
| 4. Consultants and Research Coordination               | 3            | 93           | 93           | 51           | 240             |
| 5. Contingency, Item A4, 15%                           | -            | 14           | 14           | 8            | 36              |
| B. Training  | <u>10</u>    | <u>78</u>    | <u>76</u>    | <u>58</u>    | <u>222</u>      |
| 1. Seven for 3 years, U. S.                            | 10           | 68           | 56           | 48           | 182             |
| 2. Four for 2 years, Africa                            | -            | 10           | 20           | 10           | 40              |
| C. Commodities   | <u>92</u>    | <u>24</u>    | <u>22</u>    | <u>-</u>     | <u>138</u>      |
| 1. Four Vehicles @ \$10,000 ea.                        | 40           | -            | -            | -            | 40              |
| 2. Training Supplies and Equipment                     | 20           | 8            | 7            | -            | 35              |
| 3. Research and Laboratory Equipment                   | 10           | 8            | 7            | -            | 25              |
| 4. Office Supplies and Equipment                       | 10           | 5            | 5            | -            | 20              |
| 5. Contingency, All Commodities, 15%                   | 12           | 3            | 3            | -            | 18              |
| D. Local Costs   | <u>100</u>   | <u>96</u>    | <u>130</u>   | <u>15</u>    | <u>341</u>      |
| 1. Houses @ \$24,000 ea.                               | 72           | -            | -            | -            | 72              |
| 2. Crop Research Workshop                              | 15           | -            | -            | -            | 15              |
| 3. Grain Storage Warehouses @ \$24,000 ea.             | -            | 48           | 72           | -            | 120             |
| 4. Inflation Factor, Item D3, 77-78 = 10%; 78-79 = 10% | -            | 5            | 15           | -            | 20              |
| 5. Budgetary Support                                   | -            | 35           | 30           | 15           | 80              |
| 6. Contingency, Items D1, D2, D3, 15%                  | 13           | 8            | 13           | -            | 34              |
| E. GRAND TOTAL   | <u>340</u>   | <u>400</u>   | <u>600</u>   | <u>402</u>   | <u>1,742</u>    |

Estimates prepared February 1976 by OSARAC/REDSO staff at Mbabane.

Projected Accrued Expenditures\*  
Botswana Crop Production Project  
FY 1977 - FY 1981  
(000 US\$)

|                                    | <u>TOTAL</u> | <u>L.Q.</u> | <u>FY77</u> | <u>FY78</u> | <u>FY79</u> | <u>FY80</u> | <u>FY81</u> |
|------------------------------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|
| A. Technical Assistance            | 1,041        | -0-         | 161         | 346         | 324         | 202         | 8           |
| 1. Chief Crop Improvement Officer  | 315          |             | 37          | 90          | 90          | 90          | 8           |
| 2. Crop Program Officer            | 270          |             | 37          | 90          | 90          | 53          |             |
| 3. Crop Screening Officer          | 180          |             | 15          | 90          | 75          |             |             |
| 4. Consultants                     | 255          |             | 69          | 69          | 62          | 55          |             |
| 5. Research Coordination           | 21           |             | 3           | 7           | 7           | 4           |             |
| B. Training                        | <u>222</u>   | <u>-0-</u>  | <u>-0-</u>  | <u>75</u>   | <u>79</u>   | <u>68</u>   | <u>-0-</u>  |
| 1. Seven for 3 years, U. S.        | 182          |             |             | 65          | 59          | 58          |             |
| 2. Four for 2 years, Africa        | 40           |             |             | 10          | 20          | 10          |             |
| C. Commodities                     | <u>138</u>   | <u>-0-</u>  | <u>93</u>   | <u>45</u>   | <u>-0-</u>  | <u>-0-</u>  | <u>-0-</u>  |
| 1. Four Vehicles                   | 46           |             | 46          |             |             |             |             |
| 2. Training Supplies and Equipment | 40           |             | 23          | 17          |             |             |             |
| 3. Research and Lab Equip.         | 29           |             | 12          | 17          |             |             |             |
| 4. Office Supplies and Equip.      | 23           |             | 12          | 11          |             |             |             |
| D. Local Costs                     | <u>341</u>   | <u>-0-</u>  | <u>190</u>  | <u>128</u>  | <u>19</u>   | <u>4</u>    | <u>-0-</u>  |
| 1. Houses                          | 83           |             | 83          |             |             |             |             |
| 2. Crop Research Workshop          | 17           |             | 17          |             |             |             |             |
| 3. Grain Storage Warehouses        | 161          |             | 64          | 97          |             |             |             |
| 4. Budgetary Support               | 80           |             | 26          | 31          | 19          | 4           |             |
| <u>TOTAL</u>                       | <u>1,742</u> | <u>-0-</u>  | <u>444</u>  | <u>594</u>  | <u>422</u>  | <u>274</u>  | <u>8</u>    |

## Notes:

- 1) Prepared February 1976 by OSARAC/REDSO staff.
- 2) Appropriate inflation and contingency factors are included in line items.

## ANNEX VII

## Waivers and Approvals

I. Waivers and Approvals Required

- A. A procurement source and origin waiver from AID Geographic Code 000 (U.S. only) to Code 935 for procurement of construction materials and of project vehicles (four 3/4 ton pick-up trucks); and a waiver of the provisions of Section 636 (i) of the Foreign Assistance Act to permit procurement of project vehicles from non-U.S. source and origin.
- B. Approval to deviate from policy expressed in AID Handbook 11, Chapter 2, which limits employment of third country nationals for AID-financed construction to 20% of the non-local work force.
- C. Waiver of policy set forth in AID Handbook 11 to permit procurement of construction services and equipment maintenance and repair services from Free World firms in equal preference to U.S. and local firms, and/or joint ventures of such firms.

II. Justification for Source and Origin Waiver for Construction Materials and Project VehiclesA. Summary Waiver Information

|                          |   |
|--------------------------|---|
| Cooperating Country:     | Botswana  |
| Authorizing Document:    | PP  |
| Project:                 | Botswana Crop Production  |
| Nature of Funding:       | Grant   |
| Description:             | Construction materials for housing, workshop and storage warehouses - \$196,000; four 3/4 ton pick-up trucks - \$46,000 |
| Approximate total value: | \$242,000   |
| Probable Source:         | South Africa or United Kingdom  |

B. Discussion and JustificationConstruction Materials

Construction materials will be used in building the crop research workshop, grain storage warehouses, and three houses for the AID-financed technicians (see PP, Annex VI, "Explanatory Notes" for description of these facilities). The cost of construction materials is estimated at \$196,000; i.e. 75% of the total cost of construction. Although it is not expected that all materials will be procured from South Africa, a waiver is requested for the full estimated cost. This is necessary because the fixed amount reimbursement method will be used, making the

distinction between procurement sources difficult, if not impossible.

It would not be practical to purchase U.S. items in the small quantities needed when private dealers in Botswana are equipped only to service and repair equipment made in South Africa and the U.K. Moreover, considering shipping costs and small quantities involved, U.S. delivered prices would substantially exceed prices for comparable items procured in South Africa. The long lead time required to procure from the U.S. could also delay project implementation if construction of housing for AID-financed technicians was delayed. The severe shortage of housing in Botswana makes it imperative that construction begin at the earliest possible date.

### Vehicles

This project requests approval to purchase vehicles of local source but of Code 935 origin. The vehicles are four pick-up trucks, 4-speed manual, 3/4 ton, 6 cylinder engine with 8-foot bed. Vehicles will be used by AID-financed technicians and consultants and by the Government of Botswana counterparts assigned to these technicians. A waiver is requested for the procurement of Ford, IHC, or Chevrolet vehicles based on (1) the lack of repair capability (both in parts availability and in mechanic skills) and (2) safety hazards for the AID-financed technical staff resulting from driving left-hand drive vehicles.

OSARAC has encountered several problems with U.S. manufactured vehicles procured under other on-going projects in Botswana. The Central Transport Office of the Government of Botswana, which has vehicle maintenance responsibility, has serious problems in securing repair parts for U.S. manufactured vehicles. The office also has no mechanics who understand or have experience in any component area of the U.S. vehicles, i.e. engine, running gear, transmission, axles, transfer case or body. The result is that these vehicles have remained "deadlined" for extensive periods of time and when released, repairs often promptly prove inadequate.

As a further problem, and while noting that to date no accidents have occurred in Botswana, it is clear that improper driving position (i.e. left hand drive) of U.S. vehicles in all Southern Africa locations is a genuine hazard. OSARAC has discussed this problem with representatives of U.S. manufacturers which assure that production costs would be substantially increased for such a small lot order.

In addition to a procurement source waiver under AID Handbook 15, this action request requires a waiver under Section 636 (i) of the Foreign Assistance Act. Section 636 (i) limits AID financing to U.S. manufactured vehicles, but permits a waiver of this limitation "where special circumstances exist". According to the appropriate Conference Report, "special circumstances" are deemed to exist in "emergency or special situations such as a need for right hand drive or other types of vehicles not produced in the United States".

Based on the foregoing, we believe that "special circumstances" within the meaning of the legislative history do exist in this case and that a waiver to the U.S. vehicle requirement of Section 636 (i) is justified.

III. Justification for Deviation from Policy in AID Handbook Regarding Employment of Third Country Nationals (TCN's)

Contractors constructing the three houses, workshop, and warehouse facilities may require technical and supervisory services of TCN's to handle electrical, plumbing, and other design and installation since local expertise may not be available. As the total cost of construction will be only \$261,000, U.S. firms and personnel will not likely be interested in this work. Therefore, deviation from the employment policy in AID Handbook 11 to permit hiring of TCN's is considered necessary.

IV. Justification for Waiver of Policy Set Forth in AID Handbook 11 to Permit Procurement of Services from Free World Firms

The need for this waiver is based on the following:

A. Since the total cost of construction will be only \$261,000, U.S. construction firms are not expected to be interested in this work.

B. A sufficient number of qualified local firms operating in Botswana are available to perform the required construction and permit competitive procurement. Possibly a number of firms may be qualified as "local firms" under Section 2 (d) (2) of HB 11 (Chapter 2), on the grounds that they are integral parts of the local economy. However, since some of the firms operating locally may not be incorporated in or may not have their primary place of business in Botswana, this waiver is considered necessary to assure adequate competition and availability of services. Customary GOB contracting procedures will be used.

C. In addition, it is anticipated that some maintenance and repair services will have to be provided by local firms, many of which may also be owned by South African or other Free World interests.

D. No U.S. firms providing the required services are known to exist in Botswana.

## ANNEX VIII

Draft of Project Description for Project Agreement  
Botswana Crop Production Project

This project supports the Government of Botswana's (GOB) effort to develop and expand programs in cereal crop production, with particular reference to sorghum so that Botswana will have the institutional capacity with which to identify and react to opportunities in arid land crop development. This institution will be able to integrate crop research, social science research and extension; recommend policy; create programmatic activities; support their implementation; and have trained field staff in crop production operations. The project will staff key positions in a new GOB-created Crop Division in the Ministry of Agriculture (MOA). This division will prepare crop development policy recommendations which, when accepted by MOA, will be converted into programs and projects supported by the division. The division will coordinate and provide liaison with crop research at the Research Station, other donor activities in crops, the extension system, the crop marketing board and contacts with international crop research bodies. In addition, it will act as a feedback mechanism between and among these groups and, ultimately, the farmer. The project will include financial support for storage of crops at the local level; research support including staff and a crop research workshop; participant training and commodities. The project will support the development of new dry land farming systems requiring minimum inputs for grains -- sorghum, millet and pulses. The project also will focus on developing and field testing innovative technological transfer methods acceptable to the small farmer.