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Agricultural Sector Assessment

B O T S W A N A

This sector assessment was undertaken in conjunction with the Southern Africa Development Analysis Project and has been used extensively, but not totally, in the Main Report and Country Papers

Prepared for

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GLOSSARY OF TERMS AND ACRONYMS

BOTZAM	Botswana - Zambia
CIDA	Canadian International Development Agency
DANIDA	Danish International Development Agency
DO	District Officer
FY	Fiscal Year
GDP	Gross Development Product
NDP	Net Development Product
ODM	Overseas Development Ministry
PASA	Participating Agency Service Agreement
SIDA	Swedish International Development Agency
UBS	University of Botswana and Swaziland

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I. INTRODUCTION

The Republic of Botswana, an independent nation since September 30, 1966, is a medium-sized country in south-central Africa. In terms of physical size and distribution of rainfall, it is often compared to the State of Texas. Other characteristics are that Botswana is situated on a relatively high (altitude 1000 m) plateau with a subtropical climate. Rolling sand, brush and grass cover most of the southwestern part of the country designated as the Kalakari Desert. The northern region of the country is dominated by the Okavango Swamps, a huge inland delta formed by the spreading of the waters of the Okavango River. The most productive agricultural lands are along the nation's eastern border.^{1/}

Botswana's population of 700,000 plus is essentially homogenous, ethnically and culturally. Some 80 percent of the Botswana live in the eastern part of the country within 50 miles of the "line of the rail." Eighty-five percent of the nation's population is considered rural.

Annual population growth is estimated as high as 3 percent. Internal migration is marked by a 12 percent annual increase in the urban population, one of the highest rates in the world. Most of the rural population is village-centered, often with temporary housing located elsewhere on arable holdings. External migration for work in South African mines, industry or farms is practiced by about half the male wage earners, and consequently some 40 percent of the rural households are headed, effectively, by women.

Although based on less than adequate data, there is evidence that

^{1/} Details on the physical features and climate of Botswana have been recorded in many volumes, thus it is not deemed necessary to repeat the information in this report.

dramatic changes are occurring in the basic structure of the nation's economy. Data for the 1973-74 period indicate that agriculture (including hunting, forestry and fisheries) accounted for over 37 percent of the nation's gross domestic product with mining contributing less than a 10 percent share. Projections to 1980-81 indicate that the agricultural and mining sectors will each contribute about 20 percent to the nation's GDP. One observer notes, however, that agriculture (primarily cattle) will tend to play a determining role in affecting the Botswana's income, since a sizeable portion of mining income accrue to non-citizens.^{2/}

Converting to constant prices, the per capita income in Botswana increased from \$368 (equivalent) in 1976, to \$405 in 1977, and to \$425 in 1978. The cost of living has increased at the relatively high, but not disastrous, rate of 12 to 15 percent annually during the 1976 to 1978 period. The income of the rural residents are substantially lower than those in other sectors and are distributed in a highly skewed manner. Stressing the caveat about inadequate data, it has been estimated that the "poorest 10 percent" of the rural population receive only 2 percent of the average income of those in the "richest 10 percent" category.

Botswana is a constitutional democracy headed by an elected President and Parliament (plus four appointed members). Its 12-year history since independence has been notably free of the tribal conflicts that have troubled some of the new African nations. Political leadership has proved itself to be responsible and responsive to the people's aspirations and needs.

The executive branch of government is organized along conventional lines. Exceptions to this rule are related to the special characteristics of the economy. For instance, the Ministry of Local Government and Lands is a

^{2/} Epstein, Gerald. Transition in Southern Africa--Botswana--Prepared under contract for AID, February 1977.

relatively large bureaucracy, out of recognition of the importance of land problems and as a reflection of the Government's desire to encourage democratic participation.

This very brief introduction to Botswana provides the setting for presenting more detailed information on the items of specific interest in preparing a development strategy for the agricultural sector. In the next section, the emphasis will be on the nation's resource base and the use of these resources in alternative production systems. The third section of the study will examine the "demand variables" with special emphasis on the interrelationship between the resource base and the marketing system. The constraints and potentials for increased agricultural production will be presented in a fourth section. The fifth section will present a discussion of a long range development strategy for agriculture in Botswana. An attempt to capture the general thrust of the proposed development strategy will be included in a summary and conclusions section.

II. THE RESOURCE BASE

Traditionally, economists evaluate the productive capability of a system in terms of the availability of land, labor and capital. This framework will serve as the framework for this analysis, with augmentation as needed to cover "real world" problems. For example, "land" will be defined to include all natural resources and the associated institutional forces. Similarly, "labor" includes the whole manpower continuum from the unskilled laborer to the most skilled professional. Placing appropriate parameters on the "capital" input is even more difficult. As a minimum two major categories of capital need to be considered--short term production credit and longer term investment capital.

Although somewhat "outside" the traditional tripartite division of inputs into the land, labor, capital categories, the role of transportation in facilitating the movement of inputs and outputs--in both production and consumption--must also be considered. In the idealistic world of many economic models, the effects of space have been ignored and a spaceless, frictionless economy assumed. For convenience, in this study the role of the transportation "factor" will be considered as a component of the resource base, with full realization of its impact on the "market side" of the analysis.

It is recognized, of course that all factors are interrelated in a productive system. However, the economists' technique of assuming ceteris paribus will be employed when needed for examining the role of specific strategies on agricultural production potentials.

A. LAND RESOURCES

1. Current Land Use

Since the 1971 Census, which was inadequate and is now out of date, there

is no comprehensive body of data covering the acreage, yields, production and other statistics relating to land use of Botswana. Part of the explanation lies in the undeveloped state of the existing statistical services and part in the difficulties inherent in a country with a widely dispersed farm population, poor communications and the extreme impacts of variable water supplies. Thus, any assessment of current land use is necessarily fragmentary and impressionistic.

Generalizations about land used for crops can be summarized as follows:

- a. Sorghum, millet and maize are the principal crops, followed (in an order dictated largely by weather) by cowpeas, groundnuts, wheat, sunflowers, soybeans, pigeon peas, field beans and haricot, jugo beans and barley.
- b. Most farm units are classed as small or medium (97.5 percent).^{3/}
- c. Cultural practices are generally primitive: yields are among the lowest in the world; nearly half the farmers lack their own animal draft power; broadcasting as opposed to seeding in rows is common; weeding and water conservation receive only sporadic attention; use of fertilizer is all but unknown; and, influenced by variability in rainfall patterns and the late summer conditions of work stock, planting dates vary from early November to late December.^{4/}
- d. Scattered areas along the western edge of the Okavango, the margins of the Rotletle River, clay soils on the western edge of the Mkgadilegadi Pans and strips along the Rhodesian border offer some cropping potential, but the Government is disposed to concentrate its arable land development in the more accessible and most heavily

^{3/} Even this classification is based not on crop acreage planted or harvested but on the number of cattle managed by the landholder. "Agricultural Statistics 1977," Planning and Statistics Unit, MOA, January 1978, Table II.

^{4/} "Agricultural Research," An Incoming Director's Report, MOA, September 29, 1977, p. 28.

populated blocks of Barolong, Garborone (including Kanye, Lobatse, Molofrolole and Mochudi), Mahalapye and Francistown.^{5/}

- d. Current estimates indicate that only about 7 percent of the total land area of the country, most of it in four major eastern blocks, is suitable for cultivation. Some of these lands are devoted to grazing and 15 percent of it lies in freeholder estates which are presently not available for smallholder cultivation.^{6/}
- e. Crop failure is the common lot of Botswana farmers. For instance, in 1971-72, which was rated a fairly good year, 9 percent of the farmers who had planted sorghum and 27 percent who had planted maize failed to harvest a crop.^{7/}

Since livestock production (specifically beef cattle) has dominated the Botswana economy, and to a considerable extent the lives of its people, it is necessary to examine the impact of livestock on the nation's natural resources. In the 1960's, for example, when total agricultural production accounted for nearly half of the GDP, animal production exceeded 56 percent of the net value added in the rural sector, as compared with only 4 percent for crops. Moreover, beef and other animal products comprised upwards of 80 percent of the country's exports, while in most years crop products were in short supply which resulted in substantial net imports of these items.

The characteristics of the livestock industry that were relevant then, and in varying degrees today, may be summarized as follows:

- a. Water has always been an important constraint. Roughly 80 percent

^{5/}"Development of an Arable Lands Policy for Botswana," a GOB publication (recent but undated).

^{6/}Ibid., 1.1.

^{7/}Agricultural Survey 1971-71," Agricultural Statistical Unit, MOA, 1973, p.11.

of the livestock are grown in the 20 percent of the land area of the eastern region where precipitation is the highest.

- b. Feed supplies, and their geographical and seasonal variability, have been a second limiting factor of great importance. During severe drought years, the livestock population has declined as much as 30 percent through starvation or premature slaughter.
- c. Ownership of the livestock asset has always been sharply skewed. An estimated 45 percent of the farmers own no livestock at all,^{9/} while only 5 percent of the land area freehold farmers own about 20 percent of the national herd and provide some 50 percent of the total commercial slaughter.
- d. Overgrazing has been a chronic problem, especially on the communal lands. Cattle numbers fluctuate widely with the changes in feed availability, but the national herd has increased by nearly 50 percent in the last two decades; despite recent improvements in land management policies, pressure on the natural vegetation cover has continued to intensify.

2. Institutional Constraints on Land

Botswana's land is held in three principal forms of tenure. Tribal holdings account for about half of the total land area, and 46 percent remains under state ownership. Freehold estates, comprising 5 percent, account for the remainder.

Ten District Land Boards administer and adjudicate conflicting claims to rights in land and water. One of the important functions of Land Boards lies

^{9/}"The System of Mafisa and the Highly Independent Agricultural Sector," Thomas W. Hertel, Rural Sociology Section, MOA, December 1977, p.1.

in their power to authorize the drilling of bore holes, which furnish both stock water and village water supplies. Because of early free-lance drilling and general inaccessibility, the inventory of bore holes is incomplete, and estimates of their number range from 4,000 to 7,000.

In recent years the Government of Botswana (GOB) has attempted to rationalize both land tenure (e.g., through the TGLP) and water rights as exemplified by controls over the use of ground water. In this latter activity, as in many others, government undertakes to serve as both the moderator and catalyst of private undertakings; i.e., it restricts bore hole exploitation in the interest of conservation, on the one hand, and subsidizes their drilling on the other.

The official policy with respect to land and water rights is clear: it favors the smaller, less well-endowed landholder and indeed, the citizen of Botswana. That this goal may at times appear incompatible with an equally high priority objective - that of rapid economic growth - is recognized in such documents as the National Development Plan. Nonetheless, the multi-goals are considered as official policy and a potential area for conflict in the nation's long range development.

B. LABOR RESOURCES

1. Current Use of Labor Resources

In 1976/77, the labor force of Botswana was 373,000, 51 percent of the total population. Eighteen percent of the labor force was employed in the formal sector, 70 percent work in the informal sector, primarily subsistence agriculture, and 13 percent are employed in the Republic of South Africa (RSA). By 1980/81, the Ministry of Finance and Development Planning projects that the labor force will increase to 434,000, a rate of growth of 3.9 percent

per annum. Because RSA is mechanizing its mining industry and has a policy of giving preference to black South Africans, the number of Batswana employed in South Africa is projected to remain constant. The formal sector is projected to increase by 5.3 percent per annum or 15,000. The residual, the informal sector, will have to increase almost as rapidly (4.1 percent per annum) and will have to absorb 38,000 more Batswana. It will be very difficult to employ this many more workers without increasing disguised unemployment and without decreasing real income in the subsistence sector. If these results are to be avoided, it will be necessary to increase the productivity of labor in the informal sector by increasing the resources available to it, making available new production systems, and improving the quality of labor.

Because Botswana will soon achieve its goal of universal primary education, almost all the additions to the informal sector labor force will first pass through Botswana's formal school system.^{10/} In addition, it is even possible that a small proportion of informal sector workers may have attended secondary school. Projections for the most recent development plan indicate that 664 secondary school leavers and degree holders will be unable to obtain employment in the formal sector. These individuals will either work in the informal sector or will be unemployed. However, this projection is several years old. Given the recent increased potential for mineral exports, it is likely that demand for skilled labor will be greater than predicted, resulting in a continued shortage of secondary school leavers rather than a surplus. Because many if not most Batswana who stop their formal education at the primary level will become agriculturalists, primary education should include materials related to agriculture. Moreover, many Batswana with some secondary or more

^{10/} Ministry of Education, National Development Plan V, 1979-1985, Draft Keynote Paper, N.D. (1978?), p.37.

educated will be employed in public agencies and private firms involved with agriculture and most will continue to farm and raise cattle in their home villages. Thus, these individuals also could benefit from agricultural education.

The need for informal adult education in agriculture is so obvious and so well accepted, it does not require justification here. At present, over 260,000 individuals, or 60,000 families, depend on agriculture for income. Yet Botswana agriculture is very inefficient; crop yields and cattle off-take rates are low by international standards. Many techniques for improving the efficiency are known. The primary means for providing this information to those who can use it is adult education. A brief description of formal and informal agricultural education in Botswana follows in the next two sections.

2. Formal Agricultural Education

a. Primary schools - At present, little emphasis is placed on agriculture in primary school classes. Their major involvement with agriculture is school gardens. Students under the supervision of their teachers prepare school gardens, the produce of which becomes the property of the school.

b. Secondary schools - All government and government-aided secondary schools presently offer agriculture at the junior level (Forms I, II, and III) and three teach it in Forms IV and V. Agriculture is one of four optional vocational subjects. Thirty-six teachers instructed 5,030 students in 1977/78. Nine of the teachers are Botswana educated at the University of Botswana and Swaziland (UBS). They received a diploma in agricultural education. The largest group of expatriates are Rhodesian refugees who are expected to return to their homeland after majority rule is established. Several teachers are American Peace Corps Volunteers. Because student enrollments are increasing

rapidly, there is a growing need for teachers, several of whom will have to be employed from abroad because of low enrollments in the agricultural education diploma course at UBS. Botswana commits few resources to operating and administering its agricultural education curriculum. Only one education officer is assigned to it at the Ministry of Education (as compared to five in Swaziland). P5 per student are allotted to the schools to purchase operating equipment and supplies with the result that buildings, equipment and livestock are frequently in short supply. Poor preparation of students and little garden produce are frequently the result.

c. Certificate - The Botswana Agriculture College certificate programs in agriculture and animal health prepare 108 individuals annually to become agricultural demonstrators and veterinary assistants in the MOA, and employees of the parastatal organizations. In 1981, with the possible assistance of AID, this output will be doubled. With this increase, the number of certificate holders will be sufficient to meet needs.^{11/}

d. Diploma - Diploma courses in general agriculture, home economics, animal production and health, and agricultural education are offered by UBS at its Luyengo campus in Swaziland. Annually 35 Botswana may enter the animal and general agriculture diploma courses - an insufficient number to meet Botswana's needs.^{12/} Over the next several years, a deficiency of 15-20 is anticipated which in part may be alleviated by a special one year BAC course for experienced certificate holders now under consideration. Ten positions in the agricultural education UBS diploma course are allocated to Botswana. If all these positions are filled, it will result in bringing up the corps of teachers

^{11/} Multinational Agribusiness Systems, Inc., The Supply and Demand for Trained Agricultural Personnel in Botswana, May 4, 1978, p.9-10.

^{12/} Ibid., Table 8.

to the target level (44) and in a small excess (4) in the corps. Because of the rapid expansion of students studying agriculture, however, the required number of teachers is difficult to project. Some controversy exists as to whether 44 is a sufficient number. This should be reassessed in two years to determine whether the number of places available to Botswana continues to be sufficient. The diploma programs offered by UBS are widely criticized as inappropriate to Botswana's needs because of the lack of emphasis on crops produced in Botswana. It is anticipated that BAC will initiate diploma courses in the early or mid 1980's.

e. Degree program - The number of Botswana agriculture degree holders is totally insufficient to meet needs. As a result, 70 to 94 MOA positions requiring degrees are occupied by expatriates.^{13/} Moreover, the number of positions is expected to increase by 8.5 per year over the next decade. It is anticipated that 249 will be required by 1988.^{14/} Currently, 55 Botswana are studying for a degree including 3 at the graduate level. Twenty-six have only recently initiated their studies at UBS/Gaborone; 25 are studying in Nigeria, Kenya, U.K., and Swaziland. Only 3 of these students are expected to return in 1978. The largest number will complete their studies in 1981. Assuming all 55 now studying complete successfully, then 194 or 28 per year will be needed between 1982 and 1988. The number of students receiving bursaries for agricultural degree programs is a function of the number of secondary school graduates who pass the Cambridge School Certificate Examination in Division I and II who also have completed satisfactory programs in science and mathematics, and indicate a preference for studying agriculture. In 1977, 236 (27 percent) of those who took the exams passed with a I or II and 26 were assigned to

^{13/} Ibid., p. 136.

^{14/} Ibid.

agricultural subjects. Clearly because Botswana's needs for agriculture degree holders cannot be met domestically, the country will continue to depend on foreign technicians. The United States can contribute significantly to Botswana's development by providing technical expertise as well as learning opportunities.

3. Informal Agricultural Education

The primary organizations providing informal education in agriculture is the Agricultural Field Service of the Ministry of Agriculture. This service is organized around regions (4), districts and areas. At the regional level is a Regional Officer and supporting subject matter specialists (4-B, home economics, crops, livestock). Typically, these will be degree holders or experienced diplomates. Districts are administered by a district officer assisted by a senior demonstrator. The DO is normally a diplomate while senior demonstrators are certificate holders with long experience. Each area is served by an agricultural demonstrator, a certificate holder. The Field Service employs 313 certificate holders, 72 diplomates and 39 degree holders. Approximately 240 of the certificate holders work at the area level. On the average, each demonstrator serves every 250 farmers. It is an immediate objective to bring this ratio down to 1 to 200. Even at present, the ratio of farmers to demonstrators is one of the most favorable in Africa.

The Field Service has just undergone a total reorganization from a pupil-farmer program to an area-based program. The objective of this change was to make services available to a broader spectrum of Botswana farmers. At the same time the communications and reporting system within the Service was redesigned. As a result, the Field Service is now one of the best structured and organized in all of Africa.

C. CAPITAL RESOURCES

The current level and distribution of capital inputs is as difficult to

understand as is important in development of a strategy for agricultural development.

Specific estimates of long run capital available to agriculture are not available. However, one can generally infer an almost total lack of long range investment credit in the agricultural production sector. For example, only 5 percent of the agricultural area is held as freehold lands, the remainder is either in tribal (46 percent) or state-owned (49 percent) status.^{15/} Thus the need for credit to purchase land is not a major concern.

The source and availability of short and intermediate term credit depends on the type of operator requesting the loan. The larger freehold crop and livestock producers borrow directly from commercial banks and to a limited extent, from the National Development Bank. The Botswana Cooperative Union (BCU) works with the Botswana Cooperative Bank to distribute surpluses from the cooperatives' operations, and thus provides limited credit to small farmers. It is essentially the only credit alternative available to the traditional farmer. This lack of credit is one of the major constraints to increased use of improved production practices, but it is difficult to "correct" this deficiency because of the high risk facing both lender and borrower.

D. TRANSPORTATION

At independence in 1966, Botswana had about 430 km of all-weather roads, serving the more densely populated eastern corridor, linking the major urban centers. Since then, with the assistance of the World Bank, SIDA, CIDA, UASID, KFW, DANIDA, NORAD and ODM, the all-weather road network has been expanded to approximately 1500 km, of which 250 km are bituminous-surfaced.

The 7,200 km of inventoried roads, which are classified as main (2,300 km),

^{15/} Agricultural Statistics 1977, Planning and Statistics Unit, MOA, January 1978.

main feeder (1,600 km) and secondary road (3,300 km) are primarily earth roads, with only 20 percent of gravel standard or better. In addition to the gazetted roads mentioned above, the rural network of earth and sand roads under the jurisdictions of the District Councils has been estimated at 11,300 km.^{16/}

The Norwegian assistance to rural roads is adding another 920 km of rural roads in selected areas, with costs of construction per kilometer of P6,000 to P20,000, depending upon terrain. These roads will be maintained under terms of the grant for a period of two years before responsibility for upkeep will be turned over to local authorities.

An essential element in transport strategy is continued dependence on freight movements by rail, with truck transport serving as a link between rural centers in the vicinity of the line-of-rail and the rail line itself. Six hundred forty kilometers of main line and subsidiary are operated and maintained by Rhodesia Railways, and serve exclusively the north-south corridor in the East from Ramatlabama to Moroka. The development of rural roads to railheads in the eastern corridor is consistent with the pattern of development emphasizing export of mineral wealth as a leading sector, with rural development a dividend from the investment in an export-oriented economy.

A summary of the transportation facilities would be incomplete without a discussion of what does not exist at the current stage of development. First, most rural villages are inaccessible to two-wheel drive vehicles. Second, most district headquarters in outlying rural areas are not served with all-weather roads; communications by road disappear during the rainy season. Third, there is no plan currently envisaged to link all farms with village centers, as population densities are very low (approximately two persons/KM²) in all

^{16/} World Bank, Appraisal of a Fourth Road Project, Republic of Botswana, March 23, 1977, p.5.

except the eastern corridor. Fourth, the current program of rural roads construction will affect less than 30 percent of the rural population of Botswana. The remaining areas will depend upon traditional forms of transport: oxen and carts, pedestrian traffic, trekking of cattle long distances with considerable weight loss, and occasional airlifts of emergency services.

Seven of the ten districts of Botswana have identified roads as first or second priority for use of development funds.^{17/} In particular, roads were singled out as the number one priority in the districts of Ghanzi (population 14,700), Kgalagadi (population 8,100), Northeast (population 55,600) and Southern (population 96,400). Access to major population areas improves the level of social services, as professionals in education and health are more likely to tolerate rural assignments when long-term isolation is not a necessity. The planning process in the Ministry of Works and Communications carefully assesses the value of proposed roads in terms of population served, social service centers potentially made more accessible, possible economic activities in agriculture and mineral extraction, and other secondary economic benefits before assigning priorities in the national road-building program. The prominence of roads in development planning is attested in a number of statistics:

- Proportion of the development plan investment funds allocated to roads - 25 percent;
- Internal rates of return on existing road projects estimated at 10-15 percent;
- Rates of growth in numbers of vehicles of 9 percent per annum.

^{17/} Office of Rural Development, Ministry of Finance, Botswana, 1977. Analysis of District Development Priorities.

The close association between urban and rural populations is attested by the fact that many urban dwellers return to family farms in rural areas on the weekends, and considerable numbers of persons have three residences: city, rural farm, and the outlying cattle-ranch tended by members of the extended family. There appears some danger that rural road programs may benefit primarily the wealthier cattle-raising groups in the proximity of the largest cities and villages, rather than spreading the benefits of economic development to the lowest income groups in remoter areas. There has been a move to accelerate road building by turning to more expensive, capital-intensive methods to hasten completion of links in the Eastern Corridor, while at the same time devolving responsibility for dirt road maintenance to the local District Councils, whose needs for manpower and equipment render them incapable of preventing serious deterioration of existing roads and tracks. As indicated above, the road building program is skewed toward support of the extractive industries, and the more productive cattle-raising areas, rather than broad-based rural development design.

III. DEMAND CHARACTERISTICS AND THE MARKETING SYSTEM

Any discussion of the "market economy" of Botswana needs to be prefaced with the warning that a large portion of the nation's rural population lives at subsistence levels and is thus primarily outside the market system. Information from a 1974/75 survey of sources of income (Table 1) indicates that 71 percent of income for the poorest 10 percent of the rural population was "in-kind." The same measure for those in higher income classes are also relatively high--with even the richest rural residents (top 1 percent) estimated to receive 32 percent of their income "in-kind."

In addition to the effect of a high percent of in-kind income, it is also necessary to stress the low absolute level of income. For example, the average annual income of rural residents in the 15 to 50 percentiles is estimated to be \$525 equivalent. The in-kind values account for 49 percent of this income or a market income of less than \$300 annually. For those in the poorest 10 percent category, the market income is only \$60 per annum. The point to be emphasized is that any examination of the market economy of Botswana must be related to the income available to residents to spend in the market.

The market system in Botswana might be described as a "controlled free enterprise" system. Although seemingly a contradiction of terms, the forces of supply and demand are permitted to operate within government controlled limits on prices of inputs and outputs.

The marketing process is generally conducted through cooperatives except for the larger freehold operators. In fact, the cooperative system in Botswana has developed to a remarkable degree in the past decade, considering the obstacles faced in establishing physical facilities and in training

Table 1. ECONOMIC CLASS AND SOURCES OF INCOME IN RURAL BOTSWANA
(% of income obtained from different sources)

Source of Income	Economic Class (Percentiles)			
	Poorest (0.5-10%)	Lower Middle Income (15-50%)	Upper Middle Income (60-95%)	Richest (99-99.7%)
Manufacturing ^{1/}	5%	8%	1%	0%
Trade	0	2	2	22
Services ^{2/}	3	1	1	1
Hunting ^{3/}	0	0	0	2
Housing benefits	10	7	3	2
Property income	0	0	10	0
Additional income ^{4/}	17	10	7	6
Employment	15	36	36	9
Transfers in ^{5/}	21	14	4	0
Gathering ^{6/}	18	8	2	0
Crops	6	9	4	0
Livestock	5	7	32	64
Taxes	(0)	(-1)	(-2)	(-7)
(% in kind)	71%	49%	42%	32%
Value (Rands) ^{7/}	161	430	1,669	9,143
Value in Dollars (eq)	196	525	2,072	11,154

Source: The Rural Income Distribution Survey in Botswana, 1974/75.

Notes

- 1/ Includes, and mainly comprises, making traditional beer.
- 2/ Includes traditional medicine and giving of parties.
- 3/ Includes fishing.
- 4/ A bookkeeping adjustment to offset underreporting, and not really an independent source. The adjustment is 20 Rands per household p.a. plus 6% of reported income.
- 5/ Includes remittances from mine workers abroad and gifts of meals to old people.
- 6/ Gathering of firewood, building materials and wild food such as green leaves, roots, fruits, nuts.
- 7/ After tax and net revenues and includes value of subsistence consumption.

competent management and staff. It has evolved without large infusions of government capital, but is still far short of a full-service system that provides inputs, credit, and marketing services.

The Botswana Cooperative Union (BCU) is the apex organization under which are four specialized groups of cooperative societies. The marketing societies, which handle chiefly livestock, are the dominant type (56 in 1978), followed by the thrift and loan societies (29), consumer societies (23) and credit (3). However, the marketing and consumer societies are by far the largest in terms of volume of business. Gross sales of marketing societies were P5,833,000 in 1976, compared with F4,100,000 for consumer societies. The thrift and savings societies, which are often attached to marketing societies, had savings of only P56,000. The credit societies are similarly attached, but have only limited operating capital.

The Botswana Agricultural Marketing Board (BAMB) operates as a parastatal organization separate from the cooperatives, but performs key functions in cattle marketing and the purchase and storage of maize, sorghum and several minor crops. BAMB handles the cattle marketing quotas from the Botswana Meat Commission (BMC), and maintains the records of sales by society members. In turn, the societies act as agents for BAMB in the assembly of cattle for shipment to the BMC. They also assist in assembling small lots of maize and sorghum that BMC purchases and stores. Floor prices are offered farmers, tied to prices in the Republic of South Africa.

Although the basic concept is to stabilize supplies over good years and bad, and to prevent sharp seasonal variations, total quantities handled have been relatively small. BAMB purchased 5,800 tons of sorghum following the bumper crop in 1974, mostly in small lots. Such operations will become

even more important as the program progresses to encourage subsistence farmers to increase their production above subsistence levels.

Less than one-half of the marketing societies provide any farm inputs and for many of these gross sales are minimal. Total sales were only P91,000 in 1976. Sales of livestock inputs, chiefly bone meal and salt, were even smaller - P63,000. Virtually no sales of fertilizer were made, nor is this critical input available from private dealers.

With meat exports accounting for more than one-third of total national exports, it is not surprising that much effort has been expended on developing a rather complex and relatively efficient system. The Botswana Meat Commission (BMC) with its modern abattoir and export marketing arm represents the centerpiece of the system. It handled 192,000 head in 1977, or about 80 percent of total national marketings. Gross sales were P53 million, of which P31 million was paid to producers. Most of the output is boneless beef for export to Great Britain and other EEC countries.

The BMC receives cattle through several marketing channels: (1) directly from larger producers, (2) from their own bonded agents, (3) through sub-agents who act as intermediaries between farmers and the BMC agents, and (4) livestock marketing societies. Producer prices vary somewhat among these various outlets, but distance from railheads is the major factor affecting prices received by farmers. The government has taken several steps to reduce transportation costs by developing trek routes with boreholes, as well as veterinary services. However, cattle from the northern and western districts must be driven to railheads and the trip may take 3-4 weeks and average as much as P45 per head in death and weight losses.

The 51 livestock marketing societies active in 1976 provided about 35,000

head, or 16.5 percent of BMC receipts. The societies handle a major proportion of the sales by small producers. Total sales of cattle through the societies were P5,153,000 in 1976, up to 56 percent from 1974. Average price per head increased only slightly, from P145 to P150 in 1976, which was below the national average, although in 1974 and 1975, prices were about the same.

Farmers have several other outlets for their cattle. About 10 percent of total annual sales move through auctions where buyers may be larger farmers, or private traders. An additional 10 percent are slaughtered at village abattoirs.

The Botswana Livestock Development Corporation (BLDC) provides still another outlet, especially in remote areas. Originally created as a subsidiary of the BMC to fatten cattle for owners for a fee and subsequent sale to the BMC, it soon suffered financial losses because cattle owners resisted paying a fee during a number of good rainfall years. Ownership of the agency was subsequently transferred to the government and provided with P200,00 in interest-free capital. This measure was taken in the expectation that BLDC would provide a valuable marketing channel in remote areas of the northwest and southwest and could become financially viable.

The outbreak of foot-and-mouth disease caught the BLDC with 7,000 head of cattle that could not be sold. Hence, it was in precarious financial condition as of mid-1978. However, it may receive the P50 per head advance being offered to farmers in infected areas, and become the government agency to administer the relief program. Additional funding has been approved in principle to fully stock two ranches, thus providing cash payments to farmers who could not otherwise sell their cattle.

The embargo on Botswana meat imposed by the EEC in the fall of 1977

following the outbreak of foot-and-mouth disease dealt a serious blow to the livestock industry and the entire marketing system. Botswana had had access to the premium priced EEC market as a result of the Lome Convention that provided remittance of 90 percent of import duties.

The BMC suspended all slaughter operations in November-December 1977, and did not resume receiving cattle from uninfected areas until early 1978, and then at a reduced rate. Operations of the local marketing societies in the infected areas were suspended.

As of mid-1978, the embargo was still in effect despite vigorous effects by the GOB to resolve the problem. The alternatives to sales to the EEC are not promising. Nearby countries, as well as other major meat exporting countries have abundant supplies and some have lower production and transportation costs. Processed meats provide one alternative outlet, but at significantly lower prices than for frozen meat. The BMC was in the process of adding a processing plant in the fall of 1977 which would provide an outlet for a portion of their output. An additional processing plant has been under discussion for several years in the northern part of the country, and financing of equipment has been offered. But such a plant could not come on-stream soon enough to relieve the present situation.

Several other programs are in various stages of implementation that will impinge directly on the future course of the livestock industry. The most comprehensive is the Tribal Grazing Land Program (TGLP) which proposes to convert present tribal grazing lands to rental or purchase arrangement as a means of improving range and livestock management.

IV. GENERAL ASSUMPTIONS

It is clear from this cursory examination of the nation's resource base and its marketing system that Botswana is confronting a series of challenges that will affect the configuration of its economy in the years ahead. The following is a list of assumptions about the overall economy which help to set parameters of a general agricultural development plan.

A. THE CHANGING CHARACTER OF NATIONAL-LOCAL RELATIONSHIPS

This adjustment, current or imminent, is exemplified by the tone struck in the district plans that were released only recently. The issue of greatest concern at the local level does not in all cases parallel the priorities established or in making in Gaborone, and a certain amount of restudy and negotiation seems inevitable. Final decision will be based on these negotiations, not on autocratic pronouncement from the central government.

B. THE TREND FROM AN AGRICULTURAL- TO A MINERAL-ORIENTED ECONOMY

Minerals are generally superseding agriculture as the leading component of the GDP, and no infusion of realistic levels of investment into agriculture is apt to alter its relative decline as a contributor to national income.

C. GROWTH OF THE PUBLIC SECTOR, CONCEIVABLY AT THE EXPENSE OF THE PRIVATE SECTOR

Fear of a proliferating bureaucracy has been voiced by some GOB planners, who note that Government competition for a limited pool of technical and managerial manpower in the country eventually may inhibit growth in the private sector, which growth is an important goal in itself.

D. UNCERTAINTIES ASSOCIATED WITH THE SALE OF BEEF TO THE EDC COUNTRIES

The European market for beef has been a major source of foreign exchange earnings for Botswana for some two decades. It is presently jeopardized by an

outbreak of foot-and-mouth disease and, since the U.K. entry into the Common Market, has been subjected to a series of short term concessions on the import levy. The resolution of the present embargo and the question of import levy will have important consequences for beef producers and the country. However, it is assumed that Botswana will continue to be a major producer of beef at competitive prices.

E. INCREASED EMPHASIS ON ARABLE AGRICULTURE

The Fifth National Development Plan, now in early stages of formulation, will probably stress greater concentration of development resources in the arable land areas than was deemed feasible in previous planning. One of the considerations is the fact of population density in the cropland areas, from which stems a growing demand for additional services.

F. THE EVOLUTION OF THE PUBLIC LAND POLICY

Initiation of the Tribal Grazing Land Program in 1975 marked a far reaching alteration of traditional land tenure sanctions. Its ramifications are still under extensive discussion and testing in affected parts of the country. The outcome is certain to have a bearing on the future of rural development in Botswana, but the precise nature of the plan is yet to be determined. It is assumed, however, that the program will be important in integrating additional economic incentives into the agricultural sector.

G. DEFENSE REQUIREMENTS IMPOSED BY VARIOUS BORDER INCIDENTS

In its 1977 appeal to the U.N. Security Council, GOB placed the initial costs of establishing a defense force at \$9 million, and noted that this unforeseen burden represented a drain on funds otherwise earmarked for development expenditures. In view of the policy favoring growth in the agricultural sector, the need for additional support for such purposes from external sources became apparent.

H. HIGH PROBABILITY OF A DECLINE IN EMPLOYMENT OF BATSWANA IN RSA

One estimate of the number of "absentees" from the population of Botswana (NDP) is 46,000; this is substantially the number of Batswana who migrate seasonally for employment in South Africa, chiefly in the mines. Their wages form an important fraction of Botswana's foreign exchange earnings, and this source of revenue presently is threatened by increasing mechanization of the mines and RSA's policy of giving preference to employment of the Homelander; e.g., (Bophuthatswana and Tanskei).

Thus, rural development programming for Botswana is subject in greater or lesser degree to at least eight major assumptions. This renders even more difficult the task of planning for the long term, and suggests that flexibility is an imperative ingredient of the process. How to obtain that flexibility without departing from generally accepted national goals is of itself, an area in need of additional analysis.

V. CONSTRAINTS AND STRATEGIES FOR AGRICULTURAL DEVELOPMENT

The approach used in this section is to evaluate the constraints as well as the development potentials for broad areas which will contribute to an integrated development strategy. Several specific program areas will be examined in the subsequent section.

A. SOIL RESOURCES

Any realistic strategy for agricultural development in Botswana must place a high priority on retaining an ecological balance among the nation's soil-plant-climate resources. There is little evidence of serious, widespread deterioration of the nation's soil and plant resources. However, the concentration of people and livestock in the eastern one-fourth of the country is causing some pressure on the environment.

Examples of the deterioration of the rangeland around bore holes (watering facilities) are clearly visible from satellite imagery. The areas immediately adjacent to water facilities are completely denuded. Then, a concentric ring of varying degrees of deterioration extends from the water source and range from essentially bare ground to annuals, thorny species, undesirable low quality grasses and finally to good condition rangeland. Thus, good range management practices are needed to control the uneven distribution of grazing. This problem apparently becomes increasingly serious as additional watering facilities are provided. Livestock numbers apparently are not controlled except by the availability of water. Brush encroachment is a mounting problem in range management and in the coming years this will be a major resource problem.

Soil erosion of cultivated land is not so evident to the untrained eye or to the casual observer. But because of the serious soil management problems

that include low water infiltration rates and extreme compaction problems, soil erosion is a problem in many cultivated areas. The physical, chemical and mineralogical properties are poorly understood and little has been accumulated in the area of soil research.

Existing soil surveys are semi-detailed or highly generalized in design. Also, the surveys are widely scattered, conducted under different producers. Therefore the information they contain is difficult to coordinate and of limited use in expanded soil predictions. Most of the soil surveys that are available lack sufficient laboratory data to support predicted soil behavior. A need exists for the Ministry of Agriculture to adopt a standardized soil survey that can be tied to an existing system of soil taxonomy. Reconnaissance type surveys are needed on a considerable area of eastern Botswana for the purpose of identifying more specifically the soil potentials for cropland, rangeland, forestry or other uses. The survey is also needed as a basis for further laboratory investigations to achieve a better understanding of soil behavior. An example of a serious soil behavior problem that is not understood is the severe compaction of many of the soils during the dry season. Compaction causes delay in planting of spring crops and dramatically increases the need for energy for plowing. Early planted crops take advantage of the seasonal moisture and generally outyield the late planted crops by a significant amount.

Soil surveys are also needed in the periphery of the Okavango delta. This area has excellent potential for the production of rice, citrus, sugar, spices, etc., but the specialized crops require that appropriate soils be identified before the development is undertaken.

Other problems that could be predicted by adequate soil surveys are areas of accelerated erosion by water. There are also potential soil blowing problems if the soils are laid bare and exposed to high wind velocities. Conceivably, a

"dust bowl" could be created in some areas.

B. WATER RESOURCES

The development of Botswana's water resources faces several formidable constraints. Some of the more important are (1) more than two-thirds of the nation's land surface is covered with sand (to an average depth of 300 feet), with the Kalahari desert accounting for a large amount of this area, (2) the Okavango and Chobe drainage systems in the northern part of the country are Botswana's only continuously flowing surface water supplies, (3) only five percent of the nation's land is considered suitable for irrigation areas, (4) the level and distribution of rainfall is highly variable, both within and between seasons, and (5) the better soils are in the eastern part of the nation and the dependable water supplies are in the northern region of the country.

In the following sections, the potential for water resource development in Botswana is generally examined.

1. Irrigation development

- a. Short run potential (next 5 years) - Official policy statements of the Government of Botswana indicate that the nation's development emphasis over the next 5 years will not be in the field of irrigation. There are two general exceptions. The government has developed an arable land program, which is basically a scheme to improve the input and output markets for dryland farms. The lack of water is listed as one of the constraints to the development of this program and thus there may be a push for some small scale irrigation as one of the complementary inputs needed to increase the output in the subsistence farming sector. A second exception is the officially sanctioned horticultural development scheme. A modification of this scheme will be examined in more detail in a subsequent section of this report.

b. Long run potential (5 to 25 years) - Botswana is a semi-arid country, but contains two major rivers; thus there is the potential for irrigation development. Studies to date have suggested the Okavango Delta and the Eastern tier as the two areas in the nation with the most promise for developing viable irrigation schemes. The Ghanzi area, with underground water supplies (possibly from the Okavango) may be classified by some as a third area with additional irrigation potential.

- (1) Okavango - There have been numerous studies on the Okavango Delta--many of which can only be described as grandiose. An excellent, and recent, book developed from an international symposium on the region sums up the attributes and potentials of the Okavango from the historical, geographical, hydrologic and economic viewpoint.^{19/} Thus, the details will not be repeated except in the broadest categories. In general, the development of irrigation in the Okavango seems a high cost, high risk type of undertaking with a relatively high probability of doing more harm than good. Also, it is difficult to project, on the basis of a very heuristic review of the literature, the potential for obtaining a realistic benefit-cost ratio in excess of unity from any development plan. (There may, of course, be noneconomic objectives which need to be included in any detailed analysis.) A summary of some of

^{19/} Botswana Society. Symposium on the Okavango Delta, Published by the National Museum, Gaborone, September 1976.

the more important constraints to the development of the Okavango Delta for irrigation are:^{20/}

- Highly seasonal and cyclical rainfall patterns which would tend to dramatically increase the cost of structural measures.
- Relatively high potential for earthquakes (predict a quake of 6.0 on modified Mercalli scales on average of 2-4 times each century). The potential for seismic activity would increase the cost and risks of structural development.
- Botswana is a "tail end" user of the Okavango water. Upstream development by Angola and Namibia may affect the availability of water.
- High potential for disastrous grass fires in the Delta.
- Problem of predator control in crops and livestock.
- Questions of level of priority in use of water for irrigation if it is needed for mining activity.

There are also some positive characteristics which would argue for development of the area. First, there are no major problems of salinity or sediment in the Delta. Second, development may provide employment to local inhabitants who are very poor--adult literacy approaches zero, and only 36 percent of the primary and 4 percent of the secondary school-age children are in school. Third, up to 75 percent of the people in some regions of the Delta are suffering from malaria. Development may improve their access to medical care.

^{20/}"Investigation of the Okavango Delta as a Primary Water Resource - Botswana - Project Findings and Recommendations." FAO, Rome 1977.

great deal smaller--probably by a magnitude of at least 10. The reason for the rather pessimistic forecast of economic feasibility of structural type irrigation projects in the area are the relatively high level of silt load (thus requiring a large sediment pool and/or dredging, lack of good sites because of the flat land and the highly variable rainfall which requires larger-than-normal dams to handle peak flows. The economic potential for the smaller schemes, based on river extraction from sand beds, seems more feasible. However, the availability of these sites is fairly limited. There is a potential for limited irrigation development in the Eastern Tier in the long run, but the decision of the Botswana government that this should not currently be a higher priority development objective seems to be an appropriate one.

2. Domestic and Livestock Water

The number one priority in virtually all of the district submissions for consideration in the new Five Year Plan was an adequate supply of domestic water.

In terms of donor programs, several other nations (specifically Britain, Sweden and Canada) are already actively involved in this activity.

The water supply schemes for the major villages and cities (2,500+) is currently nearing completion. However, there are some areas that may run short of water in the next 5 to 10 years if the expected growth is realized.

The water supply for the villages of 500 to 2,500 are receiving water under a Swedish program which is expected to be completed in two years.

(ii) Eastern tier - The British overseas group has completed a fairly comprehensive study of the irrigation potential of the Eastern tier section of Botswana.^{21/} The emphasis in the study was on the physical characteristics of the soil and water resources with only minimum attention to the question of economic feasibility. The British team identified 17 sites totalling about 25,000 acres, that were designated as high potential for irrigation. The details are readily available in the British report and only the broadest generalizations will be summarized here. It should be noted that these 17 sites are not contiguous blocks of irrigable soils. Virtually all the sites are a series of small patches of land with the proper soil and slope conditions. Thus, in addition to the normal costs of construction there is the additional problem of providing a system for transporting the water between sites. Secondly, several of the more attractive areas, in terms of irrigation potential, are on freehold land in the Tuli Block which is not a high priority development area. In summary, there are some areas in the Eastern Tier with irrigation potential, and in the long run might be considered for development. However if one uses a four-stage decision criteria of: (1) soil amenable to irrigation, (2) water availability, (3) small holder recipients, and (4) probable economic feasibility, the estimated 25,000 acres mentioned in the report becomes a

^{21/}"The Irrigation Potential of Soils Along the Main Rivers of Eastern Botswana: A Reconnaissance Assessment." Land Resources Division, Minority of Overseas Development, England 1976.

Finally, the very small villages are receiving aid under a joint British-Swedish program. Although water supplies for all villages are not currently planned, it seems likely that the job will remain with the British-Swedish team.

There is a related program associated with the deterioration of the boreholes. However, discussions with local officials suggest that the Canadians probably have the inside track on that program.

C. TRANSPORTATION

Current discussion by officials in Botswana on the role of transportation in their strategy for development seems to revolve around four options. First is construction of major international road links between urban concentrations, which will spawn development along the vast stretches of rural segments of these roads. An example of this option is the proposed road through the sparsely populated Ghanzi District, which would give Botswana the added option of a road outlet to Namibia. Second is construction of secondary roads in rural areas, linking selected villages with the line-of-rail. Third is construction of feeder roads between farms and marketing centers in parts of the country where agriculture offers commercial opportunities (e.g., Tuli Block Farms area in eastern Botswana). Fourth is building the road maintenance capability of rural councils, through the training of local manpower in necessary skills of vehicle maintenance, road equipment operation, elementary road design, supervision of labor intensive teams for road repair, provision of inexpensive forms of capital equipment and spare parts, and the development of local fiscal capacity to sustain the maintenance of the roads.

It would appear that the four options all have merit, but from the standpoint of consistency with rural development objectives and income redistribution considerations the fourth option appears the most attractive opportunity for foreign assistance.

An evaluation of the pros and cons of the transport investment options are as follows:

1. Construction of international road links. Favorable reaction to the current USAID project, the BOTZAM road from Francistown to the border with Zambia, stems from its political significance, allowing communication between the two African nations with parallel economic interests, and enlarging the transport options of landlocked Botswana and Zambia. It is not clear that the road, which cost P20,000 per kilometer can be justified from the standpoint of economic efficiency: vehicle usage per day runs less than 150 and few promising agricultural areas are opened up for commercial development. Currently under discussion is a similar road through Ghanzi District, which would eventually enable Botswana to have a road link of significant scale with Namibia. Low population densities, arid or desert soil conditions, and absence of major economic undertakings reduce the potential economic benefits of such an undertaking. Lack of feeder roads would limit the social service dispersion to rural populations in the area, unless the government undertook a deliberate policy to redistribute population close to the road network. Nevertheless, this road construction is important for future transport options, reducing economic dependence upon the Republic of South Africa, and for the potentiality of developing sophisticated cattle raising programs in designated grazing areas. Cost/benefit studies have not been completed as yet, and U.S. aid at this point would be better used to conduct a feasibility study than as a direct commitment to underwrite construction costs.
2. Construction of secondary roads in rural areas, linking selected villages with line-of-rail or the gazetted road network. Numerous useful projects

of upgrading secondary roads in rural areas, to provide all-weather access of important villages with the national road network can be undertaken. The rural roads planning unit in the Ministry of Works and Communication can provide planning data to prioritize the roads most in need of development. In general, investments carry an internal rate of return of 10-15 percent in the more populous eastern areas, where savings in vehicle operating costs, and maintenance cost savings appear to justify these road projects.^{22/} Social benefits of providing road access to isolated sections of the country such as the area northeast of the Okavango merit attention.

Construction of feeder roads. Feeder roads are defined as those roads which lead from individual farms to marketing centers, or to primary, gazetted roads which comprise the national network of main roads. They are invariably of lower construction costs, typically engineered earth roads or improved tracks, where traffic is very light.^{23/}

It appears that few areas in Botswana warrant substantial construction of feeder roads, given the current emphasis on primary road construction, the very low population densities and consequent universality of needs for feeder roads and the difficulties experienced by the rural district councils in maintaining the existing rural road infrastructure. It was suggested by some that commercial justification for feeder roads could be made in selected areas, such as the Tuli Block farms; however, before commitments are made to such projects, thorough

^{22/} See, for example, World Bank, Appraisal of a Fourth Road Project, Republic of Botswana, March 23, 1977, Annex I, Table I.

^{23/} For an extended discussion of feeder road programs in Africa, and their economic justification, see USAID, Project Paper, Kenya-Rural Roads Systems Project.

cost/benefit analyses should be undertaken. Maintenance costs run close to construction costs, and would cause important recurring drains on development funds, unless local fiscal mechanisms are developed along lines described below.

4. Building road maintenance capabilities of district councils. Of all the transportation options, the fourth appears the most promising for longrun improvement in rural standards of living, and spread of the benefits of development to hinterland areas. As indicated above, responsibility for the maintenance of the majority of rural roads rests with the District Councils, rather than with the Ministry of Works and Communications. The District Councils are in need of elemental equipment to carry out this responsibility. In addition, the Councils lack trained manpower to repair road maintenance equipment, to perform the machine operations required and to supervise the deployment of labor-intensive teams of locally recruited workers to maintain the 700-1,000 km of ungazetted roads per district.

D. LIVESTOCK PRODUCTION

There are several constraints on livestock production as well as potentials for development which are commodity specific rather than generally related to the specific resource inputs or the marketing system. Following are several of the more important "givens" when examining the livestock sector.

1. Cattle ownership serves the dual function of being: (a) an economic enterprise and (b) a status symbol and informal storehouse of wealth. Thus overgrazing is exacerbated by cultural factors. Additionally, the dual role of livestock causes the annual slaughter rate to seldom

reach 10 percent--a level which is considered to be substantially below the optimum rate.

2. Animal diseases are a constant menace. By African standards, Botswana maintains an excellent animal health program, but foot and mouth disease and cysticercosis "remain potential dangers to the valuable beef export trade."^{24/} Anthrax, blackleg, rabies and, more recently, the tsetse fly are generally held within tolerable limits.
3. Small stock (sheep and goats), although numerically important, have never received the official attention accorded beef cattle. Sheep and goat production long has been regarded as basically a family subsistence enterprise with little commercial potential; intake of these animals by BMC is only a fraction of the numbers of cattle handled by that agency.

The GOB recognized the deleterious effects of these factors and is currently engaged in programs to decrease their negative impacts. In 1973, the MOA instituted a range monitoring program under its Division of Land Management. The "first line of attack" is on lands which are being completely denuded of vegetation, where there is substantial encroachment of woody shrubs and trees, and/or where there are detrimental changes in the botanical composition of the lower herbage layer.^{25/}

Among the objectives was a reversal of desertification, a process described as "the diminution or destruction of the biological potential of the land (that) can lead ultimately to desert like conditions"^{26/}, i.e., a distortion

^{24/}"African Livestock Development Study," op. cit., p. 79.

^{25/}"Range Monitoring in Botswana, 1973-77," Land Utilization Division, MOA, November 1977.

^{26/}Ibid., p.11.

of the ecosystem - a combination of light sandy soils, a dry climate and consequently a delicate vegetative cover - which simply will not withstand excessive grazing. The latter, in turn, was compounded, rather than mitigated, by increases in the number of boreholes, especially in the Kalahari Desert and other westerly areas. A licensing system was established for the drilling of bore holds and various measures undertaken to control the use of lands around them. Depending upon the extent of deterioration in rangeland capabilities as determined by monitoring techniques, limits were placed upon the number of grazing days per hectare in the areas under surveillance.

A second major and extremely important activity is the tribal grazing lands programme (TGLP). Instituted in 1975, the program was undertaken after two years of study and a country-wide educational effort. Its repercussions, impinging as it did on traditional practices virtually centuries in the making, are still being felt throughout Botswana.^{27/}

As its core, TGLP is a comprehensive instrument for rationalizing live-stock production and the utilization of the nation's grazing lands. Following on the heels of the Agricultural Resources Act of 1972^{28/} TGLP would subdivide tribal lands into "commercial," "communal" and "reserve" zones. Individuals or groups may obtain 50-year leases in commercial zones and will pay rents. Collective rights will be retained in communal zones under the terms yet under discussion. Reserve zones are those involving protection of wildlife and unique ecological conditions. Local Land Boards, already a factor of some consequence in the rural economy, will enjoy wider membership and enhanced

^{27/}TGLP is a complex approach to solution of a complex problem. Its implications are too extensive for full exploration in a summary report, but the interested reader is referred to the growing body of literature on the subject (See List of References, Annex).

^{28/}Which created an Agricultural Resources Board under MOA having authority to issue regulations dealing with land and water rights.

regulatory powers under TGLP. As a corollary, traditional tribal controls over land use will be diminished.

TGLP is a remarkable as an example of participatory democracy as for its impact on land utilization. GOB has made a strenuous effort to engage the interest and participation of its citizens in shaping the final form of the new policy. Among other steps, the Government launched a "Radio Learning Campaign" concurrently with the inauguration of TGLP with its purposes stated as follows:

". . . it is vital that the public be informed of the need for change and the reasoning behind the government's proposals."

". . . it is most important that the dangers of misunderstanding be recognized and avoided."

"Therefore, before implementation of the Tribal Grazing Land Policy begins the government will mount a nationwide public discussion of the programme and the issues involved. People at every level will be fully informed and consulted before the process of change is set in motion."

"A multi-media consultation programme based on this Government Paper, will be launched."^{29/}

Under an inter-ministerial Grazing Committee, consultation teams were organized at district, town and village levels to elicit the criticism and gauge the concerns of people throughout the country. The response was lively and at times impassioned, and the dialogue is still continuing. Some 25,000 reports were received from local groups and processed and evaluated at the Centre. The entire exercise was preceded by national speaking tours headed by the President and his ministers, followed by an elaborate series of briefings and seminars of Government and tribal authorities. Moreover, the Government is listening to the voices of its constituency, and the consensus being sought

^{29/}"Preliminary Report on the Public Consultation on the National Policy on Tribal Grazing Land," Ministry of Local Government and Lands, November 1976, p. 1. .

is certain to be influential in molding national policy and the character of the next National Development Plan.

Even in nations pledged to the democratic processes, the uninhibited participation of Batswana in determining the evolution of TGLP, prophetic as they are of the course of future policy, are worth noting:

- a. "RLG's in general did not react strongly to the conservation measure. They seemed more worried about making a living now than about trying to conserve the grazing for future use."^{30/}
- b. Respondents were wary of livestock groups to manage grazing rights. Enforcement of group decisions was questioned and "There was some feeling that a group of the poor would inevitably remain poor." Fear of manipulation by powerful individuals was expressed.
- c. Issuance of exclusive grazing rights was viewed with caution, including "how the small man can get exclusive rights," and what happens to exclusive rights on the death of a leaseholder.
- d. Rules for allocating land, especially to individuals, were severely questioned.
- e. Better range and cattle management received endorsement in principle, but delegation of managerial responsibilities by the cattle owner was viewed with skepticism.
- f. The idea of zoning was generally accepted, as were wildlife reserves in areas of low population density. On this item, approval varies with differences in local conditions.
- g. Fencing and further development were considered desirable but too expensive for most small cattle owners. Subsidies were suggested as an offset to the advantages of wealthy operators.

^{30/} Ibid., p. 7.

- h. In addition to the possibility of subsidizing the small producer, sentiment was expressed for low-interest loans to small producers to pay for fencing, for example.
- i. Placing limits on the total number of animals each person may be allowed to graze in communal areas was opposed, although less so where overgrazing is presently most common.
- j. Timing for implementation of TGLP was discussed frequently, but except for those awaiting approval to drill bore holes, the prevalent mood was one of willingness to wait until the people's views had found expression.
- k. The poor and those with no cattle are not likely to benefit from TGLP; their needs will have to be addressed by other, as yet unspecified, programs specifically designed in their behalf.
- l. It was feared by many that TGLP might entail resettlement of large numbers of people - a highly unpopular move - and the sponsors of the consultations counseled GOB to clarify its intentions on this score.

Thus, the educational work supporting TGLP before and since its inception has served the valid purpose of involving the people in the resolution of affairs of great moment in their pursuit of a livelihood. As such, it is proving to be a stellar illustration of give and take between the governors and the governed.

E. CROP PRODUCTION

Using the same rationale as discussed above for livestock, there are constraints and potentials which are commodity specific in the crop sector. The following is a list of some of the major items of interest.

1. The subsistence level of production is especially prevalent in the crop sector. The most credible sources show, for example, that in the good weather year of 1973-74 when 70 percent of the rural households grew crops, the average gross income was P126 per household while the comparable net income estimate was P114.^{31/} Thus net income was over 90 percent of gross income--an indication of the very low levels of such purchased inputs as seed, fertilizer and pesticides.
2. For those farmers who produce a marketable surplus, creation of the Botswana Agricultural Marketing Board has provided a ready market. The BAMB has made considerable progress in stabilizing prices and reducing shipment-reshipment of grain stocks to and from South Africa. The Board's future success, apart from its exercising wisdom in adjusting purchase prices to variable supply/demand conditions, will reside largely with the establishment of suitable warehousing and processing facilities.
3. Under anything approximating "normal" conditions, and notwithstanding the extreme variations in access to farming resources, Botswana has not yet experienced the ruinous effects of excessive population pressure upon its food-producing capacity.
4. In a study published in 1974, farmers were asked why they planted more land in 1970-71 than in 1969-70. The answers provide a clue as to input limitations, at least in the minds of the farmers, imposed upon them by natural or institutional shortcomings:

^{31/}"The Rural Income Distribution Survey in Botswana, 1974-75," CSO, p. iv.

- | | |
|--|----------------------------|
| a. More rain | - 51 percent |
| b. Wanted more food | - 45 per cent |
| c. Draught power available for plowing | - 18 percent |
| d. More seed | - 11 percent |
| e. More workers | - 8 percent |
| f. More implements available | - 2 percent |
| g. Other | - 3 percent ^{32/} |

When the question was reversed, - Why plant less land? - the answers were reversed, in about the same proportions. The study concluded that rainfall is by all odds the major constraint on crop production, with lack of animal power a close second and land, equipment, labor and seed being contributing factors. Difficulties and costs associated with transport received little attention, presumably because it was not stressed in the study, although improvements in transport receive heavy emphasis in the district plans prepared in 1978. Farm credit was not perceived as a major factor, despite its generally accepted importance in a progressive agricultural system. One might speculate, without empirical support, that institutional credit for small farmers is such a rarity that it is simply outside the pattern of their experience.

- . Botswana has experimented with various forms of Government-sponsored organizations aimed at increasing the productivity of cropland farmers. These include the Cooperative Demonstration Plot Scheme, the Pupil Farming Scheme, an attempt to involve women in extension

^{32/}"Study of Constraints on Agricultural Production in the Republic of Botswana," Division of Planning and Statistics, MOA, 1974.

services, to promote Rural Training Centers and Short Course Centers, 4B Clubs, a Seed Multiplication Unit, a Government Tractor Unit, a Grain Storage Unit, cooperatives and various activities carried out by BAMB. More recently (1976), MOA has instituted the Integrated Farming Pilot Project (IFPP), the objectives of which include testing a new system of arable agriculture and livestock management and to promote an integrated approach to rural development.

It is too early to assess the effectiveness of the newer of these enterprises, but for those which have had a reasonable trial the record is not encouraging.^{33/} The reasons are not all available, but the Cooperative Development Plot Scheme was discontinued after several years of limited accomplishment. The Pupil Farming Scheme (1962-74) seemed to have been useful for a small group of selected operators but never reached the mass of small, needy farmers. In a surge of interest following an analysis of women's role in agriculture^{34/}, a women's extension unit was created in MOA; three positions for female officers remain unfilled "because of recruiting difficulties."

The Agricultural Information Service has performed some worthwhile duties, but its radio broadcasts were reported to have reached only about 7 percent of the heads of rural households and only about 3 percent "appeared to have assimilated any information from the most recent broadcast."^{35/}

^{33/} Op. cit., "Development of an Arable Lands Policy for Botswana," p.26.

^{34/} "Women's Involvement in Agriculture in Botswana," by C. A. Bond, MOA, November 1974.

^{35/} Ibid., p.

Six training and short course centers are maintained in five districts, but the Bond study indicated that only 2 percent of the farmers had attended courses there, and 40 percent never heard of the Centers. Provision of tractors and other implements was terminated because of maintenance problems and high costs.

The Grain Storage Unit (1968-75) was closed out due to a breakdown of management and erratic delivery of supplies. A fertilizer supply scheme under the Botswana Cooperative Union ended in 1976 because of "administrative problems." Similar difficulties have attended GOB's attempts to provide such inputs as improved seed.

The moral of these experiences appears to be that GOB is not yet prepared to deliver the wide range of services which farmers in a modern system require, certainly not in the absence of experienced technical and management assistance from external sources. Training of Botswana manpower for an eventual management role is correctly regarded by many observers as the number one requirement and the Nation's premier goal.

6. In view of the preceding it should not be assumed that there is a complete lack of potential for development. Possibilities for improvements in dryland crop production seems especially promising. In projections made by the Ministry of Agriculture, for instance, relatively simple innovations are capable of eliciting outstanding results.^{36/} One system, involving the use of moldboard plows, contemplates a four-year increase in output (kg/hectare) for

^{36/} "Dryland Crop Production in Botswana: A Review of Research," MOA, 1975.

sorghum of 540 to 1,350, cowpeas from 360 to 675 and sunflowers from 180 to 540. In a second system, entailing use of the tool-bar, sorghum yields are projected to rise from 675 kg per hectare to 2,250, cowpeas from 450 to 1,080, sunflowers from 225 to 900, castor beans from 225 to 900 and groundnuts from 450 to 1,620. Granted that these data are based on an assumption of optimum operating conditions, they are reflective of the feasibility of enhanced productivity, notwithstanding the well-known constraints.

Based on these yield assumptions, AID has translated the data into farm budgets which show promising potential increased in income for the average farmer (Table 2).^{37/} Under one system, net farm income would rise from a submarginal level to the Pulaequivalent to 234; while under the second system, the increase would exceed 700 percent.^{38/}

^{37/}"Botswana Crop Production, a Project Paper," AID, July 31, 1976.

^{38/}Ibid., p. 58.

TABLE 2. FARM BUDGETS, DRY LAND CROP PRODUCTION SYSTEM

(SA Rand)										
		SYSTEM 0	SYSTEM I 6 ha.				SYSTEM II, 6 ha.			
SEASON:		-	1st	2nd	3rd	4th	1st	2nd	3rd	4th
ROTATION:		-	(i)	(i)	(i)	(i)	(i)	(i)	(i)	(i)
Gross Output		<u>66</u>	<u>134</u>	<u>190</u>	<u>239</u>	<u>295</u>	<u>166</u>	<u>299</u>	<u>400</u>	<u>484</u>
Variable Costs		<u>11</u>	<u>47</u>	<u>51</u>	<u>55</u>	<u>59</u>	<u>54</u>	<u>64</u>	<u>72</u>	<u>78</u>
Fixed Costs		<u>105</u>	<u>105</u>	<u>105</u>	<u>105</u>	<u>145</u>	<u>115</u>	<u>115</u>	<u>115</u>	<u>132</u>
Margin		<u>-50</u>	<u>-18</u>	<u>34</u>	<u>79</u>	<u>91</u>	<u>-3</u>	<u>120</u>	<u>213</u>	<u>274</u>
Margin over Subsistence		-90	-58	-6	39	91	-60	60	153	234
:										
			SYSTEM II, 10 ha.				SYSTEM II, 14 ha.			
SEASON:			1st	2nd	3rd	4th	1st	2nd	3rd	4th
ROTATION:			(i)	(i)	(i)	(ii)	(i)	(i)	(i)	(ii)
Gross Output			<u>277</u>	<u>498</u>	<u>666</u>	<u>831</u>	<u>388</u>	<u>699</u>	<u>933</u>	<u>1,164</u>
Variable Costs			<u>90</u>	<u>107</u>	<u>120</u>	<u>117</u>	<u>154</u>	<u>178</u>	<u>196</u>	<u>201</u>
Fixed Costs			<u>229</u>	<u>229</u>	<u>229</u>	<u>264</u>	<u>229</u>	<u>229</u>	<u>229</u>	<u>264</u>
Margin			<u>-42</u>	<u>162</u>	<u>317</u>	<u>149</u>	<u>5</u>	<u>292</u>	<u>508</u>	<u>699</u>
Margin over Subsistence			-27	177	332	499	20	307	523	749

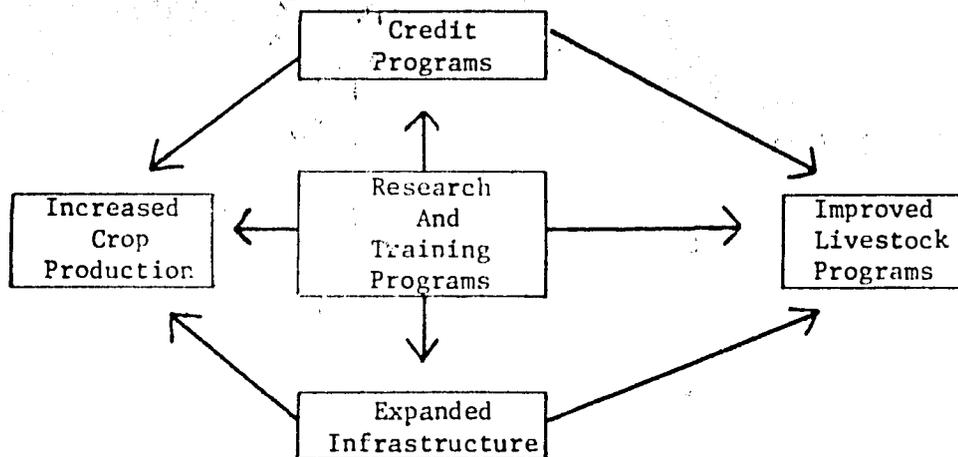
-18-

Source: "Botswana Crop Production, a Project Paper," AID, July 31, 1976.

VI. COMPONENTS OF A LONG-RANGE DEVELOPMENT STRATEGY

To this point, the study has basically been a discussion of the nation's resources and marketing system and a consideration of development constraints and potential. What follows are the components of a proposed long range development plan for increasing the effective use of Botswana's land, water and human resources. The guiding principles used in the evolution of this plan include a consideration of the efficiency-equity tradeoffs and the goal of an overall cost-effective plan. The alternatives suggested are thought to be (on the basis of an admittedly brief analysis) those in which Botswana's natural and human resources possess a comparative advantage, but constrained by the overriding need to upgrade human skills and protect the nations land and water resources.

The interrelatedness of the proposed strategy is shown in the following diagram.



The diagrammatic presentation indicates the central core of the proposed development plan is research and training. However, these activities are basically means--not ends. The elements in the proposed strategy for development is in terms of these "ends," with the research and teaching as a facilitator for attaining the desired type of activity.

For exposition purposes, a skeletal outline of the elements in the proposed development strategy will be presented first (Table 3). Then a more detailed examination of the specific proposals will be discussed.

Table 3. Outline of Elements in Proposed Development Strategy for Botswana.

- A. Increased Crop Production
 - 1. Cultural practices
 - 2. Horticultural program
- B. Improved Livestock Program
 - 1. Diversification of livestock sector
 - a. Dairy and poultry
 - b. Small stock
 - 2. Protection of soil resources
 - a. Range management program
 - b. Soil survey
 - 3. Potential for Second Abattoir
- C. Farm Credit
- D. Expanded Infrastructure - Transportation

A. INCREASED CROP PRODUCTION

USAID is currently supporting a small crop production and marketing project (633-0056) with emphasis on sorghum (Appendix A). There is need to develop a more comprehensive approach to the problem, even at the expense of decreasing the spatial coverage of the program. The core concept is that crop production is the result of the use of joint inputs such as fertilizer, improved tillage and varieties adapted to the area. Although there are slight substitution effects, crop yields are primarily a function of the "poorest" input. For example, improved seed, tillage practices and fertilizer are a hardship (due to cost of inputs) to the farmer if the crop is lost to weeds or pests. The point of emphasis is the need for "across the board" improvements rather than concentrating on a specific input.^{39/} Under conditions in which everything needs attention, the establishment and adherence to hard priorities is essential. On the premise of "first things first," it appears that research and extension, as the well-spring of agricultural modernization should receive first call, in terms of personnel, facilities and budget. The modest start in this direction is commendable, but it is not enough.

With technical training as the center piece, the research program should be expanded as rapidly as possible in every practicable direction: the basic sciences, adaptive research, middle level practitioners, farm field trials, demonstration work, soil and water management, variety experimentation, fertilization practices - the whole bundle of testing and replication procedures which, collectively, comprise a functional research effort.

^{39/} Nevertheless, there is considerable testimony available which suggests that fertilizer is a particularly promising input in certain areas. See Appendix B.

Development of extension services related to the utilization of research need not await the fruition of ultimate results. Indeed, the various components of a balanced agricultural program should evolve hand in hand. Reference here is to the primacy of the undergirding which, as manifest in advanced agricultural systems everywhere, is research - broadly defined as applied.

The costs of a strategy emphasizing research and extension is high in both time and money. However, the returns on investments in agriculture using this strategy will in the longer run, have the potential for a much higher payoff.

The main input into a research and extension strategy, as compared to an input-specific (seed, fertilizer, etc.) strategy is trained manpower. Thus a successful research and extension strategy requires the implementation of training programs of the entire continuum--from informal and primary education to diploma and degree students. Although current AID programs are designed to address some of these needs (i.e., 633-0074), the potential "payoff" from additional resources in training suggests the assigning of a high priority to this area.

The National Commission on education has recommended that vocational subjects, including agriculture, not be taught at the primary level.^{40/} Rather, as part of the study of science, students should become familiar with animals and plants. Examples utilized to make scientific subject matter more concrete and closer to the students' experience should be drawn from agriculture. Thus, efforts to introduce agriculture into the primary level should be generally limited to strengthening the school garden program and to introducing agricultural examples into the science curriculum.

^{40/} National Commission on Education, Education for Kagisano: Garborone, April 1977, pp. 70-71.

The primary problems of the school program are lack of agricultural training of teachers assigned to the program and limited manpower for supervising the program. A lesser problem is a shortage of equipment and tools. Potential contributions for AID and (1) assistance in introducing agriculture into the curriculum of the teachers training colleges, (2) provision of secondary teachers with preparation to teach academic subjects as well as agriculture (possible in conjunction with Peace Corps), and (3) supplement the staff administering the primary school gardens and provide it with necessary vehicles. In addition to the need for adequate training of extension agents, transport is a severely limiting factor. Demonstrators are expected to serve very large areas by bicycle, more than can be reasonably traversed in that manner. Also because of poor repair facilities and rough roads, a large proportion of the MOA truck fleet is under repair at any given time. For the government as a whole, it is 25 percent. this, too, would be an area in which AID may wish to consider in providing assistance.

The National Agricultural Education Task Force will, on the basis of preliminary findings, submit a report to the government, (late in 1978), recommending substantial strengthening of secondary school agricultural education. The reaction to the Task Force's recommendations will foreshadow governmental commitment to agricultural education. If the Government's response is positive, consideration of an AID project would be appropriate and could contribute substantially to strengthening agricultural education. The following needs have been identified: (1) additional MOE personnel for administering the program, (2) school buildings, equipment and supplies, (3) vehicles for delivery of supplies, (4) a revised curriculum, texts, teaching materials, and audio-visual displays, and (5) interim teachers until Batswana are available (Peace Corps).

The need for a substantial number of more highly trained (B.S. and higher) personnel has been well documented previously in this report. Although this will, of necessity, be a very long range program, continuing assistance in supporting training at the degree and graduate levels is a must in any program for agricultural development.

Paranthetically, the need for educational assistance over the entire training continuum is as important for the livestock, credit and infrastructure activities as it is for crop production. The allocation of training among these activities will await more detailed evaluation such as available in a project plan.

A second component of a strategy to increase crop production is the support of a horticultural development plan.^{41/} The goal of self-sufficiency in fruit and vegetable production, with an effective target date of 1986, is identified as a high priority item in the current five year plan. (Item AEII in the National Development Plan). With some reservations about specific details, the horticultural development plan (including the negetable research proposal), is generally a well balanced document that could serve as the starting point for developing a substantial horticulture industry.

Fruit and vegetable production enjoys several advantages that mesh well with joint USAID/GOB criteria for development:

- (1) It is well adapted to small farmer, labor intensive operations.
- (2) Vegetables and, after waiting time to reach bearing age, even the tree crops produce an annual income.
- (3) On small tracts, it can be blended with other crop activities or nonfarm occupations.

^{41/} From the Synopsis, Draft Project Memorandum, "Horticultural Development," Republic of Botswana, (Recent but undated),

- (4) Horticultural crops utilize the skills of women.
- (5) It provides a highly valuable addition to the diets of the people.
- (6) It is a direct approach to import substitution.

The disadvantages of horticultural enterprises are:

- (1) They tend to be capital intensive.
- (2) They require a relatively high level of management skill.
- (3) The crops tend to entail high risk.

Each of these obstacles can be surmounted. Subsequently in this report the need to study procedures for providing credit to small farmers is recommended, and it would have particular application to fruit and vegetable producers. Attainment of management skills is an integral part of this strategy to increase the level of trained manpower. Finally, high returns usually accompany high risks and the risks may be mitigated, (at least in the short run), by the government sponsored "insurance program".

In both the short and long run there are important policy considerations which need to be examined. In the short run, major problems may arise unless there are some fairly stringent import controls imposed. The basic "infant industry" arguments are appropriate here, and they may indeed be justification for import controls. However, this would need to be balanced off against the political and economic problems which may arise between Botswana and RSA from this type of action. Also, many of the fruits and vegetables imported from RSA are of less than grade-one quality. If, in fact, Botswana is used as a market for low quality products, it will be almost impossible for the local farmers to compete in the market until "tastes" for the higher quality product are developed. Conversely, there is the potential for a decrease in the transportation costs which should help equalize prices.

In summary, the project is only feasible if, in fact, the Botswana government is prepared to use import controls--at least in the short run. The statement in the current plan (p. 13) that import regulation be introduced only if and when the need arises does not seem very realistic.

From the longer run viewpoint, there should be analysis of the comparative advantage associated with production of fruits and vegetables in Botswana. Even if non-economic criteria such as self-sufficiency are used in the decision-making process, a study of the comparative advantage in production would provide an estimate of the cost of reaching self-sufficiency. A secondary study of the effective demand for fruits and vegetables of specific qualities should proceed the full scale support of this project. It need not be highly sophisticated study, but information on imports, assumed to be in error by at least 50 percent, is not a sufficient base on which to develop a project plan.

Parenthetically, there was general agreement with the officials contacted in the Ministry of Finance and Development that the term "multi-purpose horticultural co-ops" should replace the currently used "horticultural estates" term.

B. IMPROVED LIVESTOCK PROGRAM

1. Diversification of livestock sector.

Conventional dairy operations have no immediate future in Botswana's farm economy, although a 50-cow dairy is currently being established under research auspices and will bear observation. Generally, feed and water requirements and the overall complexity of dairying militate against production of fresh milk under arid conditions.

An alternative exploited in many countries is the reconstruction of powdered dry milk, with or without fresh milk additives. This process is used in the dairy products now being imported in Botswana, and there is no apparent reason why a domestic plant could not be established for the same purpose.

It is estimated that Botswana produces about 25 percent of its domestic need for broilers and eggs. With additional capitalization and technical assistance, this import gap could be closed fairly rapidly. Poultry production has several distinct advantages:

- a. It falls logically in the private sector,
- b. The gestation period is short.
- c. With an organized supply/marketing system, it lends itself to small operations at the project level.

Economies of scale in broiler production are quite high, but the mechanics can be adjusted to relatively small operator participation and still maintain cost-effective efficiencies. Among the physical requirements are hatcheries, feed supplies and animal health products. All may have to be imported at the start. However, crop surpluses could furnish at least some of the feed required; low-cost hatchery units can be constructed largely with locally available materials; and Botswana is already launching a pharmaceutical industry (for the manufacture of foot-and-mouth vaccine) which could produce the necessary products for the poultry industry.

Almost as an afterthought, sheep and goats, numbering some 2 million head, are being recognized as a national asset of some importance. Their commercial and certainly their export potential may be limited, but the subject merits more attention than it has received. A small unit has been created in MOA for this purpose.

No specific recommendations will be made for small stock, except to note that their capacity to survive in the drought-prone environment is phenomenal and that they may represent a saving factor for beef industry facing difficulties. At this time, the AID livestock project has sufficient scope in its terms of reference to permit inclusion of small stock in its activities.

2. Protection of soil resources.

The degradation of the nation's lands, and to a limited extent water, resources by livestock has been previously documented in this report.

Although water development plans are not a major element in the overall development strategy presented, the implementation of a plan to provide a limited number of strategically placed surface ponds or boreholes for livestock water supplies may be desirable. Specific consideration should be given to the feasibility of using impoundments or wells to prevent cattle from tramping the main channel of the rivers and streams. This is not a recommendation for widespread, indiscriminate drilling, which, as noted previously, is one of the reasons for the present level of environmental damage.

The problem of overgrazing and the cultural constraints to reducing cattle numbers have, again as previously reported, led to problems of brush encroachment increase in less desirable grasses, and in extreme cases the complete denuding of the area near water sources. Encouragement should be provided in attempts to decrease cattle numbers, but the implementation of programs to achieve that end are basically outside the parameters of what can be done by donor agencies. An indirect approach, with useful side effects, is to support a plan to better understand the soil-plant-water relationships in Botswana. Specific programs might include:

- a. An acceleration of the existing soil survey program in the MOA, with the survey so designed as to provide immediate reconnaissance type information for broad resource planning. The acceleration could take the form of increased staffing in the MOA by qualified people. Future surveys should be designed around an international system of soil taxonomy.

- b. Expansion of the research base in the area of soil chemistry, soil chemistry, soil physics and soil mineralogy. There are apparently unique soil management problems that must be researched if adequate and practical management practices are to be forthcoming.
- c. An accelerated program for training of Botswana nationals in the agricultural disciplines that include soil science, range science, agronomy, agricultural engineering and forestry. In the process of identifying qualified people, it is recommended that consideration be given to training qualified women for these positions.

3. Potential for a second abattoir.

In 1973, and possibly earlier, a second abattoir for northern Botswana was recommended by a consulting team.^{42/} Part of the rationale cited in this report by Chambers and Feldman has been modified by circumstances but the 6 benefits cited by those authors are still worth quoting:

- "(1) The increase in price to producers of cattle with access to the new abattoir.
- (2) The potential increased offtake and improved conditions that would result from responses to the increase in price.
- (3) The release of transport resources currently used to transport cattle to Lobatse.
- (4) The release of land and water currently used to a fatten trekked cattle. This would allow a considerable increase in the size of the national herd. (Author's note--or high decrease in current overgrazing).
- (5) The spreading of development into an area with considerable potential for sustained growth.

^{42/} Chambers and Feldman, Report on Rural Development, MFDP, February 1973. The site recommended was Maun; others have suggested Francistown. This is a matter to be settled by a feasibility analysis and is not critical in this context.

- (6) The release of demands on urban services in Lobatse where water and housing are in particularly short supply."

This proposal takes on added significance if the beef embargo is continued even on a modified basis. The beef industry of Botswana may be facing a restructuring of previous cost-price relationships for its product. Whereas chilled beef of export quality once commanded a handsome premium on the European market, it might become necessary to settle for substantially lower returns in the form, say, of canned beef, in which foot and mouth disease is no longer a factor. In this eventuality, the beef producer must find ways of cutting costs. Transportation is a major cost item which a second plant should reduce substantially

A change in labels would help on this score. Instead of "abattoir," a second facility should more properly be called a "meat processing plant" to connote an operation capable of employing alternative combinations of meat conversion technology.

The intent of this recommendation is not to prejudge the results of an updated economic feasibility study. Rather it is suggested as worthy of consideration because of the key role played by livestock in the nation's economic base.

C. FARM CREDIT

The availability of credit at realistic rates of interest is of the same importance to the small farmer as the availability and price of seed, fertilizer, and other production input. The question of need is well documented. Even the question of the most appropriate delivery system for providing the credit seems to be coming in focus--with the emphasis being on the use of farm cooperatives as the appropriate organization for increasing credit operations.

It appears that one of the initial elements in the credit picture is a coordinating function. For example, the IBRD's "Second Livestock Project" provides for a relatively large loan (U.S. \$6.6 million equivalent in 1977) to

livestock producers. Implementation of this plan encompasses inputs of one kind or other from the National Development Bank, BMC, communal associations, individual ranches and small producers, the transport system, the LBDC and various units of MOA. Additionally, the project is to be guided by a Steering Committee involving four Government entities, a Livestock II Coordinating Committee and the International Livestock Center for Africa. It will surely provide a test of inter-agency cooperation. Thus, the question becomes one of additional study on the most efficient and equitable process of actually getting the credit into the farmers' hands, and technical assistance to help him make the proper use of this "production input."

The credit question is indeed one of the most difficult of all development related problems. It tends to be the catalyst for moving toward a more productive agriculture. This is the reason for the recommendation that additional study precede any action program for providing credit on anything more than a pilot basis.

D. EXPANDED INFRASTRUCTURE

Roads play an important role in rural development in Botswana, and offer many opportunities for useful application of foreign assistance. It appears that human resource development is more important than outright donations of roads constructed by foreign contracts, as far as the long range benefits to the rural standard of living are concerned. Thus the emphasis in this component of the development strategy is on road maintenance rather than new construction.

The organizational requirements for a successful program to build road maintenance capabilities exist already:^{43/}

1. An extensive feasibility study on road maintenance has been completed.

The average cost per kilometer per annum for routine maintenance is estimated at approximately P150 for earth roads.

^{43/} Republic of Botswana, Ministry of Works and Communications, Highway Maintenance Study, Final Report, Volume 2, District Road Maintenance Pilot Project, May 1978.

2. The World Bank is undertaking a pilot project to assess the difficulties and prospects for labor-intensive road maintenance projects for rural areas; results will be available within two years giving important management lessons.

3. Training facilities could be organized under a variety of possible auspices.

- a. The Roads Training Center in Gaborone could accommodate nominees from the District Councils provided funds were available to support salaries, and to build needed housing accommodations. The Roads Training Center is currently prepared to allocate 25 percent of its training slots for employees or designates of the Districts.
- b. The Rural Development Training Centers could sponsor training programs in road maintenance, provided curriculum development and instructors' salaries could be paid out of grant funds.
- c. The Ministry of Local Government would like to sponsor local development institutes, moving from district to district, to enlarge the construction and maintenance capabilities of the District Councils. This program could improve technical skills not only in roads, but also for water, housing, school construction and other activities currently within the purview of the District Councils.
- d. The self-help programs fostered under the brigades system could develop local entrepreneurs with capabilities for bidding on contracts for road maintenance. The brigade training system has shown excellent results in stimulating private initiatives, and spreading technical skills to rural areas.

4. Program management could be the responsibility of the Ministry of Local Government and Lands, since the District Councils come under the jurisdiction of this Ministry.

5. The program would be tied in with a broad effort to promote rural development, and build the capacities of the rural District Councils. The program has the potential for being self-sustaining, provided that adequate fiscal mechanisms are set up to tax the beneficiaries of road improvements (trucking firms, traders and shopkeepers, in particular).

6. The types of inputs needed for a successful program include:

- a. Trainers for the Roads Training Center or other institutions providing instruction.
- b. Road building equipment of low-cost, appropriate technology, as revealed by the proposed World Bank pilot project. (Equipment, for example, should be appropriate for women operators, in some cases, since the men of working age may be absent during much of the year.)
- c. Adequate supplies of spare parts for equipment.
- d. Housing facilities for the training center, or alternative mobile facilities for training institutes in the field.
- e. Experts in local finance to work with Ministry of Local Government, the Ministry of Finance, and other appropriate agencies to set up taxing mechanisms capable of sustaining economic support of road maintenance programs.

7. Before investing in such a program of human resource development, it would be wise to undertake a modest feasibility study to include surveys of labor availability and costs of public versus private organizational bases for road maintenance. The Central Transport Organization, a public body, for example, has been unable to eliminate waste and inefficiency in providing mechanical services to government agencies, and many believe a private contractor may be a better long run solution.

VII. SUMMARY AND CONCLUSIONS

The development strategy for agriculture presented in this report focuses on one major thrust--improvement in the human resources and related institutions. With full recognition that the development of human capital is expensive and based on long run considerations, it is argued that this approach is the most effective way to attain sustained economic development.

The Botswana people are fortunate in having a stable and effective government and adequate, albeit not bountiful, natural resources. Thus the major structural pieces of a development framework are already available. The need is for trained people to operate and manage the resources to the advantage of all the nation's citizens.

Specifically, the development plan calls for using the trained manpower to: 1) increase crop production; 2) improve livestock programs; 3) provide for a better transportation system; and 4) to increase the availability of production credit.

Appendix A

Brief Summary of
USAID Program in
Rural Development*

Until FY 77, USAID maintained only a nominal presence in Botswana, restricting its activities mainly to developmental targets of opportunity having a limited scope. Since then, circumstances have dictated an expanded, though still modest role for U.S. foreign assistance. In money terms, the FY 79 program totals \$25 million and consists of six on-going projects (\$8 million) and five new projects (\$17 million).

The programming task is simplified somewhat by a general coincidence of joint USAID/GOB policy objectives. Botswana's four national principles - democracy, development, self-reliance and unity -- parallel in spirit a corresponding list of long-standing American traditions. Similarly, Botswana's commitments to rapid economic growth, social justice, economic independence and sustained development pose no difficulties save in the matter of details. To the extent that conflict arises, it derives basically from the differing manner in which each government conducts its business.

It is difficult to cull from existing and planned AID projects in Botswana all those elements that are identified precisely as rural development; overlapping effects are certain to occur in a predominately rural setting. A brief description of those projects about which there is little doubt as to their proper

*The broad objectives, funding, project descriptions and projected contributions of USAID in Botswana are covered rather thoroughly in the Annual Budget Submission FY 1980 OSARAC/Botswana (AES). Comments contained in this section apply chiefly to the rural development content of the program and its relevance to the SADAP assignment.

classification, however, will indicate the texture of AID's contribution to the rural development effort. These are:

1. Range and Livestock Management (633-0015)

The purpose of this project is "To institutionalize the processes by which group action by small holders, resulting in increased productivity and more efficient use of the resource base, can be encouraged, supported and expanded." It will focus on the needs of small livestock producer groups and attempt to better their income position through improved management.

Five American technicians, under a USDA PASA agreement, will comprise the advisory staff. Training will be provided for 6 participants to the diploma level and 7 will seek degrees. It is a five-year project at a total cost of \$3.4 million.

2. Crop Production and Marketing (633-0056)

This project aims to create a crop division in the Ministry of Agriculture and to expand crop research, with the emphasis on sorghum. In addition, it has a storage and marketing component in collaboration with the Botswana Agricultural Marketing Board. It is expected to improve the linkage between research and extension and to reach 20,000 small farmers.

Three long-term American technicians are being assigned to the project and 12 Batswana will receive training, 9 of them in advanced scientific fields. The project is budgeted for three years, with extensions likely, at a total cost of \$1.8 million.

3. Agricultural Planning (633-0067)

This project has as its purpose the development of an indigenous planning capability in the rural sector. Academic and in-service training of a Batswana planning staff will be strongly emphasized.

The project will be manned by U.S. specialists provided by USDA plus selected consultants. Commodity inputs include office, housing and transportation facilities. First 3 and then 6 participants each year will receive long-term training. In recognition of the time requirements for specialized training, the project is booked for 5 years and beyond, at a total cost of \$4.8 million.

4. Agricultural Training School (633-0074)

This project will assist the Botswana Agricultural College to upgrade and expand its capacity to train basic and intermediate level technicians. The final project design is currently under preparation, but the original target was an increase of 138 new graduates per year in BAC's two-year certificate courses in agriculture, animal health and community development.

In addition to construction of classroom and student facilities, the project will undertake to train 47 Botswana as participants and counterparts. Six long-term U.S. technicians will be assigned to the project for a period of 5 years and beyond. The total cost is \$4 million.

5. District Planning (633-0077)

The purpose is "To increase the capability of village and district governments to provide vital rural development services. This project follows up the Accelerated Rural Development Program (ARDP) of 1973-75, at which time the limited experience of many district and local officials proved to be a handicap in the coordination of a national program. It is "on a yearly non-project specific basis, with the provision of each yearly tranche (of AID funds) dependent on a positive evaluation of prior year expenditures." Thus, it is a unique combination of open-end allocations, the continuation of which is to be determined by effectiveness of performance. Project activities are to be directed toward improvements in water, health, education and other basic human needs.

Like virtually all AID-supported projects, this one provides for training of Batswana; there will be 5 long-term participants, as well as in-service training for larger numbers. Two long-term advisors will work on the project. The term is for 5 years and beyond, and the cost is in the \$4 million range.

A concluding comment is that all AID-supported projects have implications for rural development, but those described above fall distinctly in that category. The other projects, planned or under implementation, will not be reviewed here. These include health and sanitation, transport, manpower, housing, education at primary, secondary, intermediate and university levels, energy and income skills training for women.