

I. PROJECT IDENTIFICATION

| | | |
|--|--|---|
| 1. PROJECT TITLE Botswana Range and Livestock Management | | APPENDIX ATTACHED <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |
| 3. RECIPIENT (specify) <input checked="" type="checkbox"/> COUNTRY <u>Botswana</u> <input type="checkbox"/> REGIONAL <input type="checkbox"/> INTERREGIONAL | | 2. PROJECT NO. (M.O. 1095.2) 690-11-130-015 |
| 4. LIFE OF PROJECT BEGINS FY <u>73</u> ENDS FY <u>79</u> | | 5. SUBMISSION <u>4/1/73</u> <input checked="" type="checkbox"/> ORIGINAL DATE <input type="checkbox"/> REV. NO. DATE CONTR/PASA NO. |

II. FUNDING (\$000) AND MAN MONTHS (MM) REQUIREMENTS

| A. FUNDING BY FISCAL YEAR | B. TOTAL \$ | C. PERSONNEL | | D. PARTICIPANTS | | E. COMM. CD. ITIES \$ | F. OTHER COSTS \$ | G. PASA/CONTR. | | H. LOCAL EXCHANGE CURRENCY RATE: \$ US _____ (U.S. DOLLAR) | | | |
|---------------------------------------|-------------------|--------------|-----------|-----------------|-----------|--------------------------------|----------------------------|----------------|-----------|--|------------|------------------|--|
| | | (1) \$ | (2) MM | (1) \$ | (2) MM | | | (1) \$ | (2) MM | (1) U.S. GRANT LOAN | | (2) COOP COUNTRY | |
| | | | | | | | | | | (A) JOINT | (B) BUDGET | | |
| 1. PRIOR YEARS ACTUAL FY | - | - | - | - | - | - | - | | | | | | |
| 2. OPRN FY 73 | 300 | 140 | 48 | - | - | 30 | 130 | | | | | | |
| 3. BUDGET FY 74 | 317 | 210 | 75 | 29 | 72 | 38 | 40 | | | | | | |
| 4. BUDGET +1 FY 75 | 342 | 235 | 75 | 37 | 96 | - | 70 | | | | | | |
| 5. BUDGET +2 FY 76 | 261 | 225 | 75 | 36 | 84 | - | - | | | | | | |
| 6. BUDGET +3 FY 77 | 284 | 255 | 75 | 29 | 60 | - | - | | | | | | |
| 7. ALL SUBQ. FY | 82 | 65 | 15 | 17 | 24 | - | - | | | | | | |
| 8. GRAND TOTAL | 1526 | 1130 | 363 | 148 | 336 | 68 | 240 | | | | | | |

9. OTHER DONOR CONTRIBUTIONS

| | | |
|---|--|-------------------|
| (A) NAME OF DONOR UNDP Great Britain, MOD | (B) KIND OF GOODS/SERVICES OPAS-OPEX Staff in MOA Divisions Related to Project. Financial Support to Agr Research Used by Proj. | (C) AMOUNT N/A |
|---|--|-------------------|

III. ORIGINATING OFFICE CLEARANCE

| | | |
|--|---|----------------|
| 1. DRAFTER Johnson/ODA Winter, Schaefer/REDSO/EA | TITLE Project Designers | DATE 3/6/73 |
| 2. CLEARANCE OFFICER RStacy JWithers | TITLE OSARAC REDSO/EA | DATE 4/1/73 |

IV. PROJECT AUTHORIZATION

1. CONDITIONS OF APPROVAL

1. Waiver of certain AID source and origin procurement requirements and approval of certain procedures as outlined in the attached continuation sheet. The signature of the Assistant Administrator for Africa of this project authorization, among other things, certifies that the exclusion of procurement of the nature outlined herein would seriously impede the attainment of U.S. foreign policy objectives and the objectives of the Foreign Assistance Program and that waiver of AID regulations requiring such exclusion serves the best interest of the United States.

2. CLEARANCES

| BUR/OFF. | SIGNATURE | DATE | BUR/OFF | SIGNATURE | DATE |
|----------|-------------------------|--------|---------|-----------------|--------|
| AFR/DS | Princeton Lyman (Draft) | 5/2/73 | AFR/DP | Edward Logan | 5/2/73 |
| AFR/ESA | Jerry Knoll (Draft) | 5/2/73 | AA/AFR | Donald S. Brown | |

| | |
|--|---|
| 3. APPROVAL AAS OR OFFICE DIRECTORS SIGNATURE: <u>Samuel C. Adams</u> TITLE: Assistant Administrator for Africa | 4. APPROVAL AID (See M.O. 1025.1 VI C) SIGNATURE: _____ DATE: _____ ADMINISTRATOR, AGENCY FOR INTERNATIONAL DEVELOPMENT |
|--|---|

**CERTIFICATION AND RECORD OF WAIVER,^{1/}
REGULATORY DETERMINATION, DEVIATION OR DEPARTURE**

WAIVER CONTROL NO.

AFR/W/73/013 -

BUR. OF FICE SYMBOL - SER. NO.

(This certification does not convey any waiver authority beyond that provided in applicable directives)^{2/}

| | | | | | |
|--|--|---------------------|--------------|---------------------------------------|--|
| PART A | | DOCUMENT NUMBER | | PROJECT, LOAN, GRANT, OR CONTRACT NO. | |
| DOCUMENT TITLE Source Origin Procurement/Services | | | | 690-11-130-015 | |
| WAIVER EFFECTIVE DATE May 1, 1973 | WAIVER TERMINATION DATE June 30, 1979 | COUNTRY Botswana | COUNTRY CODE | DOLLAR AMOUNT OF WAIVER \$75,000 | |

| CHECK BOX | PROCUREMENT WAIVERS ^{1/} | MONITORING OFFICE ^{3/} | CHECK BOX | OTHER WAIVERS ^{1/} | MONITORING OFFICE ^{3/} |
|--|--|---------------------------------|--------------------------|--|---------------------------------|
| GENERAL | | | | | |
| <input checked="" type="checkbox"/> | Commodity Source Origin | PROC/IRD | <input type="checkbox"/> | Standard Loan Provisions (M.O. 1265 1.1) | PPC/CA |
| <input type="checkbox"/> | Componentry Rules | PROC/IRD | <input type="checkbox"/> | Foreign Assistance Act, Section 636(b)... | GC |
| <input checked="" type="checkbox"/> | Service Contracting Source | PROC/CSD | <input type="checkbox"/> | Other Foreign Assistance Act Sections (Specify) _____ | GC |
| <input type="checkbox"/> | Monthly Summary of Minimum Value Transactions | PROC/IRD | <input type="checkbox"/> | Executive Orders on Security | |
| <input type="checkbox"/> | Proprietary Procurement | PROC/IRD | <input type="checkbox"/> | Employees <input type="checkbox"/> Contractors <input type="checkbox"/> PASA's | A/SEC |
| <input type="checkbox"/> | Standard Commodity Financing Procedure | PROC/IRD | <input type="checkbox"/> | A.I.D. Directives on Security | |
| <input type="checkbox"/> | Marking Requirements | PROC/SB | <input type="checkbox"/> | Employees <input type="checkbox"/> Contractors <input type="checkbox"/> PASA's | A/SEC |
| <input type="checkbox"/> | Special Provisions of Commodity Procurement Instructions | PROC/IRD | <input type="checkbox"/> | A.I.D. Personnel Regulations (Specify) _____ | PM/PPE |
| <input type="checkbox"/> | Barter Transaction | PROC/IRD | <input type="checkbox"/> | CSC and FPM Regulations (Specify) _____ | PM/PPE |
| <input type="checkbox"/> | Special Development Activity Authority | PROC/SB | <input type="checkbox"/> | A.I.D. Travel Regulations (Specify) _____ | A/AS |
| <input checked="" type="checkbox"/> | A.I.D. REGULATION I. | PROC/SB or C/FRD | <input type="checkbox"/> | Other Directives ^{2/} (Specify) _____ | GC |
| FPR & AIDPR | | | | | |
| <input type="checkbox"/> | Waiver Determination & Finding | PROC/CSD | | | |
| <input type="checkbox"/> | Deviation | PROC/CSD | | | |
| A.I.D. CAPITAL PROJECT GUIDELINES | | | | | |
| <input type="checkbox"/> | Departure (M.O. 1440.1) | PPC/CA | | | |

PART C The provisions of (specify the directive): _____ Section: _____ Paragraph: _____

are being waived as follows: M.O. 1412.1, 1412.1.2 and 1414.1.

To permit contracting locally for the construction of five (5) houses and one (1) laboratory building with an estimated value of \$75,000 in waiver required commodities and third-country national supervisory and specialist personnel.

References:

BOTSWANA RANGE AND LIVESTOCK MANAGEMENT PROJ
(Continue on reverse if necessary)

PART D

I CERTIFY that the waiver described above is approved by me pursuant to the cited provisions of the directive indicated above, and that I am authorized to take the action described above and in the attached documents by virtue of authority delegated to me by (specify the directive containing your delegation of authority) M.O. 1414.1.1 and I am distributing this certification as follows: Signed original to PPC/SRD, signed copy to the Monitoring office indicated above, and signed copy to the following official file (indicate by office symbol) AFR/ESA.

| | | |
|---|---------------|------------------|
| NAME AND TITLE Dr. Samuel C. Adams, Jr. AA/AFR | SIGNATURE | DATE 5/3/1973 |
|---|---------------|------------------|

^{1/} The term "waiver" as used throughout this form shall be interpreted to include Waivers, Regulatory Determinations, Deviations and Departures as appropriate.

^{2/} The term "directive" as used throughout this form shall be interpreted to include as appropriate the AID manual orders and circulars; AID regulations and directives, including AID and Federal procurement regulations; CSC and FPM regulations; the Foreign Assistance Act and applicable Executive Orders.

^{3/} The monitoring office is sometimes but not always a clearing or concurring office. All clearances, concurrences, and approvals of waivers are to be in accordance with the directive authorizing the waivers.

Continuation Sheet
Botswana Range and Livestock Management PROP
Section IV.1 Conditions of Approval, cont'd

The following waivers are requested for the dollars and local currency costs indicated:

(a) A procurement source and origin waiver from Geographic Code (000) U.S. to Geographic Code (935) (South Africa):

(i) for equipment, commodities and services at an estimated value of \$75,000 representing procurement from South Africa of commodities and services required in the construction of five (5) houses for U.S. provided technical staff and for one (1) laboratory building.

(b) A waiver of AID Regulation No. 1 to permit approval of the use of established Government of Botswana procedures for the competitive selection of construction firms for the building of facilities financed by AID.

(c) A waiver of AID Regulation No. 7 thus removing restrictions on employment of third-country nationals on construction projects financed by AID.

In addition, approval is requested for the use of AID financed local currency (approximately \$165,000) to pay for the purchase of goods and services of local source and origin (including certain off-shelf items).

See Appendix No. 2 of PROP for discussion and justification.

Clearances: (for source/origin waiver and others)

GC/AFR: *William*

~~XCOM/CS/ATS~~: SER/CM/CS/TS: M. Harway (draft)

~~XSER/PROC/CS/IT~~: SER/CM/SD/POL: J. Sewall (draft)

SER/FNGR: T. Elliott (draft)

STATE: AF/S: Richard Dols (draft)

APPENDIX NO. 2

SOURCE AND ORIGIN PROCUREMENT WAIVER JUSTIFICATION

I. IDENTIFICATION OF WAIVERS REQUIRED

This PROP face sheet and continuation lists the following requests for waivers and contains the necessary certification to effect such waivers.

A. A procurement source and origin waiver from Geographic Code (000) U.S. to Geographic Code (935) Special Free World (South Africa).

i) For equipment and specialized services related to construction of U.S. technical staff housing and project related laboratory facilities (see PROP Section, U.S. Inputs, for detail). Calculations follow:

1. Total Cost:

| | |
|--------------|---------------|
| U.S. Housing | \$100,000 |
| Lab. Block | <u>30,000</u> |
| | \$130,000 |

2. Not to exceed 50% of total costs will require procurement outside of Botswana: i.e., Republic of South Africa. (Hardware items, electrical and plumbing special technical services.) NOTE: Percentage based on engineering estimates of current construction.

3. Calculation of waiver amount:

$\$130,000 \times 0.5 =$ \$65,000

ii) For equipment and specialized services related to construction of training centers and warehouses on test sites (see PROP Section, Discussion of U.S. Inputs, page 23 for detail).

1. Total Cost

| | |
|----------------------|--------------|
| (3) Training Centers | \$18,000 |
| (3) Warehouses | <u>6,000</u> |
| | \$24,000 |

2. . Not to exceed 30% of total costs will require procurement outside of Botswana; i.e., RSA (hardware items, electrical and special technical services).

3. Calculation of waiver amount:

| | | |
|-------------------------|----------------|-----------------|
| $\$24,000 \times 0.3 =$ | | <u>\$7,000</u> |
| | Total | <u>\$72,000</u> |
| | Waiver Request | \$75,000 |

B. A waiver of AID Regulation No. 7 thus removing restrictions on the employment of third-country nationals on construction financed by AID.

C. A waiver of AID Regulation No. 1 to permit approval of the use of normal, established Government of Botswana procedures for the competitive selection of construction firms for building the facilities financed by AID.

II. SUMMARY WAIVER INFORMATION

- (a) Cooperating Country: Botswana
- (b) Authorizing Document: PROP attached
- (c) Project: Botswana Livestock and Range Management
- (d) Nature of Funding: Grant
- (e) Description of Goods and Services: See above
- (f) Approximate Total Value: \$75,000
- (g) Probable Source: The Republic of South Africa
- (h) Previous Funding: None

III. DISCUSSION

A. GENERAL

Waivers requested above in the amount of \$75,000 are directly in the best interest of the United States. The favorable impact of U.S. participation in this project would be dissipated and the project success seriously jeopardized if the waivers are not provided. Specifically, the relative small size of the total

construction element, \$130,000, makes it unrealistic to expect construction firms normally eligible under AID rules to participate. In addition, local costs contractors (Botswana) may probably require the technical services of third-country nationals to handle specific electrical, plumbing, etc., designs and installations.

B. HOUSING AND LABORATORY BLOCK

The GOB is currently unable to provide housing for project personnel. All donors now provide housing for their staff. Financing for housing or laboratory construction is not available to the GOB from any other source. Local firms, bidding on these jobs, may require third-country nationals for technical aspects of construction. The laboratory block referenced is essential to the project's concern for evaluation of changes in range ecology and the impact of livestock production on the environment. The funds include five (5) class A senior staff houses for use by U.S. provided personnel and one (1) laboratory wing (30 ft. by 60 ft.). Customary GOB contracting procedures will apply.

IV. LOCAL COSTS (\$165,000)

In addition, approval is requested for the use of AID financed local currency.

Local costs for purchase of goods and services of Botswana source and origin, including off-shelf procurement of items as explained in (ii) below, will be in an amount not to exceed \$165,000.

Reference is made to PROP Sections, Discussion of AID Inputs, pages 33 to 41, and GOB Contributions to the Project, pages 41 to 44, which discuss the overall need and justification for use of local currency and locally available off-shelf commodities as well as the relationship of these items to the AID and GOB inputs to the project.

(i) General (\$125,000)

Services will be required from Botswana licensed or registered contractors and also services provided by Government of Botswana force accounts for the construction of boreholes, water systems, stock tank construction and building corrals or fences.

(ii) Off-Shelf Procurement (\$40,000)

It is estimated that not more than \$40,000 of local costs will consist of mechanical equipment and supplies for use in the

project's test ranch systems and will need to be off-shelf procured. Since Botswana is in a common market and customs union relationship with the Republic of South Africa, it is not relevant to analyze off-shelf purchases as to being of local or imported origin since nearly all of such items come from South Africa. None of the items to be procured are expected to cost more than \$1,000. Individual transactions will be held to \$2,500 or less within a total level of \$40,000. The items purchased will be of a nature and type normally found in Botswana and will not be especially imported for the project. Examples include: borehole pumping systems, stock tanks, veterinary supplies and others as noted in the PROP Section, Discussion of AID Inputs, pages 33-41.

690-11-130 -015

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78 P

NON CAPITAL PROJECT PAPER (PROP)

BOTSWANA RANGE AND LIVESTOCK MANAGEMENT

MAY, 1973

BOTSWANA RANGE AND LIVESTOCK MANAGEMENT PROJECT

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BOTSWANA RANGE AND LIVESTOCK MANAGEMENT PROJECT

SUMMARY

BACKGROUND

Botswana has been designated by United Nations General Assembly as one of the 25 least developed among the developing nations with a literacy rate of less than 20 percent and a per capita income estimated at \$93 yearly. Agriculture, as might be expected, is the leading sector, employing the majority of the population and together with Government services accounting for approximately 2/3s of GDP (1969). About 90 percent of the Agricultural product is generated by the subsistence sector of which livestock production represents approximately 74 percent. Livestock accounts for the major part of non-mineral exports and as recently as 1969 for over 10 percent of GOB recurrent revenues.

Within the fragile semi-arid setting of Botswana, the delicate balance between man, livestock and the environment is, however, being threatened. Growing numbers of poorly managed livestock feeding on ill managed range resources are deteriorating large rangeland areas at an accelerating pace. The small stockholders, holding 60 head or less and constituting about 60% of the population, can least afford the deterioration but are the primary victims. If the problems can be solved, and expert opinion says they probably can, the livestock industry can serve as one of the driving forces of economic development in Botswana.

The Government of Botswana (GOB) has recognized the growing seriousness of problems facing the livestock industry and the resultant implications. Consequently, new and expanded programs to achieve solutions are being actively sought and implemented. External financial and manpower support provided by ODA, SIDA, the UNDP and the IDA, is being combined with domestic resources in a number of livestock sub-areas. Nevertheless, the lack of focused attention on smallholders leaves a serious gap which must be filled for balanced, equitable development to occur.

However, any attack on the problems of the livestock industry must also recognize the limitations which the Botswana situation imposes i.e. limited trained manpower, limited financial resources and, at this stage, social/cultural factors which may hinder the acceptance of certain solutions.

The Project

With due consideration of the Botswana environment, the involvement of the MOA of the GOB with an A.I.D. Survey Team, and the inherent constraints noted, a Range and Livestock Management Project has been developed which focuses on smallholders. In keeping with the recently approved Policy Determination on A.I.D. and the Relatively Less Developed Countries, the project is part of a coordinated donor effort to address the key problems

facing livestock development. The project builds upon, complements and mutually reinforces other donor inputs in the areas of livestock research, land and water development, village development, breeding and fattening; ranch development, animal health, livestock extension and agricultural cooperatives. The project will be administered by the Ministry of Agriculture of the GOB under the coordination of the Deputy Permanent Secretary (Technical).

The goal of the project is to assist the GOB in meeting its goal to "promote rapid development of the livestock industry on a sustained basis." This seven-year project focuses on that component of the Botswana National Development Plan 1973-1978 directed toward increasing the share of the industry and income of the small stockholders who possess about 41 percent of the cattle population (excluding livestock on freehold ranches).

Specifically, the project purpose is "to develop through systems research, replicable groups small stockholder range and livestock management systems which are socially acceptable and economically viable." Ultimately, the project, if successful, will lead to replication by the GOB of the feasible systems throughout small livestock holder areas in Botswana and requests for external assistance to do so.

Project Implementation will follow a three phase schedule over the seven year life as follows. (See Project Description, Page for details).

Phase I, lasting from 9 to 12 months will involve a Determination of Three (3) Test Systems of Range and Livestock Management, including identification of management systems, locations of units and the technology to employ. Phase II, lasting from 38 to 48 months, will Establish, Operate and Evaluate the Test Systems and will involve related training of staff and small stockholders, assistance in design and installation of facilities, and on-going support and evaluation. Phase III, lasting for one or two years will assist the GOB in Expansion of Successful Prototypes and Development of Financing Requirements. Details of these phases and Design Parameters for test systems follow in the project Description Section of this PROP.

To accomplish its purpose the project will provide a team of OPTEX Technical Experts (6) \$1,130,000; a limited quantity of U.S. commodities (\$38,000); local costs for technical staff housing and a range research laboratory (\$130,000) and local costs for establishment of three (3) or more test systems of group management of Livestock and Rangeland (\$110,000) and \$148,000 in participant training.

The consequences of developing and implementing these research-tested systems will be an expansion of smallholders' income thus meeting the objectives of more equitable income distribution and employment generation among the poorer members of Botswana's rural economy. The project will in addition have a positive effect on the Botswana range environment through its aim of sustained livestock production which can only result from the conservation rather than the "mining" of range resources.

This project, if successfully implemented, will provide new and innovative methods of improving the economic position of small stockholders, allowing them to share in the benefits of development. Simultaneously, Botswana's rural people will be offered an alternative to moving to urban areas or accepting demeaning employment in other countries. The result should be a healthier, more politically stable Botswana economy.

BOTSWANA RANGE AND LIVESTOCK MANAGEMENT LOGICAL FRAMEWORK

| <u>GOAL</u> | <u>OBJECTIVELY VERIFIABLE INDICATORS</u> | <u>METHODS OF MEASUREMENT</u> | <u>IMPORTANT ASSUMPTIONS</u> |
|--|---|--|---|
| To assist the GOB to implement the live-stock portion of its 1973-1978 National Development Plan "to promote the rapid development of the livestock industry on a sustained basis" *and thus "to promote an equitable distribu-tion of income in particular by reducing income differentials....." | 1. Increased numbers of cattle slaughtered | Annual Reports of the GOB and the Botswana Meat Commission | GOB fosters policies favorable to sustained livestock production |
| | 2. An increase in average Cold Dressed Weight | Same as above | GOB financially sup-ports objectives of the livestock com-ponent in National Development Plan 1973-1978 |
| | 3. An increase in cattle population | Agricultural Census | |
| | 4. Condition of range improved | Reports from range experts | Regional and National political stability |
| | 5. Improved equity of income distribution over the long term (25 years) | National Income Accounts | Botswana beef has access to and is acceptable in international markets |
| | | | Reliable system of national income accounts |
| | | | Relative proportion of livestock marketed by small stockholders increases in the long term |
| | | | Botswana Meat Meat Commission continues to operate as processing and marketing institution |

*Rapid development defined as 50 percent increase in offtake over a 25 year period.

| <u>PURPOSE</u> | <u>END OF PROJECT STATUS</u> | <u>MEANS OF VERIFICATION</u> | <u>PROJECT ASSUMPTIONS</u> |
|---|--|---|---|
| To develop replicable systems of group small stockholder range and livestock management which are socially acceptable and economically viable | 15 group systems in operation and marketing to maximum benefit of participants | MOA records | GOB will have funds available for system replication |
| | Small stockholders utilizing proven methods have increased incomes | MOA and Smallholder Records | There will be no constraints to project implementation due to unusual climatic conditions, out-breaks of animal disease, undue livestock price fluctuations or substantial lack of acceptable by small stockholders |
| | GOB has capability to replicate and manage small stockholder systems | Availability of funding and trained staff | |
| | MOA with skills and ability to develop alternate replicable small stockholder systems as necessary | Expert evaluation of project related performance and MOA capability | |

| <u>OUTPUTS</u> | <u>OBJECTIVELY VERIFIABLE INDICATORS</u> | <u>MEANS OF VERIFICATION</u> | <u>IMPORTANT ASSUMPTIONS</u> |
|---|--|--|---|
| <u>Research</u> An operational laboratory, standards for range evaluation and optimum stocking levels for different range areas | (a) Capacity to perform analysis on 75-100 samples per day (b) Range evaluation methodology handbook available (c) Stocking level standards established | Direct observation MOA records Project records Project evaluations Expert appraisal BMC records | GOB will make available necessary funds to carry out the project GOB will make available suitable staff for training and project operation |
| <u>Training</u> Academic, in-service and on-the-job training for MOA staff, plus short course training for participating small stock holders | (a) Cooperating country personnel trained for four senior staff positions by 1979 (b) Cooperating country personnel trained for ten key technical posts by 1978 (c) See Appendix seven (7) for in-service training schedule (d) Approximately 150 farmers trained per year (e) Training handbooks and student workbooks developed and in use (f) Evaluations completed and results utilized to assume relevency of training | | GOB will assign trained personnel to project related positions |
| <u>Range and Livestock Management</u> Range management methods, minimum acceptable livestock management standards, and evaluation methodology for range and livestock management systems completed | (a) Range management methods developed for various conditions (at least 6) (b) Minimum acceptable livestock management standards established (c) An evaluation methodology developed and in use and providing feedback | | |

| <u>OUTPUTS</u> | <u>OBJECTIVELY VERIFIABLE INDICATORS</u> | <u>MEANS OF VERIFICATION</u> | <u>IMPORTANT ASSUMPTIONS</u> |
|--|---|------------------------------|------------------------------|
| <u>Surface Water and Land Use</u> | | | |
| Standards for group ranching engineering requirements, topographical maps of sites and standards, plans and procedures for construction of small (1-5 million gallon) reservoirs | (a) Standards established and handbook completed (b) Capability exists in MOA Land Utilization Division to prepare range site and condition classification maps (c) Plans and procedural handbook available | | |
| <u>Marketing and Credit</u> | | | |
| (a) Group marketing systems (b) Working systems available to provide credit for small stockholders group management systems | Project participants benefiting by more direct marketing cattle to BMC | | |
| <u>Systems Expansion and Management</u> | | | |
| (a) Detailed plans for expansion (economic analysis, procedures, time schedules, and investment requirements) (b) Capability in the MOA in terms of staff skills in technology, Rural Sociology and organization and management to design, implement and evaluate small stockholder systems | Records of Credit Institution Plans available for use Staff training complete on-the-job engineers by GOB staff Management and operations systems standardized | | |

| <u>U. S. INPUTS</u> | <u>TOTAL</u> | <u>OBJECTIVELY VERIFIABLE INDICATORS</u> | <u>MEANS OF VERIFICATION</u> | <u>IMPORTANT ASSUMPTIONS</u> |
|--|--------------|--|---|--|
| | \$1,586,000 | | | |
| <u>I. Personnel</u> | | | | |
| A. OPEX 1,040,000 | | | | |
| 1. Senior Range and Livestock Management Specialist (Team Chief) (6 years) | | Implementation targets amounts and time frame are provided in body of PROP | AID budget support is provided | Recruitment and timely arrival of properly qualified and well motivated specialists will be accomplished |
| 2. Range Management Extension Training Officer (6 years) | | | Direct observation Project implementation schedules are followed | |
| 3. Surface Water Land Use Engineer (4 years) | | | Project evaluations | Housing and laboratory will be completed on schedule |
| 4. Range Agronomist (ecologist) (4 years) | | | | |
| 5. Livestock Production Specialist (6 years) | | | | Equipment to be provided will arrive on schedule |
| 6. Data Processing Technician (4 years) | | | | Admissions can be secured at appropriate institutions for Botswana participants. |
| E. TDY Services (\$90,000) Up to 3 man/months per year for 6 years | | | | |

| | | |
|------|---|-----------|
| II. | Commodities (\$68,000) | |
| | A. Vehicles (5) | \$ 30,000 |
| | B. Laboratory Equipment and supplies | 38,000 |
| III. | Local Costs (\$215,000) | |
| | A. Housing (5) | 100,000 |
| | B. Laboratory construction (one block) | 30,000 |
| | C. Test Area Development | 110,000 |
| IV. | Participants (\$148,000) | |
| | A. Degree Programs | |
| | 1. Range Management (2 in U.S.) | 80,500 |
| | 2. Land & Water Engineering (1 in Africa) | 15,000 |
| | 3. Livestock (1 in Africa) | 15,000 |
| | B. Certificate and Diploma Training | |
| | 1. Range Management (2 at ABU) | 14,500 |
| | 2. Range Management (2 at Egerton) | 23,000 |

PROJECT DESCRIPTION

GENERAL

The project will achieve its purpose of assisting the GOB in determining, designing, testing and replicating small livestock holders systems of group management in a three-phased cycle. Implicit in Phase I, Systems Determination and Selection of Test Areas, (9-12 months) will be the need for a very complete analysis of alternate management systems as well as need for an equally thoughtful determination of specific locations of test sites. For these reasons, this PROP Section includes a series of suggestions for consideration, by the Project Staff, to assure that ATD's experience from other livestock/range management projects will be evaluated with regard to their relevancy to the Botswana social, political and climatic environments. The activities of Phase II, Establishment and Operation of Test Systems, (36-48 months) and Phase III Expansion of Successful Prototype and Development of Financing Requirements (12-24 months) will demand research inputs, management of field operations, evaluation, with its appropriate feedback into operation, and development of individual and institutional skills to enable the GOB to expand, re-design or further design or develop, program, manage and operate small stockholder group ranches.

Specifically the project addresses the testing of three model livestock production systems with small livestock producers, the provision of credit for the test ranch development and technical services in range and livestock management, animal health, and marketing. The project will test production systems over a three to four year period under existing land use patterns, including: 1) major land use for crops, with livestock production secondary; 2) livestock production primary with crop production secondary; and 3) livestock production the sole or major land use. The project will increase livestock production by introducing improved animal husbandry and higher levels of nutrition on test sites. It will simultaneously reduce range deterioration (by improved management) and (by so doing) reverse the (downward) trend of range condition. The successful models will be replicated under an expanded program using GOB finances, in the sixth and seventh year of the project.

As test systems prove successful and replicable on larger scale, improved livestock and range resource utilization can be gradually expanded on a country-wide basis to ensure sustained high levels of production while at the same time, conserving Botswana's replenishable natural resources of soil, water, plants, domestic animals, and wild life. The small stockholders of Botswana will also share more fully into the economic development of their country.

OVERALL PLAN OF WORK FOR THE PROJECT

Phase One: Systems Determination and Selection of Test Areas
(9-12 months)

Project OPEX personnel, with GOB support in Rural Sociology and intermediate level staff, will observe the existing systems of livestock management, and in full concert with tribal, village, local governments and small stockholders will determine the physical/technical characteristics of systems to be tested, the type(s) of internal organizations or management which will be most apt to be acceptable and practical and will estimate the economic viability of the systems proposed. They will also assist in selection of participants for training, begin/initiate an evaluation system, link the smallholder test systems to the existing market system, establish revolving credit arrangements with GOB institutions, initiate selection of and detail designs for the three (or more) test areas to be established, plan for in-service training of GOB staff and stockholder training and establish, through project research, base line data (both agronomic and sociological). Such actions would lead to:

Phase Two: Establishment and Operation of Test Areas
(36-48 months)

By this time, project staff will be shifting to a period of completion of designs and on-the-ground installation of essential water supplies, fences (if needed), corrals, warehouses, training centers, etc. on the test sites. Participants will be sent for external training, in-service training and small stockholder training will be initiated and underway, base line data will be complete and research methodology developed to assure: 1) project ecological studies and livestock studies will link with, be supported by and support other GOB research; and 2) will be designed to be useful to assist in assuring sound range and livestock management systems can be devised or altered, if needed, on project test areas. An important task during the early part of Phase Two will be to design an evaluation system for annual use which will include measures of social acceptability of systems, the degree of individual participation and responsibilities assumed by members, the impact of the technology and management practices on the cattle and on the range ecology and the economic viability of the systems. The evaluation system results, and improvements in project management recommended, will be fed back into project operations. It is also probable that during the latter portion of Phase Two, and assuming that both the annual and a programmed external evaluation are favorable, the project will begin to assist the GOB to replicate the proven test systems. Criteria for determination of numbers of replicated systems will include: qualified manpower available; GOB finance available and interest of small stockholders. During Phase Two, actions in this regard will be in preliminary planning, site identification, on-the-job training of GOB staff in technology and operations management.

expanded in-service (for GOB technical and supporting staff) and farmer training, and possible preparation of budget proposals or requests for finance. These actions will lead to:

Phase Three: Expansion of Successful Prototypes and Development of Financing Requirements
(12-24 months)

The precise timing of the actions above, which are expected to occur near the end of Phase two and the following Phase Three actions may be advanced or delayed in time dependent upon results of the evaluations described above and their timing. In any event, Phase Three will consist of two types of inter-related activities: first, using the funds provided by the GOB as discussed in Phase Two above, and working with sites and designs selected in anticipation of action, project staff will assist in expanding the numbers of the successful prototype systems. It is premature to identify the exact numbers but it is estimated that not more than 15 new units could be handled with resources expected to be available. (Probable limit will be trained personnel.) The second activity of Phase Three will be to assist the GOB Ministry of Finance (MOF) and Ministry of Agriculture (MOA) in preparation of documentation to attract and/or justify investment capital to use to continue expansion of prototypes, over time, to result in widespread application of the project developed methodology.

DESIGN PARAMETERS AND SUGGESTIONS FOR TEST SYSTEMS
(Contributions from F. Abercrombie, AFR/IS)

AID has had experience in group ranching systems in Africa, and worldwide, which should be considered by the project staff and evaluated for applicability to the local environment as follows:

Types of Systems to Consider and Related Land Use Problems

The selection of specific locations and physical sizes, measured both by number of participants and by acres, of systems to be tested will be affected by economic and social/political considerations. Since the large majority of Botswana's citizens, and small stockholders, live in the more densely populated eastern portion of the country, where traditionally livestock plays a secondary role to crop production, it is critical in this area, to have close coordination between the livestock/range specialists of the MOA and the regular extension (crops) service to assure close intergration of project proposed test systems within the general practices and land use patterns of the area.

The large part of the probable useful, and available, range land lies inland (west) of the more densely populated areas and in the central district. Since there are at least these three (3) general types of areas, it is apparent the project, if it is to develop useful prototypes, must evaluate systems adaptable to these varying conditions and

test small stockholder systems in these various environments.

A. Present Land Use Patterns in Areas Proposed and Comments on Scale of Units

This project shall address only the East and Northeast portion of Botswana where the core problem in the livestock industry is the small producer. Three patterns of land use are present:

1. Heavy concentrations of humans and livestock along a narrow band from north to south along the highway and railroad from Francistown to Lobatse. Crop production is the major use of land and the grazing of livestock is secondary. The small livestock producer owns 5-15 head from which draft oxen and milk are the primary production, beef production is secondary. One model should be considered for about 15,000-20,000 acres of grazing land (estimated minimum economic unit) with about 600 animal units owned by up to 60 participant livestock producers to address this situation.
2. A second unit should consider the fringe areas of heavy concentration of human and livestock population running from north to south along the eastern side of the country inland 15 or more miles from the north/south highway where the grazing of livestock is the primary use of land and crop production is secondary. Livestock owners have larger herds and beef production is the major revenue earner while crop production is subsistence oriented in this area. This model would be located where it is possible to obtain blocks of 50,000-60,000 acres of grazing land to support up to 2,000 animal units owned by 50 or more participant livestock owners.
3. The third test system should be evaluated in terms of the northern portion of the central province and possibly Ngamiland where the grazing of domestic livestock and wildlife are the major use of land. Large areas can be expected to be available for development. Water is the primary limiting factor to the utilization of available forage by both domestic and wild animals in these areas.

Here major developments to date have been by syndicates of large livestock owners who have developed water on cattle posts and who by such license to water, utilize areas adjacent to their boreholes. A model to be tested here should be evaluated in terms of areas where it would be possible to obtain large blocks, up to 120,000 acres, for consideration of group or communal grazing of up to 6,000 animal units owned by up to 100 livestock producers.

B. Group Identification

The role of the rural sociologist will be extremely important in identifying groups of small stockholders with similar production problems and social ties which will make them a close knit group. He will also be expected to establish base line data on participants as well as identify adjacent control groups. The identification of natural leaders, assurance that they are recognized by traditional authorities, and the organization of these leaders to represent the group in legal and economic matters with government will be a key factor for successful management of group or cooperative ranches. These organizations may also require legal status so they may be registered as legal bodies so they can perform, for their members, such activities as: assume responsibility for development or operating loans; handle sales of stock; purchase inputs for operational needs; negotiate for and employ contractors or individuals and assess members for development or operating costs; enact by-laws and similar duties.

C. Types of Organizations/Management Systems to Evaluate for Possible Use

A number of management systems for livestock production, which have been successful in the developing world, can be evaluated for possible use by this project. A common tie which runs through such systems is some form of formal or informal linking of livestock producers to a tenure relationship to range land with the accompanying benefits, and responsibilities, available to the stock producers as opposed to traditional systems of individual ownership of stock which do not usually involve any management of the "tribal" or "government" communal land base.

1. Individual ranches - this type of management is discussed since it now exists in Botswana: for the purpose of this project, however, it is not expected that such a system would be technically or economically feasible for owners of 60 or less cattle.

In this case livestock owners secure title to individual or private ranches. Normally such holdings must be large enough to justify development and operational costs. In areas of land scarcity this system is not satisfactory as large blocks are secured by a few individuals and the majority of the population are left without land, thus creating social problems as people move to urban areas.

2. Group ranches are systems where livestock owners secure title or long-term leases on land which they then develop and operate as economic units. This method can ensure that ranches are large enough to justify costs of development of permanent facilities. At the same time they can distribute ownership among enough of the local population to ensure ownership (or

fair use of land) by larger numbers of people.

Group ranches should be registered as a legal body and the individual livestock owners are given proportionate participating share(s) in relation to the percentage of the total animal herd their animals represent. Individuals maintain ownership of their animals and receive profits from their sale, while repayment of development loans and operation and maintenance costs are assessed members again in proportion to the percentage of the total herd their animals represent. The group is usually represented by a council of members appointed or elected by the participants. This system requires a high degree of skills by the participating livestock owners in ranch management, financial record keeping, budgeting for and in planning and operating their unit.

3. Cooperative ranches involve operating as a single unit by paid management and labor with the livestock are owned by the cooperative. Dividends are paid from profits to the shareholders. Shareholders may contribute livestock or cash as shares in the cooperative. A large number of shareholders may participate in a cooperative ranch which is ordinarily governed by a committee elected by the members. The cooperative functions as a legal body and is eligible for credit for development, maintenance and operating expenses. This system should be evaluated in terms of areas where land and population pressures are minimum so that urban individuals with available capital will not compete with and/or displace existing small stockholders. However, it should be kept in mind, that where applicable, cooperative ranch systems have been very effective in utilizing local resources for orderly livestock development.

4. Communal cooperatives are systems where livestock owners organize a cooperative which secures a long-term lease or title to the land and also secures a legal status to provide for obtaining credit for development, or operations and maintenance costs. The individuals contribute cash or animals which are then managed as a cooperative herd to pay development, maintenance, and operation costs of the total unit. Management and labor for these services is either hired or contributed by members. (Such services credited to members' accounts.) The cooperative herd is large enough to provide income to cover all expenses while members' profits are obtained from sale of animals they maintain and graze on the cooperative ranch under the guidance of cooperative management. The numbers of individually owned animals that may run on the cooperative ranch by individual members varies in accordance with members contribution to the

cooperative herd. This system allows skilled management to be hired for ranch operations while at the same time allows the individual to maintain ownership of his animals.

5. Communal grazing reserves involve establishing by government (law required for legal status) tracts of grazing land where grazing rights of involved livestock producers are protected. Local cattle owners are given rights of access to land through grazing permits for a specific registered number of animals. This provides a form of land tenure or security for these formerly landless nomadic or semi-nomadic cattle producers. Government develops the areas and assumes responsibility of operation and maintenance costs. These costs are recovered from the livestock owner in the form of an annual charge for grazing and/or water fees. The individual cattle owner manages his own herd with extension, animal health, and grazing management services provided by government staff. Livestock owners are required to follow prescribed grazing management practices and limit their total herd to the number allocated them through their grazing permit. This system requires a lower level of managerial skills by the individual livestock owners. The participants should appoint or elect a representational council to establish by-laws of a grazing association and to provide for enforcement and adherence to the by-laws as well as to such grazing regulations as established by the government project manager and agreed to by the association. The by-laws also must bind members to responsibility for control of trespass grazing with assistance from local authorities only where necessary and as a last resort. Normally, government project managers and technical services should have 8 to 10 such nearby grazing management units to service in order to fully utilize their time and to reduce government costs of providing such services.

C. Range Resource Inventories for Areas Selected for Test Unit Operations

The range planner will make an initial determination by making a range resource inventory of the forage available and the water required in relationship to the number of animals that can be supported on the area.

Base line data will be established on the management units and on adjacent areas (control) for establishing and securing long-term records of the effectiveness of the grazing management on the range ecology. Management units will be mapped in range sites and condition classes with narrative description of soils, topography, vegetative composition by species, plant density, vigor,

trees and bush canopy density, current erosion and apparent trend of range conditions.

Range forage production for each range site and each condition class will be determined by random clipping of clip quadrants. Carrying capacity and consequent proper stocking rates will be determined from forage inventories. Establishment of photo grid plots along line transects on each range site and condition class will be established to be checked at approximately three or more year intervals to determine long-range changes in range ecology and range condition. Annual forage inventories will be established to determine current year's growth and adjustments in stocking rates based on forage available.

D. Range Management Plan

Management systems used must take into account the highest possible production of beef, while at the same time conserving or improving the environment available for cattle production. This implies utilization of forage to the proper use level while at the same time allowing plants to produce satisfactory leaf growth for manufacturing a food supply which is needed by plants for root development and reproduction by seed or vegetative means. In other words, a plant must have a reprieve from grazing animals periodically to allow its physical functions to continue if the plant is to survive and compete for available space, soil moisture, and nutrients. High vigor and adequate reproduction can only occur when plants are allowed to complete these necessary physiological processes.

In most instances, the desirable forage species are the most palatable to grazing livestock and are selected by grazing animals first. The preference of these species by animals cause higher utilization and consequent lessening of their ability to compete with less desirable species. If this process is allowed to occur over a period of time the plant composition will be altered and the less desirable species will become dominant. Thus, a system must be designed whereby grazing blocks are periodically rested or deferred during the growing season to allow desirable plants to be maintained and/or increased in the plant community.

Factors limiting the time and season of beneficial grazing of livestock on a range site must also be considered in planning a system of use. Soils may limit the use of certain range sites during the rainy season because of muddy conditions. Thus, such a range site should be considered as a dry season use area.

Permanent water supplies may be difficult to obtain by either surface storage or from groundwater supplies. Thus, these areas should be considered as wet season grazing areas where temporary water supplies can be developed by surface catchment or from streams and shallow wells during the rainy season. On the other hand, areas with existing permanent water or where permanent water can be more easily developed (from boreholes or surface catchments) should be utilized for dry season use.

Biting insects such as flies and ticks may be a problem on wet areas or flood plains during the rainy season. Thus, these areas should be considered for use immediately following the rainy season when insects are less numerous.

Most grass species are palatable and nutritious during the peak growth periods, however, some species become less palatable and nutritious after maturity. Range sites producing dominant forage species which are not palatable and have little or no nutritional value after maturity should be considered as wet season grazing areas, or in the case of flood plains as soon as the area is dry enough for livestock entry, immediately following the rainy season.

Systems should be designed to coincide as nearly as possible with that practiced by local cattle owners. Considerable investigation of the practices carried out by local cattle owners should be conducted before finalizing a management plan. In most instances there are valid reasons why cattle producers follow grazing patterns on an area. These factors must be considered and solutions found if the system of grazing is to be satisfactorily altered to increase livestock production.

Grazing treatments will consist of proper stocking levels adjusted annually to current year's growth, coupled with a deferred rotational grazing system. Rotational grazing systems should be kept as simple as possible while at the same time providing plants the opportunity to complete their life cycle and reproduce themselves. Probably a five paddock system is the most satisfactory to provide this plant protection while at the same time keeping development costs of water and subdivisions at a minimum. This system provides for a three-month grazing period on four of the paddocks while the fifth is held as emergency forage for drought years and for controlled burning in bush control and eradication.

This system requires permanent water in three of the paddocks to be used as dry season grazing areas and temporary water in two of

the paddocks to be used as wet season grazing areas. Other more elaborate systems will provide greater plant protection, however, the difficulty of operation and management of them may make them less socially acceptable in initial implementation of grazing management programs.

E. Livestock Management Plan

The first phase will be one of establishing base line data on livestock within the systems to be tested and, to the degree realistically possible, on nearby control herds. A census will be conducted and register animals by sex and age for each of the participants. From this base line data project staff can compile data as to calving rates, calf mortality, mortality of other sex groups by age, rate of culling if any, age of first calf of heifers, age of sale of steers, age of sale of cull bulls, age of culling of cows, bull cow ratios, draft oxen utilized. From such base line data the present offtake ratio can be calculated. These coefficients and consequent offtake rates will be utilized to determine future increased production.

The second phase will include utilization of extension services to encourage the producers to feed mineral supplements, cull non-productive animals, upgrade herds through selection and utilization of improved bulls, follow castration and dehorning practices for all males, and assist in organizing cooperative marketing of animals to reduce marketing costs and assure maximum return from animals to the producer. The project staff should assure that animals are marketed at the age and weight which returns maximum profit to the producer. The elimination of existing middle men and this ensuring BMC annual dividends are returned to the producers will realize greater income per animal marketed, as well as assuring more equal income distribution and bring the participating small stockholders into the economy of the country.

F. Physical Resource Inputs

In order to keep capital inputs at the lowest possible level, while at the same time maximizing income generation for the largest number of small stockholders, only essential measures of grazing management and livestock husbandry should be considered in the initial development phase. These developments will include the planning for and development of additional water supplies where they are needed, subdivisions and firebreaks for control of fire and grazing management, and construction of essential livestock handling facilities such as night pens, crushes, and dips where necessary. Fencing of units should only be considered as a last

resort both to exclude trespass grazing and to retain labor intensive operations. Where hired management and labor are employed or government staff provided, housing will be required at local standards.

Office and storage facilities will also be needed on units where records and equipment are to be maintained and where participating and nearby small stockholders will be trained.

DETAILED IMPLEMENTATION SCHEDULE

Following is a detailed plan for implementation of the project. It is developed to illustrate the required actions necessary in each of the three phases of the project life. Naturally, the plan is somewhat less specific in years three to seven but does provide that annual up-dates be made of project developed work plans. Each of the phases discussed will require the involvement of project staff in planning, in the use of their technical expertise and in on-going evaluations. Following is a description of the actions expected.

Phase One: Systems Determination and Selection of Test Areas
(9-12 months) Time Period: Months 0-12

1. Arrival of Team Chief and the Livestock Specialist, the Range Agronomist (Ecologist), the Engineer and the Range Extension Officer. (Time phased through about a six (6) month period.)
2. Team orientation introduction to GOB technical staff and preparation of draft plan of work in accordance with the following actions for Phase 1.
3. With and through the MOA Rural Sociologist and his junior staff, establish contact with local government officials and tribal councils.
4. Through local organizations, and with the MOA sociologist, establish contact with small stockholders and their local institutions or organizations, if they exist.
5. Through such contacts as listed above, determine basic types of systems to work with; establish initial estimates of physical size; general geographic areas; "dry run" economic analysis and types of group management apt to be socially acceptable and responsive to project technology. Include consideration of methodology of evaluation as systems are determined.
6. Finalize Phase 1 Work Plan.

7. Initiate work with Botswana Development Bank (or other appropriate institution) to establish small stockholders' revolving credit fund.

8. Select sites for three (or more) tests of group systems and adjacent control areas. Evaluate alternate sites on basis of comments and suggestions provided herein and on: a) acceptability by participating small stockholders; b) technical feasibility, i.e., water supply, range cover, access to markets, etc.; c) support of local organizations, tribal, local government or nearby large ranchers and; d) economic analysis based on estimates of cost/benefits.

9. Initiate base line data collection for: a) technical data including, linking on-going livestock research to test areas, establishing range cover and carrying capacity levels, establishment of permanent locations where changes in range ecology and on livestock on the test areas and in control areas can be measured. Working with the GOB research staff, integrate the collection, chemical analysis, reporting and evaluation of test area livestock and range data so as to mutually reinforce both the total amount of useful information and to focus the use of the information on improvements in management practices on the test systems and; b) socio-logical data on the participants of the test systems and control areas. Such data should include local institutions, family size and composition, attitudes of local people with regard to the types of activities proposed in the project, experience or attitudes with regard to group action and other as appropriate. (NOTE: Income of participants of special importance.)

10. Select participants for overseas and "in Africa" training.

11. Initiate work on in-service training plans and small stockholder training plans. Review needs for training; level of skill of potential trainees; initiate circula planning, check facilities and order needed supplies; initiate work on student reference material; review and evaluate local skills and personnel resources for use in training. Prepare evaluation systems for training to permit annual appraisals of relevancy of training to project and to the range/livestock technical and managerial problems in Botswana. Note: See Appendix 7 - Schedule For In-Service Training.

12. Request and utilize consultants during this period. Probable needs would include local action specialists, rural sociologists or specific technical expertise such as groundwater or management personnel.

Phase Two: Establishment and Operation of Test Areas
(36-38 months)

Note: Phase Two may last to month 48 of project or from months 48 to 60.

1. Prepare Phase Two Work Plan for annual update/approval by MOA based on the following actions.
2. Complete detail designs for selected sites, including topographic mapping, water requirements, delineation of test range areas (by fences or other means), location of trails or roads, corrals and allied equipment and local housing and/or training facilities.
3. Based on management and technical issues resolved by group participation, initiate training and education of participating small stockholders in: 1) their role, responsibilities and privileges in system management and operations and; 2) in the technology which is to be employed.
4. Install facilities and begin operations on test sites.
5. Complete base line studies initiated in Phase One above and establish data collection systems and research methodology on test sites and control areas.
6. Send participants for third country training.
7. Work with the Botswana Meat Commission to establish direct marketing linkages with the test systems to assure maximum profit to participants.
8. Establish technicians "in-service" training and initiate training schedule.
9. Develop evaluation system to identify and evaluate: 1) social acceptability of systems (and probable replaceability); 2) the degree to which small stockholder participants are participating in management and decision making; 3) the impact of the technical management systems, and the technology employed, on the cattle and on the rangeland; 4) the economic viability of the systems and their benefit cost ratios. NOTE: (Livestock and ecological data is essential to this issue) and; 5) modifications to systems, including training components, which appear useful or essential. EDY consultants would be very useful to assist in this task. NOTE: This implementation schedule will become increasingly less specific as the project progresses. It is expected through the use of annual work plans and evaluations, feedback from the livestock and ecological research and feedback through the rural sociologist services, that operational actions and details of small stockholder operations may be altered.

10. Establish and continue yearly on-going evaluations and modify operations as determined.
11. Continue in-service training and small stockholder training.
12. Utilize returned participants in paired roles with U.S. provided staff for practical on-the-job training and experience, especially in management aspects of project operations.
13. Utilize TDY services to provide additional evaluation, sociological, management or technical skills as required.
14. Continue collection of and integration of ecological data with other GOB livestock and agronomic information for use in on-going test area management decisions, i.e., time to market, stocking levels, grazing rotations to employ, etc.
15. Prepare for and hold major objective evaluation by third parties at the end of three years actual operation (or as appropriate) to determine future course of action/identify systems to expand. Include in the evaluation comparisons with control areas. TDY consultants will be expected to perform this evaluation.
NOTE: The following actions, near and up to the end of Phase Two, assume that the external evaluation noted above, has resulted in a GOB decision to program for initial expansion of the test system(s) (probably 15 or less due to limitations of technically trained manpower).
16. Assist in identification (pre-selection) of areas for new system consideration (as in Phase One). NOTE: Magnitude or scope of expansion (number of units) will be determined by an analysis of: 1) availability of trained staff with required technical skills and technical/logistically/managerial backstopping; 2) availability of finance and management skills to expand the small stockholders revolving credit fund and; 3) availability of interested and trained small stockholders and their appropriate organizations who wish to participate.
17. Assist in preliminary designs of such system and prepare cost estimates.
18. Assist in preparation of GOL budget needs (requirements to finance new systems). Assist local credit institution in its need to expand services. Preparation of requests for external finance may be required.

19. Expand small stockholder training and education activities.
20. OPEX staff will assist to assure that returned participants assume increasing responsibility for management and decision making.
21. Continue to utilize consultancy services - probably of value in assistance in establishment of forward funding requirements for system replication.
22. Phase down and out U.S. provided support for: 1) range agronomist; 2) surface water and land use engineer and; 3) data processing technician. By this period, trained staff should be available for the range and data position. The Division of Land Utilization, also with UNDP assistance, can be expected to be able to handle the water and ranch engineering tasks by this time.

Phase three: Expansion of Successful Prototypes and Development Financing Requirements
(48-60-70 months)*

NOTE: Phase Three may be advanced or delayed dependent upon project results and the results of the evaluations scheduled in Phase Two.

1. Prepare Work Plan for Phase Three based on the following actions.
2. Continue, if needed, to assist the GOB in securing funds for systems replication.
3. Complete detail designs of replicated systems and assist installation.
4. Assist in establishing additional links with the market system.
5. Provide returned participants with increasing opportunities and responsibilities.
6. Continue evaluation and design and new evaluation systems appropriate to larger scale operations.

* Will coincide with end of project.

7. Assist, if needed, the MOF, MOA in preparation of documentation to attract/justify investment capital for use in continuing and/or major replication of group small stockholder systems for widespread application.

8. By in-service and on-the-job training of GOB staff, assure that capability to expand all phases of small stockholder programs is available to manage, attract funding, provide with requisite know-how and successfully adapted to varying Botswana social and physical environments.

JUSTIFICATION FOR PROJECT

Introduction

As indicated in Appendix I, livestock production is the most important industry in Botswana by any measure. However, the industry and the country face a complex dilemma involving the livestock sector and the resources it feeds upon. Experts agree that range deterioration is an accelerating problem, particularly in the heavily populated eastern tribal lands where range and cropland are intermingled. At the same time, small stockholders (defined as those family units having less than 60 head of cattle), who make up about 60 per cent of the total population (based on the 1970/71 Agricultural Survey), are largely dependent on the range in these areas. The predictable result of this untenable situation is a worsening economic situation for the majority of the population with serious repercussions for the entire Botswana economy.^{1/}

Almost paradoxically, livestock production also appears to hold the greatest development opportunities in the agricultural sector, given Botswana's natural resources. World livestock markets currently provide positive economic incentives for Botswana to expand production. Range and livestock experts indicate that Botswana has the animal and range potential to boost livestock output significantly. A large reservoir of people with livestock experience and the desire to work with livestock rather than in other agricultural enterprises is available. However, to fully capitalize on these advantages by developing Botswana's livestock production potential and allowing the returns to be equitably spread to the more neglected members of the rural economy, resolution of smallholder range and livestock management problems is required. This is precisely the aim of this project.

GOB Priority

A key positive factor for range and livestock project directed primarily at small livestock holders in the East and North-West is the demonstrated attitude and interest of Government. The goal of this project is a direct

^{1/} In the words of Government of Botswana Paper I Rural Development in Botswana, "overstocking, especially in the communally grazed area, occupied in particular by the small farmers who cannot afford individual cattle posts, demands an urgent solution. There are large concentrations of cattle around existing watering points and with the prevailing systems of land tenure effective management and control of these cattle populations are difficult to achieve...a rapid and wholesome introduction of individual forms of land tenure would, however, almost certainly widen and fix more rigidly the existing division between the rich minority and the poorer majority. People with small herds will now be actively encouraged to form themselves into viable groups."

quote from the National Government Plan 1973-1978. The Plan outlines practical steps toward achieving that goal while stressing the importance of an equitable distribution of the benefits from livestock development. Emphasis is on ensuring that "owners of small herds can share the benefits of improved husbandry" and that "those selling only a few beasts get the best possible price for them". The Plan also recognizes that "the technical knowledge for an enormous increase in livestock production exists, provided that the problems of social organization can be solved". (emphasis added) Furthermore, a recent report by outside experts strongly urges policies of land use planning, a short moratorium on borehole permits, a rapid "quick and dirty" survey of land use and establishment of lease or rent systems for private use while serious consideration is given to the possibility of reserving areas for cooperative and communal systems.

Concrete evidence of continued and expanded GOB interest in agriculture and livestock is reflected by increase in budgets for these purposes. Recurrent budgets for Agriculture have risen from R2,242,200 (\$2,915,000) in 1970/71 to R2,813,018 (\$3,657,000) in 1972/73, with an increase to R3,100,000 (\$4,000,000) projected for 1973/74. The Agricultural Development budget has also risen during this period with a substantial jump of over R600,000 (\$780,000) projected between 1972/73 and 1973/74.

Other Donor Programs

Enhancing the suitability of the proposed project is its role as one of the integral pieces in a coordinated donor effort to address the development problems of the livestock industry. As such, much of the A.I.D. assistance will be built upon or complemented by work already underway with the results of the project both directly benefiting the Botswana livestock industry and also increasing the effectiveness of donor inputs in the livestock area. The project scope and direction was confirmed by other donors, in several meetings held in January/February, 1973, as filling a key gap in livestock assistance efforts.

A review of donor assistance in the livestock sub-sector shows:

(a) IDA, with SIDA cooperation, provision of loan funds (IDA and SIDA) and grant (SIDA) assistance to 1) Large scale ranching schemes in The Western Lands, both breeding and fattening; 2) Karakul Sheep Farms; other fattening ranches and some assistance to the Botswana Livestock Development company. These schemes will be complementary to the small stockholder project proposed by this PROP. Project provided research can be expected to be applicable to these activities;

(b) ODA provision of large number of MOA staff on a topped up basis, including the heads of Agricultural Research and Animal Production Divisions, who have direct responsibility for administering and implementing MOA programs effecting livestock production;

(c) ODA grant financing for selected operations such as the MOA livestock breeding ranches and the agricultural training schools;

(d) UNDP supplied senior personnel on both OPAS and technical-expert basis including the agricultural statistician, the head of the MOA's Division of Land Utilization (where the project's Surface Water Land Use Engineer would be assigned), the officer in charge of Animal Husbandry Research (with whom the A.I.D. Research Agronomist would work), and four international experts in cooperative development focusing on organization, education and training, and livestock marketing and management;

(e) A UNDP proposal to expand its assistance to the Division of Land Utilization; and

(f) SLIDA work on village development programs in western Botswana which are comprehensive and include livestock development.

Other donors such as OXFAM and the UN Freedom from Hunger Campaign are involved in village development projects, including construction of water supplies, which are on the periphery of the livestock industry perhaps involving small livestock owners. The relationship of this project to other donor activities can be summarized as non-duplicating, filling a major gap, complementary and fully cooperative.

Project Constraints

Turning to potential barriers to successful implementation, the project perhaps faces its greatest difficulties in the social/cultural area. In Botswana, there is growing evidence that many of the relevant cultural attitudes which might formerly have placed impossible constraints on technology are now changing. For example, the recently passed Agricultural Resources Act, 1972 provides a legal basis on which to take stock control action indicating that the Botswana Lawmakers, who presumably reflect the wishes of the electorate are prepared to see changes in current practice implemented. Examples of changes include: the concept of fencing land, traditionally abhorrent to the culture, is occurring on a limited basis and is being supported by the GOB and tribal officials when they have to be in the best interests of the community as a whole; the concept of specific group/individual control of waterholes, also not a traditional concept, is being practiced in specific cases; the traditional methods of exchange or market of livestock is being rapidly substituted by some form of cash sale and interest in the Botswana Meat Commission and G.O.B. fattening ranches is high. It can also be noted that in talks with livestock owners there was recognition that the traditional practices of range utilization were leading to a rapid deterioration problem and they were concerned with finding solutions. It can also be reported that livestock production is increasingly viewed, even by small producers, as a means to an end (income) rather than an end in itself. Taken together these indicators demonstrate a growing interest in and willingness to adopt new methods.

To ensure ample consideration of the social/cultural aspects of the setting in which the project must work, particularly during the first phase when group range and livestock management systems are being formulated for testing, the GOB will provide the services of a rural sociologist on a 1/3-1/2 time basis. He will help make certain that the systems developed reflect the wishes of the small stockholders. These may take time to ascertain, but all concerned must realize that excess speed in formulating systems (perhaps due to pressure for achievement) might have high subsequent costs if stockholders do not fully understand what is happening or are not fully committed. It is believed that the sociological input will meet project requirements and allow the development of systems and methods compatible with changing social/cultural attitudes.

A second area of potential concern is the GOB's ability to provide the manpower and financial support to carry out the project as well as to expand and replicate the systems and methods developed within the project. Trained manpower is a current MOA problem. Many posts affecting this project are empty or are filled by personnel with a multitude of duties. Given this situation, typical of a least developed country, it was not judged feasible to provide advisors requiring direct, full-time professional counterparts. Instead, the project will provide OPEX, operational personnel, supported by lower level MOA staff who will receive on-the-job training by project personnel. (If professional counterparts are insisted upon, they could be provided only by, in effect, "raiding" other current MOA and donor-assisted projects for appropriate personnel. Obviously, in the long term interests of developing MOA capability in several fields this alternative would not be productive.)

The participant training element, which is as large as possible given the manpower situation, will provide personnel in the later years of the project who will act more nearly as counterparts and be able to assume full project responsibilities as U.S. personnel are phased out. In addition, as part of an on-going GOB agricultural training program, 12 to 15 Botswana each year attend the three year diploma course in agriculture at the Swaziland Agricultural College, a part of the University of Botswana, Lesotho and Swaziland (UBLS) complex. It is estimated that at least three of these students will be annually employed in the MOA divisions responsible for the present project. In addition, by the end of the project, it is expected that the UBLS system will be able to supply the additional technicians required for replication of the range management systems, so that training of additional participants in the U.S. or elsewhere will not be necessary.

* The MOA has affirmed its ability and interest in providing necessary personnel for training and supporting staff from existing and incoming manpower pools. The MOA also confirmed that recurrent project costs will be included in the 1974/75 MOA budget which coincides with the expected implementation schedule. Their past record is good and no reasons are foreseen why more than normal problems will occur for this project.

* See PROP Section, GOB Inputs, Page 41
See Appendix 7, In-Service Training Schedule

Through the filling of selected manpower gaps and the in-country and external training of Botswana, combined with personnel available from other sources, it is believed a core staff can be developed by project end which will allow expansion of successful research-tested methods and institutionalization of project objectives. Also the phased nature of the project allows MOA capability to be developed as the project develops, without threatening project success.

During the expansion phase of the project it is expected that external financial resources will be available to augment GOB budget amounts required for capital and technical inputs.

Economic Considerations

The economic return for projects involving substantial periods of development and testing is difficult to measure. First, there is no certainty of the development and testing results which can be achieved within a given time span. Second, the economic environment affecting the results may substantially change over time. Third, the time required for adoption and implementation of research results by a significant portion of a particular population often cannot be predicted. The timing is made even more uncertain when thousands of individuals rather than one or two large producers are involved. What can be done is to specify the types of results which are expected from the development and testing and then plot these against the potential adaptive population assuming current conditions.

For this project over the long run, if replicable economic systems of smallholder range and livestock management are developed, it is expected that a larger number of heavier, higher quality cattle can be harvested by smallholders while maintaining the range in good condition. Translated into money this means greater incomes flowing into the pockets of smallholders.

On a country wide basis small improvements in the proportion of the national herd which falls into the smallholder classification (about 40 per cent) can be significant. For example, if smallholders were able to market one per cent more animals, grading 5 per cent higher and weighing 5 kilograms more per carcass, the annual additional gross returns to smallholder producers would be approximately \$1,000,000 annually (based on a smallholder herd of 500,000 and average 1971 weights and prices as reported by the Botswana Meat Commission). Such improvements over time are quite conservative in terms of what is already being achieved on better managed herds and range in Botswana. We would expect actual improvements to be of a greater magnitude.

In addition to the above benefits there are certain others which will result from the project and which should be considered. Improved management of the range will maintain or even improve its productivity over time

rather than allowing the range to deteriorate to a point of little value. Implied in a project which successfully reaches smallholders and increases their income are important political and cultural ramifications for the country as a whole. The management techniques developed can be carried over into other projects and areas with positive results. All of these and similar benefits are difficult to quantify.

During the 7 year life of this systems development project, direct costs will undoubtedly outweigh benefits. Development and testing of smallholder range and livestock systems to the point where they are ready for widespread application will require most of the project life. Several additional years will be required before the systems are widely in use and the quantifiable returns become significant in an aggregate sense. Clearly any meaningful cost benefit analysis would need to cover more than just project life, and take place after the optimum organizational models are identified.

An attempt was made through the use of economic models, which were based on current information and costs and on expectations and judgments, to determine if smallholder systems would be economically viable. The models used were 1) a smallscale model, technically feasible in the more densely populated areas and 2) a largescale model which would be technically feasible where availability of rangeland was not a constraint. Both models appeared viable over the long run (20 years) with significant returns beginning to appear almost immediately but with cash flow problems in early years.

These economic models are not included because of the lack of sufficient hard data at this time and because it was feared that they would be construed as the actual situation, results which might definitely be expected, or systems to be implemented and tested. In the process of project implementation a thorough economic evaluation of the systems tested must be prepared. This will serve as an important criteria to determine which systems to test and should assure that over the long run the project will develop systems which are economically sound.

In conclusion, failure to solve the range and livestock problem as it relates to smallholders predicts a stagnating or retrogressing industry with probable disastrous effects on the country as a whole and especially on the large number of small stockholders. It is thus in the interest of Botswana's long term stability and economic progress to take positive steps toward developing group livestock and range management systems which will halt the current trend toward deterioration. Technical solutions to problems are possible and the GOB is prepared to undertake them. The A.I.D. input will be a major ingredient in developing these solutions.

DISCUSSION OF AID INPUTS

AID inputs consist of technical services, commodities, local costs and participant training.

Technical Services (\$1,130,000, including consultancies)

In the MOA Division of Animal Production, a team, composed of a Senior Livestock and Range Management Specialist (SLRMS), a Range Management Extension Training Officer (RMETO) a Livestock Production Specialist (LPS) skilled also in marketing, a Surface Water Land Use Engineer (SWLUE) seconded to the Division of Land Utilization, a Range Agronomist (RA) seconded to the Agricultural Research Division, and a Data Processing Technician (DPT) also seconded to the Agricultural Research Division, will work closely with rural sociologists, extension staff, local government, tribal leaders, and small stockholders in order to formulate three or more technically feasible and socially acceptable group systems of livestock production and range management. The team is to be recruited as a unit with the possible exception of the SLRMS who will act as team chief. If a qualified direct-hire staff member is available on a timely basis for the SLRMS position and is willing to accept OPEX conditions he should be given first consideration. In the absence of such a direct-hire staff the SLRMS should be provided by the same organization supplying the other team members.

Senior Livestock Range Management Specialist:

The SLRMS will focus on overall direction, development, and coordination of inputs to obtain systems for testing and a comprehensive plan for completing the tests. He will emphasize the development of systems which will permit optimal use of forage resources while maintaining and improving range conditions. Methods considered will include alternate grazing plans such as rest rotation systems with "what and where" controls. Methods will utilize forage at times of highest nutritive levels and provide for periods of rest to insure plant vigor, recovery, seeding, and seeding establishment. Another important aspect will be the determination of optimal carrying capacities over time. Studies of burning practices will also be taken into consideration.

Planning will take account of other existing or possible range uses such as wildlife and arable agriculture. Procedures will include sociological and technical baseline records, i.e. family size and income, purpose of cattle sales and photogrid sample plots for data collection on forage production, cattle numbers, and rainfall data, etc.

Since social acceptability is a key factor in success of smallholder programs, the SLRMS will, with the 1/3-1/2 time services of the MOA rural sociologist and with the assistance of a full time qualified GOB junior staff member who has had experience working with local or tribal groups, assure that the technically feasible and economically evaluate measures proposed fit the local environment.

Surface Water Land Use Engineer:

To assist the SLRMS, the SWMLUE will advise on surface water inflow, soil conditions, evaporations rates, percolation loss, and general conditions affecting the type and

size of surface water structures best suited to the test areas. The need is to provide adequate water in the right places so grazing can occur according to a planned grazing scheme with efficient livestock and people movements. The engineer will plan and assist in installing the recommended water system, including reticulation. If ground water is employed, the engineer will arrange for the necessary coordination to complete the water system in the test areas. In all instances he will work with the small stockholders from inception to insure that they feel it is their water and their responsibility. This phase will be coordinated with the sociologist and extension personnel in order to thoroughly explain the principle of water management to chiefs, sub-chiefs, smallholders and water custodial personnel. A final important job of the engineer will be to prepare specific plans, procedures and designs on the construction and maintenance of small surface water systems (1-5 million gals). These will be translated into the local language where feasible. Routinely he will add an economic dimension to his recommendations.

Range Management Extension Training Officer:

The RMETO will have much of the field responsibility for construction/installation of the test areas, including working with smallholders on fencing, rotational grazing, burning practices, and water and soil conservation. Further, he will oversee the organization and development of grazing committees (legalized where necessary) to administer project areas and present their interests to appropriate authorities as required. As the physical construction responsibility for test areas eases, he will guide his efforts towards the creation of a viable in-service extension training unit which will be formed, staffed (initially with OPEX trainers), supplied with new training materials developed by the team, and will utilize some of the early test experience from the range management systems.

Livestock Production Specialist:

The LPS will be expected to provide detailed plans that will insure test areas operate under minimum acceptable standards of management (e.g. controlled constant grazing, daily watering, salt, bonemeal, and protein supplement, culling, castration, vaccination etc.). He will consider trailing routes, holding grounds, and marketing links between the BMC and smallholders. He will gather local opinions of the test plans and incorporate plan changes if necessary. He will arrange "show me" trips, initially for possible participants in test areas and later for smallholders outside test areas to acquaint them with new methods. He will prepare extension materials for the production portion of the in-service training and will present them to GOB officers and smallholders as required. He will complete an economic analysis of each rangeland livestock management system tested.

*Range Agronomist: (Ecologist)

The RA will see that methods and site areas have established baseline data for future comparison. His main responsibility will be range research addressing methods

* While Position is noted as Range Agronomist, detailed duties noted above and in appendix 3 require incumbent to also have many skills normally found in Range Ecology discipline.

of quantifying what cattle are doing to the range (changes of range ecology, grass and browse balance, bush encroachment, etc.) with a view towards preventing and redressing damage. He will prepare a range site and conditions classification map of project areas and early in the test he will assist in determining the carrying capacity based on forage production. He will help install permanent photo grid transects, at least one in every pasture, and insure that needed samples are collected as part of the project. As a matter of course, he will remain abreast of current research that has application to the project.

Data Processing Technician:

The DPT will receive information and samples from the field. He will check them for accuracy and completeness, supervise the encoding and key punching, and process the data through the computer. He will be responsible for checking the printouts and distributing them within the ministry and to outlying field stations in a timely manner. His responsibility will also include on-going analysis of country wide livestock, range and sociological data and the highly useful linking of such data through the existing processing systems, to the substantial and inter-related data flowing from the projects studies in range ecology, effect of management systems on range and livestock and sociological/evaluation information. By means of the GOB data processing systems, research information can be very rapidly introduced to project operations.

Note: The MOA has available and utilizes a small scale encoder and data processor. This equipment will be replaced in FY 74 by use of a centralized, GOB wide installation to which the MOA and project research will have terminals. By the use of this modern data processing system, results of livestock and range ecological data (both project generated and GOB research) can be promptly processed and feedback into needed improvements/modification of project operations. The DPT will also in service train MOA, and other GOB staff in systems programming and in operations of modern data processing systems.

Following is a Summary of Project Manpower Phasing and Costs:

| Position | I Manpower Schedule | | | | | | | Total |
|-------------------------|---------------------|-----|-----|-----|-----|----|----|-------|
| | (Cost in 000) | | | | | | | |
| | Year (FY) | | | | | | | |
| | 73 | 74 | 75 | 76 | 77 | 78 | 79 | |
| 1. Senior Lvt.kg.Mgt. | \$75 | | 80 | | 90 | | | \$245 |
| 2. Land Use, Water Eng. | | 65 | | 70 | | | | 135 |
| 3. Livestock Splst | | 65 | 70 | | 75 | | | 210 |
| 4. Rang. Agromst. (ECO) | | 65 | | 70 | | | | 135 |
| 5. Range Mgmt. | | 65 | | 70 | | 35 | | 170 |
| 6. Data Proc. | | | 70 | | 75 | | | 145 |
| 7. TDY Service | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 90 |
| TOTAL | 140 | 210 | 235 | 225 | 255 | 50 | 15 | 1,130 |

U. S. Commodities (\$68,000)

Comodity unputs and timing will be as follows:

Vehicles: (\$30,000 FY 73)

1. Three 4 wheel drive pick-up trucks are required for field use by project staff, since test sites will be in different locations and each technician will have different responsibilities requiring different on-site time. Such vehicles, equipped with canvas tops will be used to transport supplies as well as carry the project related personnel if needed.

2. Two 4-wheel drive carry-all type vehicles are needed. One will be used by the team Chief for his coordinative and administrative, as well as his technical duties, which will often involve several people. The other carry-all will be used by the Range Management Extension Training Officer. In his extension/training role he will often need to transport people and light training materials which can be done with greater efficiency and security in carry-alls.

All vehicles should be equipped with 4-speed transmission and heavy duty tires, springs, shock absorbers etc. Provision is also made for approximately \$500 of spare parts with each vehicle.

NOTE: Local repair capability is only available for U.S. manufactured Cheverolet Vehicles and proprietary procurement will be required.

Laboratory and Technical Supplies: (\$38,000 FY 74)

Laboratory Supplies (30,000 FY 74)

The following types of equipment and supplies will be needed for installation in the U.S. provided Laboratory Block to be constructed by the project. This Laboratory Block and these supplies, will be provided to the Division of Agricultural Research for use by the project in testing and determining chemical analysis of the large numbers of forage samples related to project required applied research tests. The GOB has a somewhat similar block in use at present which serves a well managed nation-wide range/livestock research effort. It is expected that the GOB existing facility will, as the project provided unit gets in operation, specialize on animal research samples, both from the projects tests and GOB wide tests, while the AID provided unit can specialize on range grass/forage analysis for the project, and for other GOB research. This will provide improved efficiency of use of staff, equipment and time as well as assuring the essential consistancy of analysis.

Without the laboratory block and equipment herein identified, the GOB would not have the capability to handle the projects needs. The size of the unit proposed and the equipment listed is consistant with the amount of additional analysis required by the Research Division in support of this projects objectives.

Following is a list of equipment required.

| Laboratory and Supplies | US \$ |
|---|----------|
| Drying ovens | 1,500 |
| Sample grinders | 300 |
| Sieves | 200 |
| Stirring Apparatus | 200 |
| Distillation equipment | 500 |
| Sample Storage containers | 300 |
| Colorimetric facilities | 400 |
| PH meters | 200 |
| Flame spectro-photometer | 2,000 |
| Mettler balance or equivalent | 1,500 |
| Field sample scale | 800 |
| Refrigerator | 400 |
| Freezer | 500 |
| Kjeldahl apparatus and hoods | 4,000 |
| Centrifuge | 1,000 |
| Microscope | 800 |
| Chemicals and reagents | 5,000 |
| Classware (burettes, distillation flasks, beakers, tubes, pipettes) | 3,000 |
| Incubators and blenders | 1,400 |
| Voltage stabilization system and transformers | 6,000 |
| Sub-total | \$30,000 |

Other Supplies (\$8000, FY 74)

The following types of equipment are required to assist project staff in 1) implementation, testing and evaluations of sites selected and 2) in support for the substantial in-service training schedule of the project and the small stockholder training component.

Following is a list of Equipment Required.

| | |
|-----------------------------------|----------|
| Camera and photo equipment | 500 |
| Camping equipment (4sets) | 1,600 |
| Level, tripod, tape, rod, chain | 350 |
| Scales | 250 |
| Reference materials | 200 |
| 5,000 watt generators (2) | 750 |
| 16 mm Sound projector/System (2) | 3,000 |
| Films strips/slide projectors (2) | 700 |
| Desk calculators (3) | 650 |
| Sub-total | \$8,000 |
| Grand Total | \$38,000 |

Local Costs (\$240,000 FY 73-75)

Local cost provisions are required on this project for non-recurrent items such as staff housing, a small laboratory block and minimum installation and facilities at up to three test and training sites. The GOB will be responsible for all recurrent costs associated with these investments and will provide the required staff support.

US funding for local costs is justified given the "least developed nation" designation for Botswana, the cessation of general budget support by the U.K. and the practical need to procure types of commodities, i.e. pumps, motors, fencing supplies, building supplies and components, etc. which are consistent with local designs and for which repairs or replacements can be assured. These local costs which are of direct benefit to participating small stockholders will be placed in a GOB managed "revolving credit fund" and participants will be expected to repay development costs (see item 3 following).

1. US Technical Staff Housing (\$100,000, FY 73)

No housing is currently available for project staff with little chance of improvement due to the acute housing shortage experienced by all GOB ministries. Consequently, five (5) houses, equivalent to GOB senior staff quarters will be required at a unit cost of \$20,000 each for a total of \$100,000 (costs are based on recent GOB/AID experience). Payments for housing construction will follow standard AID-GOB procedures. Locations will be determined by GOB/OSARAC negotiations. Housing will be provided by the GOB for the data processing position in the project.

2. Construction of a Laboratory Block (\$30,000, FY 73)

One laboratory block, approximately 24 feet by 60 feet will be constructed at a cost of U.S. \$30,000. It will be attached to or constructed adjacent to existing research facilities which are being used to capacity. The laboratory would have the AID provided equipment installed and would be utilized in analysis, testing and evaluations of range samples as described above.

Costs listed above are based on GOB estimates of research laboratory construction costs.

3. Installation and Operation of Three Test Area Systems: (\$110,000 FY 74-75)

Because of the experimental nature of the operations and the limited financial resources of the MOA, it is appropriate that AID provide limited financing to get test areas underway. Costs will include water supply, corrals, fences (if required) ranch trails, farmer training facilities and perhaps housing for local training staff. AID will provide up to \$92,000 for a revolving fund to be used for not more than three (3) such installations and up to \$18,000 for other requirements of the sites which would not be charged to participating small stockholders.

The GOB has agreed that this AID provided local currency funding will be placed in a revolving fund and that small stockholder participants will mutually pledge repayment on an agreed-to long term basis for those essential facilities and installations. AID will not require repayment of funding provided for required local staff quarters or training facilities. Following is a breakdown by category of the local funding:

| (A) <u>Revolving Credit Fund Purpose</u> | <u>Amount</u> |
|--|---------------|
| (1) <u>Water Supply</u> | |
| (a) Boreholes (7) | \$25,000 |
| (b) Reservoirs (7) | 14,000 |
| (c) Pumps, motors (7) | 7,000 |

GOB CONTRIBUTIONS TO THE PROJECT

AID expects the MOA of the GOB to be responsible for the following types of costs and services in support of the project and the MOA is preparing a detailed requirements analysis, as requested by the Ministry of Finance and Development Planning, for inclusion in the budget for fiscal year 1974, which begins in April of 1974. This budget will include the following items:

Human Resources

The GOB has agreed to provide the following personnel from the Ministry of Agriculture.

Year One

- 1 full time typist in the Animal Production Division
- 5 Agricultural Assistants as follows:
 - 3 Livestock and Range Management oriented
 - 1 Agricultural Demonstrator - Data and Record keeping and sampling oriented
 - 1 Agricultural Demonstrator - Surface water engineering interest
- From 1/3 - 1/2 time services of the Senior Rural Sociologist
- One 1 full time Agricultural Demonstrator in support of the Extension/Rural Sociology requirements.

Year 2-4

- Same as above plus:
- 2 Agricultural Demonstrators (or equivalent) per test area

Year 4+

Estimates for years 4+ are currently premature. Required staff (Technical and Managerial) for project replication will be essential.

Financial Resources

1. Costs Associated with Project Staff:

- (a) Base salary for U.S. technical staff at appropriate grade levels as follows:

| <u>Position</u> | <u>Level Expected</u> |
|--|--|
| -Team Chief and Senior Livestock and Range Management Specialist | Senior staff in Animal Production Division |
| -Surface Water Land Use Engineer | Senior staff |
| -Range Agronomist (Ecologist), (Research) | Senior staff |
| -Livestock Production Specialist | Senior staff |
| -Range Management Extension Training Officer | Senior staff |
| -Data Processing Technician | Senior staff |

- (b) Office space and normal administrative support, (secretarial,

furniture, supplies, etc.) at GOB standards.

- (c) Operating, repair and replacement costs for project - provided vehicles at GOB standard.
- (d) Within country travel expenses for approved project related needs per GOB standards.
- (e) Support for local staff working on the project according to GOB standards (salary, housing, office space, travel, allowances, etc.).

2. Costs Associated with Project Operations:

- (a) Operating, repair and replacement costs for AID provided laboratory technical equipment and facilities.
- (b) Costs of associated research, support from other MOA divisions and such other contributions to project objectives as may be needed and agreed to by the team chief and the MOA
- (c) While AID proposes to provide up to \$110,000 (\$92,000 under a revolving fund arrangement) for test area studies, if additional tests are agreed upon, the GOB will finance them. Similarly, initial expansion of the prototypes to operational ranches (up to 15) will be financed by the GOB. (It is expected that the participants will bear a substantial portion of such costs through a revolving fund or credit arrangement.)
- (d) Farmer training centers will be available, staffed and supported to permit short-term (3 to 5 days) training for up to 150 farmers per year in the improved management systems developed under the project.
- (e) Participants for external training at U.S. and other African institutions, will be available according to standard GOB procedures.

Note: 2 for training in the U.S.; 6 for training in other African countries.

- (f) MOA junior staff employees of the Division of Animal Production, the Division of Land Utilization, the Division of Agricultural Extension and the Division of Agricultural Research will be supported for in-service training as described in Appendix 7 of this Project paper.

Preliminary Estimate of Actual Costs Borne by GOB

| <u>Item</u> | <u>Unit Cost</u> | <u>No.</u> | <u>Yearly Estimate (Total)</u> |
|---|------------------|-----------------|--------------------------------|
| Technical staff base salary | \$5,000 | 6 | \$30,000 |
| Secretary | 1,000 | 1 | 1,000 |
| Office equipment & supplies | 100 | 6 | 600 |
| Maintenance of laboratory equipment | 3,000 | 1 | 3,000 |
| Research operations | 6,000 | - | 6,000 |
| Farmer training, 150 @ 5 days at \$2.00/day | - | - | 1,500 |
| Participants' salary | 1,500 | 8 | 12,000 |
| Agricultural Demonstrators | 1,500 | 6 | 9,000 |
| Rural Sociologist 1/6 time (Ave. over project life) | 1,000 | - | 1,000 |
| Vehicles - repair & replacement @ 20% original cost | 1,200 | 5 | 6,000 |
| - operation | 1,200 | 5 | 6,000 |
| Local travel of technical staff | 300 | 6 | 1,800 |
| | <u> </u> | <u> </u> | <u> </u> |
| | Yearly total: | | \$77,900 |

For six years' operations = \$467,400

Note: Not included are values of land provided for housing and laboratory space, general overhead costs of motor pool, typing services and costs associated with other MOA or GOB agencies in cooperation with or in support of the project.

PROJECT COORDINATION

With the Ministry of Agriculture

Of project OPEX personnel provided to the Division of Animal Production three will be seconded to other divisions - The Range Agronomist and the Data Processing Technician to Agricultural Research and the Surface Water Land Use Engineer to the Division of Land Utilization. Clearly, successful project operations are inexorably dependent on coordination between these three Divisions as well as with MOA's Department of Animal Health, the Agricultural Extension Division, Division of Planning and Statistics and the Division of Cooperatives.

The Deputy Permanent Secretary (DPS-Technical) will be the MOA coordinator. He will call working meetings of MOA Divisions as required to assure smooth and prompt project implementation and resolution of policy issues. Coordination with MOA Departments and Divisions will be expedited by the team chief of the project who will have, through his Division Head of Animal Production, access to the DPS-Technical. As a further coordination mechanism, annual work plans for project implementation will be prepared by the team chief for the review and concurrence of all cooperating Divisions of the MOA and the approval of the DPS-Technical. It is expected the project staff and MOA Division staff will establish close professional relationships. MCA will be active participants in all evaluations.

With Local Government and Small Stockholders

To assure prompt and successful testing of management systems, and expansion of proven prototypes, the involvement of local action groups is absolutely required. The GCB will provide links between project staff (MOA) and District, Tribal and Village groups or agencies, as well as with ad hoc units such as informal "associations" or "syndicates" of small stockholders. Systems of management will not be imposed, but rather, will be developed following extensive contacts by project staff with local groups, assisted by the MOA Planning and Rural Sociology personnel. Social acceptability of any new systems of range and livestock management must be first priority. Specific types of institutions, groups, committees or such official coordination and linking agencies are not now identifiable but will be developed by project staff in consultation with appropriate GOB officials.

Among GOB Ministries

The GOB will provide links between the project and those Ministries which will need to make significant inputs to assure that small stockholder management systems can be implemented. A particular need will be clear lines of communication with the Ministry of Commerce, Industry and Water Affairs so that both test areas and units in the expansion phase of the project which have need for prompt action on borehole and/or surface water installations will receive priority attention. Coordination may also be needed with the Ministry of Local Government and Lands, the Directorate of Personnel and other GOB agencies.

Among Project Staff

Internal coordination of the AID supported staff is provided through the Senior Range Management Officer who will be designated as team chief.

EXPECTED RESULTS

The expected results of the project fall into four categories. First it is expected that the systems of range and livestock management developed and tested will halt range deterioration where applied and be suitable for replication throughout small livestockholder or tribal areas of Botswana.

Second, in economic terms the systems will ultimately result in increased livestock production due to higher calving rates, lower mortality, better feeding and earlier maturity as well as increased incomes for small livestockholders through the sale of a greater number of heavier, higher quality animals raised on areas of range decreasing in size over time. On the national level increased production can be translated into larger exports, greater revenues and greater ability to finance needed development imports.

Third, systems developed by the project will provide small stockholders a piece of the development action, alleviate underemployment, more widely distribute the benefits of development and preserve those features of traditional rural society which promote social cohesion and mutual cooperation.

Fourth, certain key divisions in the MOA will be strengthened by on-the-job and participant training. The project will produce a wider information base and increased capabilities in the GOB to plan, implement, administer and evaluate development projects. Operating procedures will be developed which can serve as guidelines and models for similar or perhaps even dissimilar projects.

The range research carried out will provide for even further improvements which can be applied. It should be noted, while the primary project focus is on small livestock producers and most of the benefits are expected to accrue to them, that the entire livestock industry i.e. all livestock holders will be affected to varying degrees. Better information on range and livestock management will not be the exclusive property of small livestock producers but will spread and be utilized by all producers thus having an impact on rangeland much beyond the project itself and throughout the country.

APPENDIX 1

THE SETTING FOR THE PROJECT 1/

The Republic of Botswana is a land-locked African country of some 220,000 square miles or approximately the same area as France. Kalahari sand covers about 84 percent of the land surface. Much of the country is generally featureless with gentle undulations at a mean altitude of some 3,300 feet.

Botswana has a continental, arid to semi-arid climate. The mean maximum temperature in January, the hottest month, is approximately 87°F with a mean minimum of 56°F. The mean maximum in the coldest month, July, is 74°F with a mean minimum of 41°F. Temperatures vary relatively little from one part of the country to another. Ground frosts occur regularly from mid-May in the south but are less common in the north.

Variations in average rainfall are much more marked. The 30-year mean for the country as a whole is 15.8 inches a year, but it ranges from less than 7.9 inches in the extreme south-west to almost 27.6 inches in the north-east. In eastern Botswana, where dryland arable farming is mainly practiced, average annual rainfall ranges from 19.7 inches in the south-east to 11.8 inches in the eastern-central district. The distribution of rainfall however is erratic both between seasons and within. Total annual rainfall tends to be more reliable in the east and north and becomes progressively less so towards the south-west. Thus, the coefficient of variation of mean annual rainfall is less than 30 percent along the eastern border but is as high as 80 percent in the south-west.

The seasonal distribution of rainfall is, however, of greater importance than the annual variation. The rains normally begin in October-November and end in March-April, with approximately 95 percent of the annual total falling during this period. In eastern Botswana there tend to be three distinct peaks with early thunderstorms in November and more general rain from late-December to mid-February with a dry period of 20-25 days in the middle.

1/ Extracted largely from IBRD Botswana Livestock Development Project, June 9, 1972 and material prepared by the GOB.

Botswana has two main water catchment systems: the Okavange/Chebe River complex which occupies most of the northwest corner, and the Limpopo River system in the east, with the only relatively fertile soils in the country. The remaining parts are in the riverless and infertile sandy wastes of the Kalahari Desert. Most of the desert is covered by grassland, thorn-scrub, and woodland and is inhabited by vast herds of migrating animals and by bands of wandering bushmen. This area opens up into dry savannah in the extreme southwest between the confluence of the Molohe and Nossop Rivers.

The rangeland of Botswana basically consists of a number of bush and tree savannah types with the grasses being of low productivity, particularly in the Kalahari. Certain grass species remain palatable during the dry season, and these "sweet" grasses, together with a number of bush species, which provide high quality browse, enable cattle to maintain weight through the dry season, provided sufficient food is available.

Because of the harsh environment, grasses, especially the sweet grasses, are highly susceptible to overgrazing and mismanagement. Experts agree that there is an accelerating degradation of the natural pasture evidenced by a change in the distribution of plant populations from perennial to annual grass species and by bush encroachment. This shift to "lower successional" ecosystems reduces the number of cattle which can be sustained and eventually results in the need to change to "lower successional" animals such as goats.

In Botswana land may be conveniently considered in three categories; Tribal, State and Freehold. In tribal areas the land is vested in the tribe as represented by the Tribal Land Board. Under the Tribal Land Act of 1968 the Land Board has all the powers of granting, variation and determination of rights under customary forms of land tenure which were formerly vested in the Chief. Tribal Lands account for approximately half of the surface area of the country. Most of the rest is State Land, title to which is vested in the State. There are seven blocks covering some 4 percent of the country where freehold title has been granted. They are Kanagas, Gantse, Tati, Tuli, Gaborone, Lebatsa and Molohe.

Tribal law and custom permit individuals to fence in their allocation of arable land but forbid any fencing on communal pastures, which must be shared by all members of the community. Private boreholes, however, have been drilled on communal pastures either by individual cattlemen or by groups of cattlemen (known in Botswana as syndicates) who, in turn, monopolize the surrounding grazing by maintaining exclusive control of watering points.

Botswana's population has been growing at an annual rate of 3 percent during recent years and currently totals some 650,000, which gives a population density on a countrywide basis of about three persons per square mile, compared with 83 in Lesotho, 58 in Swaziland and 39 in the Republic of South Africa. Over 80 percent of the inhabitants live in the eastern Tribal Areas of the Limpopo catchment system.

About 88 percent of Botswana's labor force (228,400) was engaged in agriculture in 1967/68 and, of these, 21 percent were under the age of 15 years and only 10 percent were in the employ of someone other than a close relative. During this period, average remuneration from full-time employment in agriculture was under US \$110 per year, compared with an average of about US \$550 for the 28,100 persons employed outside the agricultural sector. The average per capita income in rural areas is, however, only US \$45 to 60.

The main business centers are the capital, Gaborone (population about 18,000); Lobatse (13,000); and Francistown (20,000). All are along the eastern border and are joined together by rail and road. The road swings westward from Francistown to Moun on the edge of the Okavango Swamp and, although it is unpaved throughout, it is negotiable year-round. Apart from a few secondary roads, transport elsewhere in the country is along desert tracks.

The last national accounts, published in mid-1970 and covering 1967/68 show that the country had a Gross Domestic Product (GDP) at factor cost of US \$55.6 million and a per capita GDP of about US \$90. The contributions of the agricultural sector and government services to GDP amounted to 46 percent and 20 percent respectively. Construction, transportation, trade and ownership of dwellings each contributed another 6 percent. The mining and tourist industries are still in their infancy, but they are being developed and will play an increasingly important role in the economy. By 1980, the mining industry is expected to employ about 5,000 more workers and to dominate exports.

As is shown above, Botswana's economy is based on agriculture, mainly livestock. Crop production is primarily for subsistence purposes; only token amounts of such grains as beans, cowpeas, and sorghum are exported. The cattle industry is by far the most important in the country and accounts for over 80 percent of export earnings (1970). In 1969 this industry contributed about US \$1.2 million to Government's recurrent domestic revenue of US \$9.75 million, or around 11.5 percent.

The National Income Accounts for 1968/69 show that 90 percent of the Agricultural Product was in the so-called subsistence sector with 74 percent of this generated by livestock. A UNDP survey in the Shoshong area in 1970/71 revealed that cattle contributed almost 50 percent of cash income whereas only 0.4 percent (61¢ per family per year) was produced by the sale of crops.

The national beef cattle herd totaled some 1,800,000 animals in 1970/71 (estimated) about 8% of which were in the Western State Lands, 11 percent in the Northwestern Tribal Area, and 81 percent in the eastern part of the country. Around 86 percent of the cattle were on African holdings and 14 percent on European-owned freehold properties, mostly in the east along the borders of the Republic of South Africa and Southern Rhodesia and, to a lesser extent, in the Ghanzi District of the Western State Lands.

The sheep and goat populations totaled about 350,000 and 875,000 head, respectively, in 1970 and were estimated at about 370,000 and 1,000,000, respectively in 1971, perhaps already reflecting a trend to "lower succession" species. Both species are traditional sources of milk and meat in rural communities and only token numbers of each are marketed for consumption in urban centers or for export abroad.

The 1970/71 Agricultural Sample Survey was conducted by Government on the more accessible holdings in Tribal and State Lands and excluded all properties in the Freehold Blocks. It covered 52,000 agricultural holdings and shows that cattle were kept on about 40,000 (77%). The average farm held 26 cattle and 27 head of small stock (sheep, goats) and the medium farm, around half these numbers. Data from the survey indicate that 61 percent of the cattle were in herds of over 60 head, averaging about 138 animals.

Tswana cattle are the most prevalent breed in the country. This breed was developed in Botswana from Sanga and lateral-horned Zebu-type cattle and compares very favorably with other African breeds in size, conformation, fertility, growth rate, heat tolerance, grazing ability, and, particularly, hardiness to adverse and arid environmental conditions. Because of these qualities, GOB is reluctant to allow indiscriminate importation of exotic breeds and is discouraging crossbreeding. Instead, the present policy is to upgrade the national herd through the selection of better quality Tswana bulls, and, in the meantime, to conduct crossbreeding experiments with Tuli, Africander, Brahman, and Charolais bulls over Tswana females to compare the performance of their offspring with pure-bred Tswana cattle. Most of these bulls are offspring of past introductions by European farmers, some of whom currently own large herds of either purebred Africander cattle or of crossbred and upgraded animals.

Beef cattle ranching in Botswana is restricted to areas with permanent sources of water, namely, around wells and boreholes, which presently number about 4,500. The estimated carrying capacity of native pastures ranges from about 15 to 25 acres/animal unit (AU) in the relatively fertile semi-arid eastern portions of the country to around 35 to 45 acres/AU in the infertile arid western areas; the semi-arid but infertile north-central region is somewhere in between, with 25 to 35 acres/AU. Two main types of cattle operations can be distinguished: the African holdings on Tribal and State Lands and the freehold properties owned and managed primarily by Europeans.

African rural life on Tribal and State Lands is still governed largely by tradition and custom. As far as cattle are concerned, this means grazing on open, unfenced, communal pastures; uncontrolled breeding; primitive technology and management; and accumulation of animals for draft, prestige and insurance purposes. Herds of mixed ages and sexes are usually allowed to graze untended and are "kraaled" or penned at night only when and where predators are around. This traditional technology has resulted in low weaning rates (40% to 50%), high mortality (9% to 12%), delayed marketing age (five to seven years) and reduced offtake (5% to 7%).

Farmers on Tribal and State Lands normally graze their stock during the seven-month dry period on communal pastures surrounding wells and boreholes and move their animals farther afield in the wet season to graze around natural catchments and ephemeral water holes. Communal grazing grounds surrounding permanent sources of water are invariably overstocked and deteriorating. The general pattern is one of near complete devastation within a radius of two or three miles from permanent sources of water, with damage decreasing gradually until natural range is reached some 12 to 15 miles away. Ad hoc drilling of new boreholes on the fringes of these communal pastures is leading to even more devastation. If not arrested, this escalating and over-lapping process will eventually lay waste large areas of land. An Agricultural Resources Conservation Act was passed in 1972 which provides the legal basis for land use control. Prompt enforcement would not only arrest the indiscriminate exploitation of virgin lands, but would also assist in rehabilitating areas already devastated, primarily through compulsory control of stocking rates and grazing.

However, it should be emphasized that the technical changes such as fencing, increases in herd size, and increased development and diversification of water supplies in themselves are not sufficient conditions for

improvement. The only final means of insuring sustained development is through the introduction of improved management which these changes permit.

The existing freehold properties are operated on a commercial basis, and, in most cases, are financially viable. Their European owners use modern production and management methods such as fencing, rotational grazing, controlled breeding, disease prevention, water reticulation, and mineral supplementation. With these measures, they have so far increased weaning rates to between 60% to 80%, lowered mortality to 2% to 4%, reduced marketing age to around three to four years and raised offtake to 14% to 18%.

The Government-owned Botswana Meat Commission (BMC) has a monopoly on the slaughter of all cattle destined for export. The Commission was established in 1965 as a non-profit organization, distributing each year's annual surplus as a bonus to suppliers of cattle. Its abattoir, on the line of rail at Lobatse, has a potential annual throughput capacity of some 200,000 carcasses if sufficient amounts of industrial water were made available. During the first six years of operation, BMC slaughtered an average of 118,000 head annually, reaching 167,000 in 1971. Exports were mainly to the Republic of South Africa (an average of about 39,000 chilled carcasses annually) and, to a lesser extent, to Zambia (15,000 to 20,000 chilled carcasses annually). The United Kingdom acted as a residual market, taking up the remainder in the form of frozen boneless beef. Currently, the South African Meat Control Board grants BMC a regular weekly quota of 1,000 chilled carcasses and 30 tons of frozen boneless beef (equivalent to about 200 carcasses), with all edible offal therefrom, for sale by auction at the Newton market in Johannesburg, where a floor price is guaranteed by the South African Government. Shortage of refrigerated rail cars and complications in transiting beef shipments across Rhodesia are currently hampering exports to Zambia. The GOB is, however, planning on direct road communications with Zambia and has already commissioned engineering studies for an all-weather road between Nata and Kazungula. It is also investigating the possibilities of establishing a second abattoir in the northern part of the country to better benefit from the Zambian market for imported beef, which is expected to reach 100,000 carcasses by 1980, despite Zambia's own efforts to expand beef production.

Internal marketing of cattle is improving gradually but is still not as well organized as beef exporting. About 60 percent of BMC's annual throughput of cattle arrive directly from the producers, compared with only 40 percent in 1960. This reduction of sales through intermediate buyers is largely a result of efforts on the part

of Government and BMC to provide farmers in remote areas with better sales outlets than those offered by European traders. These efforts include the licensing of Producer's Agents; the provision of funds to purchase young animals; and the establishment of an auction sale yards, marketing cooperatives and demonstration ranches for finishing feeder animals.

About 70 percent of the cattle slaughtered by BMC are transported by train to the abattoir, following trekking and/or trucking from the eastern and northern Tribal areas to the line of rail. Most of the remaining cattle came from the Western State Lands, and because of poor roads and high transport costs, less than 30 percent were transported by truck; the others were trekked.

By African standards, the national herd is remarkably healthy and free of disease. Both Rinderpest and East-Coast Fever, the scourges of the cattle industry in countries farther north, are unknown in Botswana. The only diseases affecting the acceptability of beef on foreign markets are foot and mouth and measles, and both are being controlled on a national scale by cordon fences, quarantines, and vaccination in the case of foot and mouth and by eradication of tape worms in humans and inspection of carcasses at the time of slaughter in the case of measles. Less serious are anthrax, blackleg, and rabies, all of which are kept under control by compulsory annual vaccination. Tsetse-fly-clearing operations are gradually pushing trypanosomiasis back into the Okavango Swamps.

External and internal parasites are common, but are not a major health hazard, particularly when animals are sprayed and dosed regularly, as is done on many European-owned freehold properties. More important is an almost countrywide deficiency of phosphorous in native pastures, which Government is trying to rectify by advocating regular feeding of bone meal.

The cattle industry is serviced by a number of organizations, all of which are staffed at the senior level by expatriate professional officers. The Ministry of Agriculture is primarily responsible for agricultural education, research, extension, cooperatives and animal health, but, like all other ministries is suffering from shortage in facilities, equipment, vehicles, trained personnel, and operating funds.

Technical high school education is provided by the Botswana Agricultural College, which graduates about 35 agricultural demonstrators and 25 veterinary assistants annually. More advanced training is offered at the Swaziland Agricultural College and University Center, namely a three-year diploma course in agriculture. Government expects about 30 Botswana citizens to graduate from SACUC between 1971 and 1973

and hopes all will join the Ministry of Agriculture.

Only four Botswana nationals have university degrees in agriculture or veterinary science, two of whom are presently abroad completing their graduate studies. Nine more are in the process of earning undergraduate degrees and are expected to return to Botswana for employment with the Ministry of Agriculture.

Present research efforts are concentrated in the fields of animal breeding, animal health and management. The Division of Animal Production is evaluating the performance of pure and crossbred Tswana and Africander cattle on 14 field stations with over 1,200 breeding cows. The Department of Animal Health is conducting studies on trace mineral deficiencies and on external and internal parasites at the central diagnosis laboratory in Gaborone. Range management research is being expanded at the Morale and Kalahari Stations.

The extension services of the Division of Animal Production are concentrated in the Eastern Tribal Lands and are directed at the improvement of range management and animal husbandry techniques. This program includes six demonstration ranches and three mobile teams, with a staff complement of about 10 expatriate professionals and 40 African technicians, but the program is having little impact on the industry because research and administrative responsibilities cut down on the amount of time that these officers can spend in the field doing extension work.

The Division of Cooperatives is promoting the establishment of livestock marketing cooperatives in village communities to serve the small producer by reducing trekking costs and eliminating intermediate buyers. Currently, 22 such cooperatives are in existence. These have been marketing increasing numbers of cattle and accounted for about 7 percent (6,800 head) of BMC's total cattle purchases in 1969.

The Department of Animal Health, staffed by 26 expatriate professional officers and 213 technicians, is responsible for the prevention and control of animal diseases; the maintenance and control of quarantine stations, cordon fences, and stock routes; the inspection and grading of meat; and the eradication of tsetse fly. The department is discharging its responsibilities with ability and efficiency and, for the control of foot and mouth disease, had divided the country into four regions by means of cordon fences. Animals are allowed to move from one region to another only after they spend at least 14 days in a strategically sited quarantine station. By this method and with the aid of mobile inspection teams and preventive vaccination in the endemic areas, the Department has kept the disease under control.

Two departments in the Ministry of Commerce, Industry and Water Affairs share responsibility for borehole development. Siting and drilling are carried out by the Department of Geological Survey and Mines and equipping and maintenance by the Department of Water Affairs; no charge is made for drilling unsuccessful boreholes. These departments are currently fielding 10 drilling rigs and 20 mobile maintenance units, but can hardly cope with the backlog of work. Drilling operations should improve with the planned purchase of five additional rigs in the next two years.

Botswana has no Central Bank and, together with Lesotho, the Republic of South Africa and Swaziland, is in the Rand (R) Currency Area. The Banking system in Botswana was developed primarily during the past 10 years and is concentrated in the three main business centers - Gaborone, Lobatse and Francistown. Agricultural credit is provided by the National Development Bank (NDB) and by the only two commercial banks, Barclays DCO and Standard - both with headquarters in London.

NDB was established in 1964 to assist in the development of industry, agriculture and housing. Capital funds now total about US \$1.4 million, mainly from Government and United Kingdom grants and from revenue derived from the sale of State Lands. Other lending activities include the administration of United Kingdom Exchequer Loans, most of which are earmarked for housing. NDB's total portfolio was about US \$2.0 million in December 1970, of which around US \$400,000 was for livestock, mainly in the form of loans to individual cattlemen or groups of cattlemen for borehole development. New loans for livestock development amounted to about US \$150,000 annually during the past two years and now carry an interest rate of 8 percent. NDB has a general manager who has considerable experience in agricultural lending in Uganda. At present, NDB has a staff complement of five, but it is planning to raise the number to eight in the near future to improve its capability to assess and supervise loans. So far the bank has relied on Ministry of Agriculture technicians to assess loan applications and collect repayments on loans granted.

The two commercial banks, Barclays DCO and Standard, are the main sources of credit to the livestock industry and are providing short-term loans and overdrafts at interest rates prevailing in the Rand Currency Area (8½ to 10½%). Their aggregate lending to the private sector increased from about US \$4.6 million in 1967 to around US \$12.0 million in 1970, an important part of which was for livestock. Barclays Bank is also advancing funds to cattlemen fattening animals on Government's demonstration ranches (US \$40 to US \$55 per head) and hopes to increase this kind of lending.

Because many cattle arrive at the BMC slaughter plant in an unfinished condition, BMC in 1969, organized a special "Grazier's Scheme" to help improve the quality of cattle. Under this scheme, BMC purchases unfinished herds of feeder steers and places them for periods of 12 to 18 months in the care of farmers with surplus feed. From the value of the cattle when they are eventually slaughtered, BMC deducts the original cost of the herd, plus interest at 9 percent per annum and US \$3.60 per head supervision fee; the balance goes to the farmer. BMC is receiving financial assistance from Barclays Bank, which supplies funds for the scheme at $8\frac{1}{2}$ percent per annum. The scheme is of considerable assistance to farmers short of working capital and a total of some 8,000 steers worth over US \$600,000 was financed under the scheme in 1971. Plans call for increasing this number to at least 15,000 per annum.

APPENDIX NO. 2

SOURCE AND ORIGIN PROCUREMENT WAIVER JUSTIFICATION

I. IDENTIFICATION OF WAIVERS REQUIRED

This PROP face sheet and continuation lists the following requests for waivers and contains the necessary certification to effect such waivers.

A. A procurement source and origin waiver from Geographic Code (000) U.S. to Geographic Code (935) Special Free World (South Africa).

i) For equipment and specialized services related to construction of U.S. technical staff housing and project related laboratory facilities (see PROP Section, U.S. Inputs, for detail). Calculations follow:

1. Total Cost:

| | |
|--------------|---------------|
| U.S. Housing | \$100,000 |
| Lab. Block | <u>30,000</u> |
| | \$130,000 |

2. Not to exceed 50% of total costs will require procurement outside of Botswana; i.e., Republic of South Africa. (Hardware items, electrical and plumbing special technical services.) NOTE: Percentage based on engineering estimates of current construction.

3. Calculation of waiver amount:

$\$130,000 \times 0.5 =$ \$65,000

ii) For equipment and specialized services related to construction of training centers and warehouses on test sites (see PROP Section, Discussion of U.S. Inputs, page 23 for detail).

1. Total Cost

| | |
|----------------------|--------------|
| (3) Training Centers | \$18,000 |
| (3) Warehouses | <u>6,000</u> |
| | \$24,000 |

2. Not to exceed 30% of total costs will require procurement outside of Botswana; i.e., PSA (hardware items, electrical and special technical services).

3. Calculation of waiver amount:

| | | |
|------------------|----------------|----------|
| \$24,000 x 0.3 = | | \$7,000 |
| | Total | \$72,000 |
| | Waiver Request | \$75,000 |

B. A waiver of AID Regulation No. 7 thus removing restrictions on the employment of third-country nationals on construction financed by AID.

C. A waiver of AID Regulation No. 1 to permit approval of the use of normal, established Government of Botswana procedures for the competitive selection of construction firms for building the facilities financed by AID.

II. SUMMARY WAIVER INFORMATION

- (a) Cooperating Country: Botswana
- (b) Authorizing Document: PROP attached
- (c) Project: Botswana Livestock and Range Management
- (d) Nature of Funding: Grant
- (e) Description of Goods and Services: See above
- (f) Approximate Total Value: \$75,000
- (g) Probable Source: The Republic of South Africa
- (h) Previous Funding: None

III. DISCUSSION

A. GENERAL

Waivers requested above in the amount of \$75,000 are directly in the best interest of the United States. The favorable impact of U.S. participation in this project would be dissipated and the project success seriously jeopardized if the waivers are not provided. Specifically, the relative small size of the total

construction element, \$130,000, makes it unrealistic to expect construction firms normally eligible under AID rules to participate. In addition, local costs contractors (Botswana) may probably require the technical services of third-country nationals to handle specific electrical, plumbing, etc., designs and installations.

B. HOUSING AND LABORATORY BLOCK

The GOB is currently unable to provide housing for project personnel. All donors now provide housing for their staff. Financing for housing or laboratory construction is not available to the GOB from any other source. Local firms, bidding on these jobs, may require third-country nationals for technical aspects of construction. The laboratory block referenced is essential to the project's concern for evaluation of changes in range ecology and the impact of livestock production on the environment. The funds include five (5) class A senior staff houses for use by U.S. provided personnel and one (1) laboratory wing (30 ft. by 60 ft.). Customary GOB contracting procedures will apply.

IV. LOCAL COSTS (\$165,000)

In addition, approval is requested for the use of AID financed local currency.

Local costs for purchase of goods and services of Botswana source and origin, including off-shelf procurement of items as explained in (ii) below, will be in an amount not to exceed \$165,000.

Reference is made to PROP Sections, Discussion of AID Inputs, pages 33 to 41, and GOB Contributions to the Project, pages 41 to 44, which discuss the overall need and justification for use of local currency and locally available off-shelf commodities as well as the relationship of these items to the AID and GOB inputs to the Project.

(i) General (\$125,000)

Services will be required from Botswana licensed or registered contractors and also services provided by Government of Botswana force accounts for the construction of boreholes, water systems, stock tank construction and building corrals or fences.

(ii) Off-Shelf Procurement (\$40,000)

It is estimated that not more than \$40,000 of local costs will consist of mechanical equipment and supplies for use in the

project's test ranch systems and will need to be off-shelf procured. Since Botswana is in a common market and customs union relationship with the Republic of South Africa, it is not relevant to analyze off-shelf purchases as to being of local or imported origin since nearly all of such items come from South Africa. None of the items to be procured are expected to cost more than \$1,000. Individual transactions will be held to \$2,500 or less within a total level of \$40,000. The items purchased will be of a nature and type normally found in Botswana and will not be especially imported for the project. Examples include: borehole pumping systems, stock tanks, veterinary supplies and others as noted in the PROP Section, Discussion of AID Inputs, pages 33-41.

APPENDIX 3

JOB DESCRIPTION FOR TECHNICAL STAFF

A. Job Title: Senior Livestock and Range Management Specialist.

Qualifications: Degree(s) in livestock production or range management or with equivalent experience in semi-arid livestock production. Experience and skill in cooperative liaison with senior government officials, other donors, local authorities and small holders in rural areas. Ability in personnel administration, management and program planning. Ability to convey ideas clearly in written and oral presentations. Willingness to consistently spend one week out of three on field trips with adequate but minimal accommodations.

Position: Located in the Government of Botswana, Ministry of Agriculture, Division of Animal Production (GOB/MOA/DAF). Reports to the Chief Animal Production Officer through whom he has access to the MOA Deputy Permanent Secretary-Technical (DPS-T) for project coordination. Coordinates 6 man technical assistance team as needed to achieve project purpose.

Scope of Work: Be responsible for overall direction, development and coordination of inputs to obtain systems for testing; design and implement a comprehensive plan for completing the tests, taking account of

- problems of social acceptability, with the assistance of the MOA rural sociologist and a full time qualified GOB junior staff member who has had experience working with local or tribal groups, assuring that technically feasible and economically viable systems proposed fit the social environment.
- other existing or possible range uses such as wildlife and arable agriculture.

Specifically:

1. Assist GOB to observe current patterns of small holder livestock production and range management and then devise and test methods to bring about water, range, and livestock development/management which will create optimal use of forage resources for livestock production while maintaining and improving range conditions.
2. Supervise range reconnaissance surveys and the planning and development of activities necessary for sound range management in Botswana in order to establish prototype test areas for different methods of group grazing schemes using minimum acceptable range and livestock management practices including seasonal grazing plans with feasible alternatives.

3. Oversee development of detailed Smallholder Livestock Range Management Plans including defined alternative grazing schemes such as rest rotation formulas and deferred rotation systems which include at a minimum "when and where" controls on cattle to assure range vigor, regeneration, and high production until positive controls are possible. Plans will utilize forage with minimum injury and at time of highest nutritive levels. Further, plans will provide for periods of deferment and rest for plant recovery, seeding, seedling establishment and growth to improve forage density and composition, bearing in mind other range uses (e.g. wildlife and arable farming). The plans will include methods of treatment for deteriorated range.
4. Oversee development and organization of local grazing committees which can collect fees for water development, operation, and maintenance. These committees will represent smallholders to local tribal councils and other authorities with the possibility of leading eventually to marketing cooperatives.
5. Establish and coordinate interdepartmental and interministerial activities with regard to pilot areas including planning, reporting systems (schedules/forms), responsibilities and procedures for information exchange, directives and notices with GOB, other donors, and consultants.
6. Arrange in cooperation with the Range Agronomist and Rural Sociologist for establishment of sociological and technical baseline records and continuous record keeping including at least:
 - (a) Continuous collection of forage production data at or near pilot area locations.
 - (b) Actual use records for each area (cattle numbers).
 - (c) Baseline and periodic photo-grid sample plots read, clipped, recorded and filed to detect management effects and classification of conditions and trends.
 - (d) Rainfall data.
 - (e) Family size and income data.
 - (f) End use of livestock (sales- to whom, home slaughter, transfers others)
 - (g) Other data as deemed necessary by project and GOB personnel.
7. Oversee the determination of areas of involvement and selection of specific test areas.
8. Estimate, devise and build into plans ways to determine optimal carrying capacity.

9. Implement a study to determine feasibility of burning as now practiced, determine whether it should be continued and if so, what pre-requisites and controlling factors are required for maximum effect.

B. Job Title: Surface Water Land Use Engineer

Qualifications: Degree in engineering with major bias in surface water for range development and land use for livestock (soil/forage conservation). Experience in semi-arid regions and hydrogeological relationships useful. Familiar with heavy equipment and pumps, engines, and windmills. Willingness to travel to field 1 week out of three or more with adequate but minimal accommodations. Should be effective in working with ministry technical staff and rural people. No language requirement but an interest in the local language is encouraged.

Position: Located in the Government of Botswana, Ministry of Agriculture, Division of Animal Production (GOB/MOA/DAP) seconded to the Division of Land Utilization. Reports to Chief Land Utilization Officer or his designee with access through him to the Senior Livestock and Range Management Specialist in the DAP for matters of project coordination.

Scope of Work:

1. Assist and advise on site investigations as proposed by range management specialists as to surface water inflow, soil conditions, evaporation, percolation losses and general conditions effecting type and size of surface water structures (primarily 1-5 million gallons) in project areas and other areas as required.
2. Coordinate with ground water staff as well as personnel from other Ministries as necessary, study feasibility of pan development and assist in selection of prototype areas with a view to best water possibilities. (e.g., adequate water in the right places so grazing can occur according to a planned grazing scheme benefitting livestock and raising smallholder living standards, while maintaining and improving range conditions).
3. Plan surface water storage capacity to allow full use of estimated potential forage available. Prepare water development plans for tanks and pans, construction and design including sediment pools, pansite fences, base drainage systems and complete systems of construction, reservoir fills, berms, sideslopes, erosion prevention, silt problems and water inlets with gabions, for erosion control.
4. Prepare plans for cleaning and reshaping surface structures including costings. Training of a water custodian and preparation of a maintenance manual with diagrams, translated into local languages where feasible. Design supporting structures such as fences which

minimize conflict with wildlife and which have low maintenance costs.

5. Survey pilot areas and design best water system working with host country personnel from inception to insure they feel it is their water and their responsibility. Coordinate this phase with the sociologist and extension input at the local level. Be prepared to explain principles to chiefs and sub-chiefs and participant small-holders. Consider/define/explain water development ownership, operation and maintenance responsibilities.

6. Add economic dimension to recommend actions for water systems. Liaise with Department of Geological Survey, Department of Water Affairs and other appropriate departments on subsurface water (bore-holes and shallow wells). Design, layout, and assist and supervise construction of surface water, dam pond or pans in pilot areas.

7. Assist with heavy equipment as required primarily when utilized in pilot areas. Work with project range management personnel to design various basic watershed drainage treatment in order to learn ways to increase surface water runoff rates from immediate watersheds in pilot areas. (lining ditches with clay, burning) etc.

C. Job Title: Range Management Extension Training Officer

Qualifications: Degree or equivalent experience in Range Management with background in extension training methods. Experience in semi-arid range management would be useful. Capable of setting up and operating an extension training unit.

Willingness to consistently spend at least one week out of three on field trips with adequate but minimal accommodations. Should be effective in working with MOA technical staff and rural small holders and have an interest in the local language.

Position: Located in the Government of Botswana, Ministry of Agriculture, Division of Animal Production (GOB/MOA/DAP), reporting to the Chief Animal Production Officer or his designee.

Scope of Work:

1. To assist the GOB and the Senior Livestock and Range Management Specialist to complete reconnaissance surveys and plan development activities effecting sound range management in Botswana with a view to early establishment of prototype areas to test different methods of group grazing schemes including feasible alternatives and minimum acceptable range and livestock management practices.

2. Assist GOB to develop and test methods to bring about water, range, and livestock development and management which will create optimal use of forage resources for livestock production while maintaining and improving range conditions. Define alternative grazing schemes such as rest rotation formulas and deferred rotation systems including; at a minimum "when and where" controls on cattle to assure range vigor, regeneration, and high production until positive controls are possible. Plans will utilize forage with minimal injury and at times of highest nutritive levels. Further, plans will provide for periods of deferment for plant recovery, seeding, seedling establishment and growth to improve forage density and composition, bearing in mind other range use e.g., wildlife and arable farming. Plans will include methods of treatment of deteriorated range.

3. Assist the GOB and the Senior Livestock and Range Management Specialist with construction/installation of the prototype areas, including working with smallholders on fencing, rotational grazing, burning practices, water conservation and care.

4. Develop and organize local grazing committees, legalized where necessary to administer project areas including collection of fees for water development, operation and maintenance. These committees will represent smallholders to local tribal councils and other authorities leading to possible marketing cooperatives in the future.

5. As the physical construction responsibility for test areas eases, he will direct his efforts toward the creation of a viable inservice extension training unit which will be formed, staffed (initially with OPEX trained staff) and supplied with new training materials developed by team, and utilizing some of the early test experience from the range management systems.

6. Arrange in cooperation with the Range Agronomist and MOA Rural Sociologist for data such as:

1. Continuous collection of forage production data at or near pilot area locations.
2. Actual use records for each area (cattle numbers).
3. Baseline and periodic photo-grid sample plots read, clipped, recorded and filed to detect management effects and classification of conditions and trends.
4. Rainfall data.
5. Collection of income, population and other socio-economic data.

7. Assist in determination of prototype areas.

3. Estimate, devise, and build into plans a way to determine optimal carrying capacities.

9. Carry out a study to determine feasibility of burning as now practiced and determine if it should be continued and what are prerequisites and controlling factors for best effectiveness.

D. Job Title: Livestock Production Specialist

Qualifications: Degree(s) in Animal Science/Production with major or strong minor in economics and marketing. Experience in semi-arid countries useful but not essential. Willingness to travel often to areas with adequate but minimal facilities. Must be comfortable working with host country nationals and local authorities and in training Government of Botswana personnel and small stockholders.

Position: In the Ministry of Agriculture, Division of Animal Production, reporting to the Chief Animal Production Officer or his designee.

Scope of Work:

1. Survey and site investigations for prototype smallholder areas.
2. In determining areas of involvement, take into account training routes, holding grounds, and marketing equity for smallholders in prototype areas with view to their improvement (minimal conflict).
3. Responsible for initiating minimal acceptable management standards in actual test areas; e.g.
 - (a) Controlled constant grazing
 - (b) Daily watering
 - (c) Salt and bonemeal
 - (d) Protein (urea), mineral, vitamin supplement
 - (e) Cull, castrate, dehorn, vaccinate etc.
 - (f) Range cattle on temporary water in rainy season moving to constructed water facilities in dry season.
4. With the Range Management Officers organize grazing committees and work closely with the MOA sociologist and local/district/regional/leaders including elders and chiefs. Arrange with local schools (primary and secondary) where feasible to talk to students about livestock production and range management and grazing systems. Gather local opinions of development (test) plans and incorporate plan changes where possible and consistent with valid management practices. Arrange "show me" trips, originally for potential smallholder candidates for test areas and later for non-participants into pilot areas.
5. Organize committee meetings. Oversee and effect plans in test areas. Make frequent field trips to follow up progress and resolve

difficulties on test areas.

6. Prepare and utilize extension materials, training plans and procedures. Set up with the Range Management Extension Officer a training unit to train local staff. Training unit will also train farmers (small holders).

7. Assist in the development and organization of livestock marketing channels and methods which will result in maximum returns to small-holder.

8. Do complete economic analysis on all methods tested and alternate proposals.

E. Job Title: Range Agronomist

Qualifications: Advanced degrees with major areas of study and experience in range ecology, agronomy and plant physiology. Experience in applied research and practical sampling of test areas. Experience in semi-arid areas useful. Should be interested in applied research that would address the problem of what effect cattle are having on the range and be prepared to emphasize methods of testing that would quantify the degree of range deterioration/recovery. Ability and willingness to serve in training capacity as needed. Willingness to travel to field as required (about 1 week out of three).

Position: In the Government of Botswana, Ministry of Agriculture, Division of Animal Production (GOB/MOA/DAP) seconded to the Division of Agricultural Research. Reports to the Chief Agricultural Research Officer or his designee through whom he has access to the Senior Livestock and Range Management Specialist in the DAF for matters of project coordination.

Scope of Work:

1. Main effort will be applied research in test areas and on GOB livestock stations (10) regarding:

- (a) Quantification of trends, conditions, and changes in range ecology, physiology of grass species, shrubs, bush encroachment etc.
- (b) Monitoring veld changes.
- (c) Correlation of range conditions with socio-economic motivation.
- (d) Affect of cattle on the range in the test areas.
- (e) Fodder reserves.

2. Prepare range site and condition classification map of project areas with descriptive narrative including:

- (a) Soils
- (b) Topography
- (c) Rainfall
- (d) Plant composition
- (e) Plant density
- (f) Plant vigor
- (g) Percentage of decreaser, increaser and invader species.
- (h) Probable hazards of grazing
- (i) Degree of erosion

3. Assist in determining carrying capacity in pilot areas on basis of forage production in pounds per acre, (air dry weight) clipped and weighed from 20 sq. ft. sample plots or equivalent method to determine animal unit*year's (AUY's) available. Assume 50% of total net produced as usable forage, 50% reduction to allow for:

- (a) Drought 20%
- (b) Wildlife 10%
- (c) Fire 5%
- (d) Other Stock 15%
50%

*AU defined as 1,000 lb animal requiring 35 lbs of air dry forage/day

4. Survey and classify the ecology and suitability of prototype areas i.e. what degree of semi desert ecosystems exist at beginning of tests.

5. Install permanent photo-grid transects, at least one per pasture in the test areas, to obtain baselines for classifying range conditions and trends.

6. Arrange for collection of historic slide photos of range areas in the test sites before, during, and after development.

7. Be prepared to address the following questions in pilot areas where perennial grasses are dead:

- (a) Are they really dead or deeply dormant?
- (b) If dead, what caused it?
- (c) What treatment is needed for restoration?

8. Establishment of "truth" areas within the test areas for accurate interpretation of satellite photography and extrapolation to the other parts of Botswana.
9. Record baseline data, establish system for monitoring all related on-going research and, where applicable, utilize results.
10. Identification and determination of changes in the plant communities of tribal grazing areas, through the utilization of two sets of aerial photographs, satellite photography and accurate ground survey techniques, together with the collection of ancillary information on cattle populations, climate etc.
11. Examination of methods of complete and partial bush clearance. Evaluation of methods of reclaiming and renovating degraded and eroded rangeland, including cultivation, reseeding and soil conservation techniques.
12. Investigation of the environment for a number of plant communities in Botswana, with particular regard to competition between grass and woody species. Agro-meteorological and soil physics equipment will be used in the field. Investigation of the germination, establishment, early growth, vegetation yield, and seed production of the important herbaceous and woody species in Botswana and how those characteristics are affected by environmental factors and agricultural practices. These studies will be carried out in the laboratory, glasshouse and small plots.

E. Job Title: Data Processing Technician

Qualifications: Degree in Animal Science or related field with experience in data processing of livestock production information. Majority of work in central laboratory but occasional field trips required. Comfortable working with and training technician level GOB staff and assistants. Ability to work well with people at all levels.

Position: Located in the Government of Botswana, Ministry of Agriculture, Division of Animal Production (GOB/MOA/DAP) seconded to the Division of Agricultural Research. Reports to the Chief Agricultural Research Officer or his designee through whom he has access to the Senior Livestock and Range Management Specialist in the DAP for matters of project coordination.

Scope of Work:

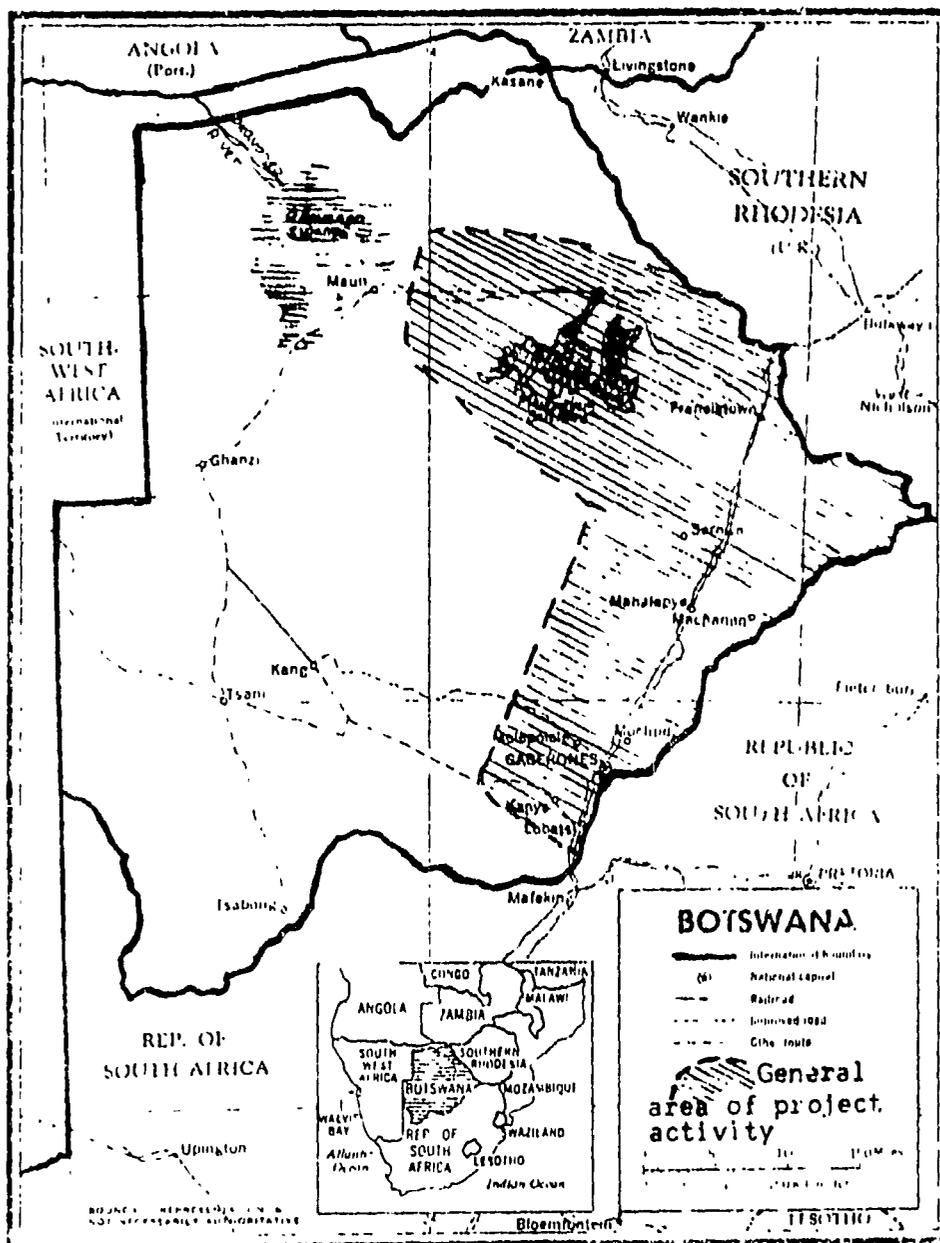
1. Works in the MOA/DAR receiving information from the field and checking it for accuracy before placing it on coding sheets.
2. Monitors and checks the key punch operation and runs the computer

to obtain research printouts.

3. Checks printouts for accuracy and makes distribution within the Ministry and to outlying field stations on a timely basis.
4. Sets up any required new research collection flow systems to insure consistency with current procedures.
5. Trains GOB staff in the necessary data reporting and statistical procedures to support on-going research.
6. Travels to the field as required to standardize data collection and discuss procedures and results with station managers/agricultural demonstrators and livestock production officers.

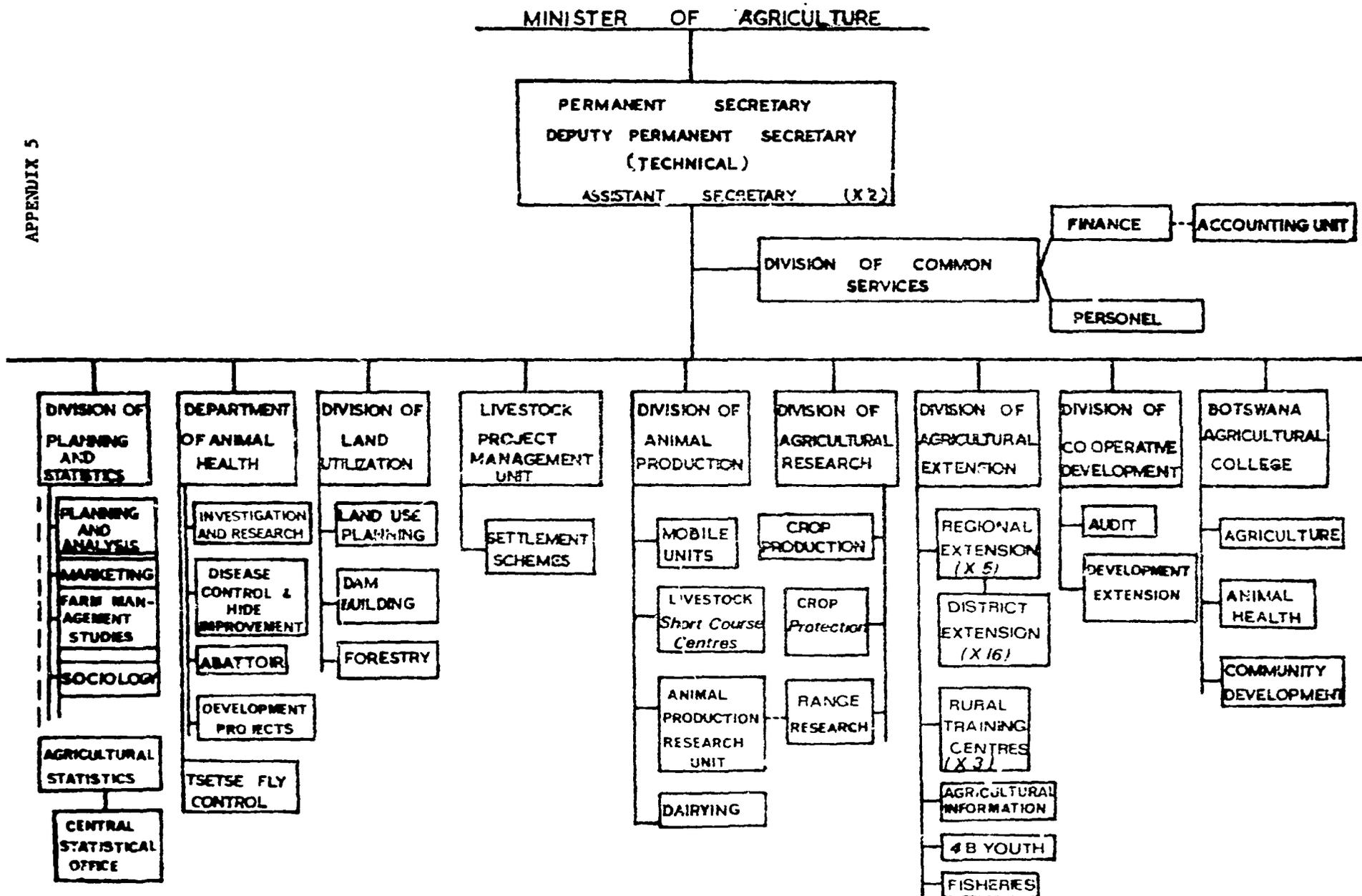
APPENDIX 4

MAP OF BOTSWANA



ORGANIZATION OF THE MINISTRY OF AGRICULTURE

APPENDIX 5



APPENDIX 6

Structure and Functions of Local Government Elements Related to Project Operations

1. Ministry of Local Government and Lands

- Minister
- Assistant Minister
- Permanent Secretary
- Under Secretary
- Principals

2. District Development Committees

role: Coordinating and planning body for the district, serving all development agencies in the district. DDCs do not, however have any executive power.

- District Commissioner (Chairman)
- District Development Officer (Secretary)
- District Council Chairman
- District Council Secretary
- Chief (or his representative)
- Representatives of Central Government Ministries and Departments (including District Agricultural Officer).
- Representative from Private Sector
- Co-opted members as necessary.

3. District Councils

responsible for

Primary education
Village water supplies
District roads (i.e. North-Central Government gazetted and maintained roads)
Health Care facilities at clinic and health post level

- Council Chairman
- Chairmen of main committees
- Councillors
- Council Secretary as Chief
- Administrative Officer
- District Commissioner as Ex-Officio Member

Committees - These vary from district to district but usually include:

Education Committee
Finance and General Purposes Committee
Health and Works Committee

Development Committee
Trade Licensing Committee

4. Land Boards

Responsible to District Councils and Ministry of Local Govt. and Lands.
Responsible for allocation of all land within tribal areas.

Members are appointed by Ministry of Local Government and Lands, and usually include Chiefs, and Representative of District Council.

5. Village Development Committees

Members: Local Headman
Local Councillor
One or two Elected Villager's
Nearest Community Development Field Officer

6. District Conservation Committees (to be formed)

Members:

Independent of Land Boards but all Land Board Members may be members of the D.C.C.

Representatives from Ministry of Agriculture. These are appointed by the President who may also appoint other members.

Conservation Committees are responsible to the Agricultural Resources Board which can also give direction of a general nature to Land Boards on land use matters. The Board is responsible to the Minister of Agriculture.

APPENDIX 7

In-Service Training of MOA Junior Staff in Range and Livestock Management:

1. Expected Conditions for Inservice Training:

- (a) Courses will be approximately six weeks in duration.
- (b) The MOA will provide a suitable location for training courses, the per-diem for students and funds for required supplies.
- (c) Project staff, AID-provided TDY personnel, and other MOA or UBLS staff, as agreed, will serve as training officers.
- (d) Project staff, working cooperatively with MOA divisions and the training schools of the MOA and UBLS, will be responsible for the curricula, organization and over-all operations of the training courses.
- (e) Training provided will be specific against project implementation and evaluation needs
- (f) Students will be selected for training from regular staff of the MOA and from students at the Training School of the GOB or students of the College of Agriculture of UBLS.

II. Estimated Training Schedule:

(Number trained)

| <u>TOPIC</u> | (Year) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Total |
|---|--------|---|----|----|----|----|----|---|-------|
| Range Management (General Course) | | - | 30 | 30 | 30 | 30 | 20 | - | 140 |
| Ranch Engineering (Water systems and fencing) | | - | - | 10 | 10 | 10 | 10 | - | 40 |
| Range Agronomy (Plant & Bush identification) | | - | - | 5 | 5 | 5 | 5 | - | 20 |
| Livestock Marketing | | - | - | 3 | 3 | 3 | 3 | - | 12 |
| Totals | | - | 30 | 48 | 48 | 48 | 38 | - | 212 |

APPENDIX 8

Possible Project Support from Other Sources:

The Project Design Team discussed with the GOB and several other donors, including the Peace Corps, the possibility of providing three additional junior staff to the project. Some interest was expressed by the donors; the GOB is presently considering making a request for such assistance. While it is not essential to the success of the project, the provision of junior staff officers in support of project operations could considerably enhance the project.

Existing laboratory analysis capability will be severally taxed when the substantial sample analysis load resulting from project research is added to current operations. To help avoid a backlog of analysis work, delays before the necessary analysis are run and less than timely availability of results, a laboratory technologist (chemist) would be of great value.

Similarly, as test areas are established, a junior agronomist (field) would be of substantial value to the activities of field sampling and analyzing changes in range conditions as affected by the management systems.

A final project area where a junior officer input would be very useful is Land Use and Water Engineering. Field training participants in techniques of low cost fencing, managing water, and construction of cattle chutes with local materials are some of activities in which he would be involved.

All above staff would be MOA employees, housing would be provided by the GOB, and MOA will have senior experienced project staff available to provide technical guidance and such supervision as is normal in the GOB civil service systems.

Job descriptions follow:

Job Title: Laboratory Technologist (Agricultural Bio-Chemistry or Equivalent)

Qualifications: Undergraduate work (or degree) with major in Chemistry or Bio-Chemistry. Comfortable with lab analysis of forage and soil samples for protein, minerals, (Ca, P, K, Cu, Na) fiber etc. Willingness to work primarily in the agricultural research laboratory with occasional field trips.

Position: Physically located in the Ministry of Agriculture (MOA), Division of Agricultural Research. Reporting to Division Chemist and working closely with the Range Agronomist.

Scope of Work:

1. Currently 5,000 samples (see above) are being processed annually under less than optimum conditions. Additional laboratory space and equipment is in the pipeline. The laboratory technologist would be instrumental in assisting other laboratory personnel to receive, set up, and utilize this and equipment already in place.
2. Early in the tour it is envisioned that the sample load will be increased due to research supporting the livestock and range management test areas of the project. The technologist would play a major operational role in sample analysis, monitoring GOB technicians and training them in more efficient methods.
3. The technologist would work primarily in the laboratory but as needed would proceed on field trips to assist in sample collections, preservation, and transport in order to gain insight into the why and how of the research he was supporting.
4. A certain amount of record keeping would be included along with sample analysis. Laboratory innovation, maintenance, and repair should not be above the candidate.

Job Title: Land Use Engineer (Agricultural Engineer)

Qualifications: Degree or equivalent experience in engineering with a bias towards surface water and soil conservation. Effective in dealing with rural people and in training them using extension methods. Travel to field a minimum one week in three with adequate but minimal accommodations. Interest in learning the local language.

Position: Located in the Ministry of Agriculture, Division of Land Utilization, reporting to the Chief Land Utilization Officer or his designee.

Scope of Work:

1. Assist with range surveys and the development of surface water. Main work will be with small surface water opportunities and how to best stabilize and manage water to bring about optimal range use for increased livestock production.

2. Assist the GOB to plan surface water storage capacity to allow full use of the estimated potential forage available. Prepare water development plans for tanks and pans, construction designs including sediment pools, pansite fences, base structures for pumps and reticulation systems, plans for improvement of existing drainage systems and construction plans for complete systems. Also prepare plans for reservoir fills, berms, sideslopes, erosion prevention, silt problems and water inlets with gabions for erosion control. Further develop plans for cleaning and reshaping surface structures including costings. Train water custodians and prepare manuals translated into local languages where feasible. Design structures such as fences to minimize conflict with wildlife and to have low maintenance costs.

3. Survey pilot areas and design best water system working with villagers and smallholders from inception to assure they feel it is their water and their responsibility. Coordinate this phase with the sociologist and extension input at the local level. Be prepared to explain principles to chiefs and sub-chiefs and participat smallholders. Consider/define/expain water development, ownership, operation, and maintenance responsibilities.

4. Liaise with Departments of Geological Survey and Mines and Water Affairs on subsurface water (boreholes and shallow wells). Design, layout, and assist in the supervision of construction of surface water dams, ponds or pans in pilot areas.

5. Assist with heavy equipment as required when utilized in pilot areas. Work with range management personnel to design various basic watershed drainage treatments in order to learn ways to increase surface water runoff rates from immediate watersheds in pilot areas. (Lining ditches with clay, burning) etc.

Job Title: Agronomy Assistant

Qualifications:

- (a) Undergraduate work or degree with major in agronomy.
- (b) Interested in applied research on range management and willingness to travel up to 75% of the time to remote areas, often camping at range stations which are dequate but lack certain amenities.
- (c) Willing to learn the local language.

Position: Physically located in Ministry of Agriculture (MOA), Division of Agricultural Research, with majority of time on field work throughout Botswana. Reports primarily to the Range Agronomist supporting pilot test areas on Livestock and Range management research.

Scope of Work:

1. This technician will be working closely with small stockholders, tribal authorities and GOB field personnel in support of applied range research (often supervision of or actual sample collection of range grasses, browse species and other items as needed by the Range Agronomist).
2. Research will be directed at determining what livestock are doing to the range (e.g. Quantification of Deterioration) with a view to preventing and redressing destruction.
3. See Job description of Range Agronomist.