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**DEMAND ASSESSMENT  
OF AGRICULTURAL PRODUCTS IN  
SELECTED AFRICAN COUNTRIES**

**COUNTRY REPORT: BOTSWANA**

Prepared for:

AFR/MDI  
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Prepared by:

Bob J. Walter, Team Leader  
and Institutional Development Specialist  
and  
Rheinhold Straub, Agricultural Marketing Specialist

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**Tropical Research and Development, Inc.**  
519 N.W. 60th Street, Suite D, Gainesville, FL 32607  
Tel. (904) 331-1886: FAX (904) 331-3284

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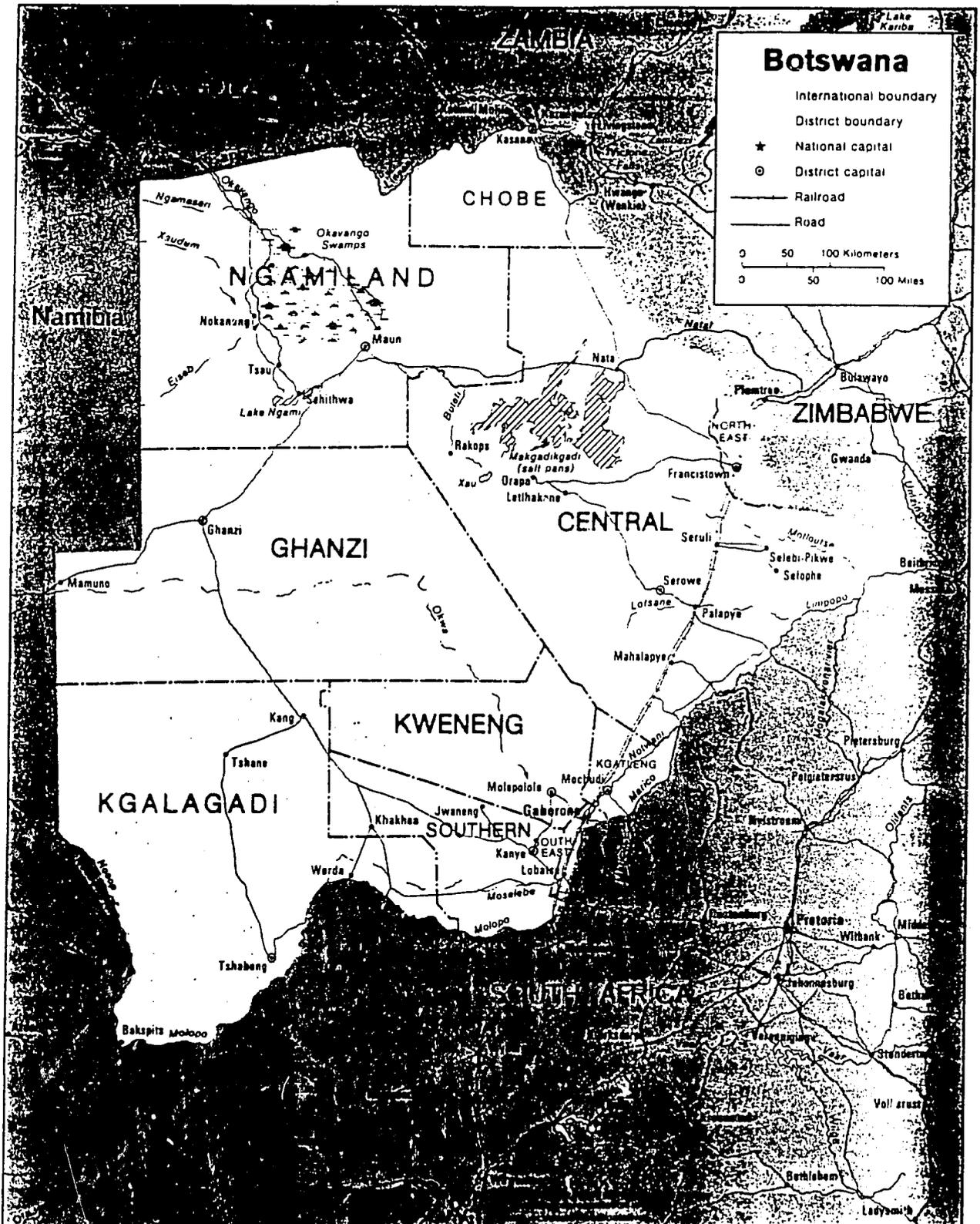
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## ACRONYMS AND ABBREVIATIONS

AFR/MDI	Africa Bureau, Office of Market Development and Investment
A.I.D.	Agency for International Development
BAMB	Botswana Agricultural Marketing Board
BMC	Botswana Meat Commission
FAO	Food and Agricultural Organization, United Nations
Ha	Hectares
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IQC	Indefinite Quantity Contract
Kg	Kilogram
L.U.	Livestock Unit
MD	Man Days
MMA	Mastitis, Metritis, and Agalactia
MOA	Ministry of Agriculture
P	Production
R.S.A.	Republic of South Africa
SADCC	Southern African Development Coordinating Council

FIGURE 1

MAP OF BOTSWANA



## PROJECT DESCRIPTION

The primary objective of this project is to develop and produce assessments of domestic and regional demand for specific agricultural products in selected African countries. To carry out this demand assessment objective, we wanted to create a method for assessing production and market potential of the products under review. The method would indicate levels of demand and potential future changes in demand levels. It would indicate potential for increased production of target commodities based on potentially available unused resources, including land, labor, and/or technical inputs. In addition, it would provide a gross indication of production and marketing costs. To the extent feasible, the project would also test the means for determining potential comparative advantage based on indicated gross production and marketing costs. It should also review existing and potential government subsidies, trade barriers, and other governmental and administrative regulations and programs. A specific focus of the assessments is to determine the feasibility of identifying all of the key constraints to private sector entree into the production or marketing system in order to expand the production of the target commodities.

### Background

There are a number of agricultural commodities and agribusiness related processed products which are capable of being produced in selected African countries. The initiation or expansion of production of such commodities can be beneficial for the developing African country in terms of increasing income and employment in agriculture. However, there is very little data available to establish effective demand patterns upon which to base potential agribusiness development activities and for determining the potential for the production of these products in African countries.

In addition, some of these potential demand commodities need to be analyzed in terms of their potential for expansion or improvement without direct production assistance from A.I.D. Instead, A.I.D. would provide assistance for market analyses, technical advice to existing production operations, and/or assistance to African intermediate financial institutions which are currently financing such products.

AFR/MDI initiated this project to meet its need to identify investment opportunities in its target countries, opportunities that would appeal to U.S. investors. MDI is working to bring the private sector into the struggle to enhance rural living standards in developing African countries by attracting private sector resources to investments that will raise levels of rural employment, agricultural production, and standards of living. In exchange for the capital and technical expertise, the private sector will invest; it expects the investment to be profitable. MDI, therefore, requires a means to

identify potentially profitable investment opportunities to offer to the private sector.

Given resource constraints, the methodology must be quick and require a minimal manpower expenditure. This, in turn, mandates that the methodology must rely extensively on secondary data and interviews with local commodity and marketing experts. The output of the methodology is not expected to yield precise levels of demand and profitability, but rather magnitudes and directions that will be useful in directing further, more in-depth, marketing research.

### Method

The first stage in the process involved a review and verification of data collected in Washington. We were given 270 raw and processed or semi-processed agricultural commodities to consider. Our first task was to narrow this list to between 30 and 40 locally produced commodities which, upon examination of the most basic production and trade data, show potential unsatisfied demand. Because of the inherent resource constraints this was a necessary step. During the course of our investigations, if we became aware of promising commodities omitted in the initial culling process, we considered them as well.

The second stage entailed a more detailed investigation of the commodities selected in the first stage. We then investigated production and trade histories of the commodities in an attempt to ascertain why production has apparently failed to meet potential demand and what would be required to increase production. This information was obtained from existing commodity studies, food balance sheets, and demand projections, and, most importantly, from interviews with knowledgeable local observers. While the study is aimed principally at ascertaining local demand, we also considered factors relating to foreign trade. We recognize that African countries are not autarchic economies and that foreign competition and foreign demand is an important factor in determining the feasibility of profitable production increases. At this stage, we narrowed our list to those commodities which continued to manifest a strong possibility for profitable production increases.

The third stage entailed a closer examination of cost factors involved in increased production and a closer look at marketing and institutional constraints. Here, we attempted to estimate the magnitude of potential profitability, the resources needed to realize that level of profitability, the feasibility of success given existing marketing and institutional constraints, and the potential for overcoming those constraints. The information will be acquired from local experts including production researchers, marketing boards, wholesalers, cooperatives, and large producers.

Basically, the questions addressed by this survey are:

- Is there a demand for increase production of the target commodity?
- What is the magnitude of that demand?
- What is required to increase production?
- Can increased production be marketed profitably, how can that be accomplished, and what is the potential magnitude of that profitability?

A secondary objective of this project was to determine a quick and relatively inexpensive method to obtain accurate, albeit perhaps not extremely detailed, answers to these questions. We were working under the assumption that the information we require exists and does not need to be derived from long-term intensive and expensive basic research.

### Organization

In the discussion which follows, we have organized the review of each commodity discussed in the same format. First is a discussion of production history, followed by a demand assessment review. Next, we look at increased production potential. Fourth is production and marketing costs and constraints. Finally, there is a section on investment possibilities and profitability assessments. Although this format is repetitive, it does provide a comparative framework for the reports.

### Output

The outputs of this project are three reports. First, and most importantly, are the two country reports, one each on Kenya and Botswana. A third report is an interpretative assessment of the Bumpers and Lautenberg amendments to A.I.D. legislation, especially the impact such legislation might have on the development and export of specific commodities. To follow is the information on Botswana.

## GRAINS

### Overview

Of the estimated 1,360,000 ha potential arable land, about 20 percent is utilized in grain production. At present, production level per unit area is much lower than the potential; income from crops is far below income from livestock, and is far less than government employment and mining wages. There are three basic production systems in Botswana: communal or traditional; commercial/free-hold; and government. Production is dominated by traditional, small-scale, subsistence, rainfed farms with low capital and labor resource inputs on communally owned tribal land. Farmers in the traditional sector produce about 85 percent of grain harvested, while the commercial farms contributed most of the balance. The average size of subsistence, rainfed farms is about 4.5 ha. while partly mechanized, improved rainfed farms average about 10 ha.

Botswana has been self-sufficient in grain production only twice since independence (1974 and 1976). Grain subsistence requirements for a family of six is estimated to be about 1250 kg per year. By the year 2000, grain needs are estimated to be at least 400,000 tons of cereals given an expected population growth rate of about 3 percent.

Productivity is low; mean yields range between 200-300 kg per hectare.

**TABLE: 1987 Crop Production**

CROP	SECTOR	AREA HARVESTED (Ha's)	AVERAGE YIELD (Kg/Ha)	PRODUCTION ('000 MT's)
Sorghum	Traditional	102607	109	11.184
	Commercial	11293	611	6.900
	Total	113900		18.084
Maize	Traditional	3199	67	.214
	Commercial	2201	1386	3.050
	Total	5400		3.264
Millet	Traditional	5412	67	.363
	Commercial	88	50	.004
	Total	5500		.365
TOTAL	Traditional	111218	106	11.761
	Commercial	13582	733	9.954
	Total	124800	174	21.716

TABLE: Cereals (MT)

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	70223	0	11530
1975	23857	9912	67050
1976	27466	2960	122247
1977	38759	1204	72000
1978	40332	9484	32600
1979	77165	2076	8050
1980	70189	1121	43570
1981	50558	751	52595
1982	61924	974	17720
1983	122880	1035	15165
1984	174566	1462	7925
1985	154685	10227	19070
1986	141424	0	19435
1987	NA	NA	23000
1988	NA	NA	56000

SOURCE: FAO.

Constraints responsible for low crop yields include:

- Lack of appropriate drought tolerant varieties.
- Untimely plowing and planting.
- Lack of or untimely weeding.
- Crop damage by livestock, pests and wildlife.
- Weeds (Datura Ferox, Cynodon Dactylon) etc.
- Lack of draft power and weak animals.
- Under-stumped land.
- Shortage of good implements.
- Low soil fertility.
- Poor tillage and crop husbandry practice.
- Un-optimal plant density.

Based on research experience, a simple package of early plowing and quality row planting, with planters currently available, will increase per ha grain yield by nearly 100 percent over wet and dry seasons.

Grain crop markets are characterized by substantial government intervention and dominance by the parastatal Botswana Agricultural Marketing Board (BAMB). Private sector involvement in product markets is limited.

## SORGHUM

### I. Introduction.

Sorghum is the major cereal crop in terms of area and production. The most widely produced sorghum variety is Segaolane which is an open pollinated, white grain adaptive and stable in yield. Other varieties are marupantse, town, 8D and 65D.

TABLE: Sorghum (MT)

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	52000	0	7800
1975	200	3500	33800
1976	1000	400	55540
1977	5000	70	33000
1978	4500	0	15500
1979	25000	100	4300
1980	15000	110	29100
1981	2000	100	28300
1982	14265	72	3870
1983	54473	64	5235
1984	87973	428	5720
1985	64320	9475	14785
1986	65000	0	16000
1987	NA	NA	18000
1988	NA	NA	40000

SOURCE: FAO.

### II. Demand Assessment:

Demand for sorghum in 1987 was estimated to be about 55,000 MT. This is expected to increase by the year 2000 to be between 73,000 and 90,000 MT, depending on changes in income and consumption patterns. This projection assumes a current population growth rate of 3.64 percent per annum which will decline toward 3 percent per annum through the year 2010.

TABLE: Sorghum Consumption. (MT)

	1981	1982	1983	1984	1985	1986
Opening Stock	13100	10700	1650	22200	21800	27900
Production	28300	3800	5200	5700	14800	16000
Imports	1880	14300	56200	37000	53700	28000
Exports	20	100	300	500	9500	1700
Closing Stock	10700	1650	22200	21800	27900	17550
Consumption	32560	27050	40550	42600	52900	52650

Source: Ministry of Mineral Resources and Water Affairs.

The following table projects consumption to the year 2017. It assumes not only the same population growth characteristics discussed above, but also factors in assumptions about per capita income changes and dietary preference changes. The resulting figures should be viewed as a low demand growth scenario; i.e., demand will likely be higher than depicted.

**TABLE: Projected Sorghum Consumption**

Year	Demand '000 MT	Population '000
1987	55.0	1169.2
1988	57.7	1211.8
1989	60.0	1255.7
1990	62.0	1301.0
1991	63.9	1347.6
1992	65.6	1395.4
1993	67.1	1444.4
1994	68.4	1494.8
1995	69.5	1546.7
1996	70.4	1600.2
1997	71.2	1655.2
1998	71.6	1711.6
1999	71.9	1769.5
2000	72.1	1829.2
2001	72.5	1890.7
2002	73.0	1954.1
2003	72.8	2019.1
2004	72.5	2085.9
2005	72.2	2154.6
2006	72.0	2225.1
2007	71.7	2302.8
2008	71.5	2387.7
2009	71.3	2471.7
2010	71.2	2546.8
2011	71.1	
2012	71.0	
2013	70.8	
2014	70.7	
2015	70.6	
2016	70.5	
2017	70.4	

Source: Ministry of Mineral Resources and Water Affairs.

### III. Increased Production Potential:

Using appropriate varieties and management practices, yields upwards of 2 MT per hectare have been achieved at the various research stations, and yields ranging between 600 and 1200 Kg/Ha can be expected from traditional producers given appropriate varieties and crop management practices. This compares to a ten year yield average of about 150 Kg/Ha for the country as a whole between 1979 and 1988. Low rainfall is

usually cited as the reason for low yields; nevertheless, research and the experience of producers in similar environments outside Botswana indicate that the average sorghum yield is only about 10 percent of potential. The shortfall is largely attributable to soil and water management practices which tend to be far less than optimal.

#### IV. Production and Marketing Costs and Constraints:

##### A. Production constraints.

The most important constraints to production are Quelea birds, poor soil fertility, and drought. Diseases and insect pests also limit yields.

##### B. Production Costs.

The following tables provide an indication of the costs and profitability of sorghum production under traditional and commercial regimes. It should be understood that the calculations for traditional production are derived from farm enterprise income surveys for the country as a whole and, therefore, represent average values for all producers surveyed.

TABLE: Average Gross Margin, Sorghum, Traditional Sector.

Item	Per Farm	Per Hectare
Area Ploughed (Ha)	6.30	
Total Yield (Kg)	2674.35	424.50
Average Percent Marketed	36.00	
Average Price (P/Kg)	.32	.32
Output (Gross Return) (P)	868.20	135.84
Total Variable Costs (P)	589.18	93.52
Gross Margin	279.02	42.32
Average Labor Input (Man days)	67.35	10.69
Gross Margin per Man day (P/MD)	4.14	3.96

Source: Ministry of Agriculture, 1989.

**TABLE: Gross Margin per Hectare, Sorghum, Top One Third Traditional Sector.**

Item	Unit	Unit Price (Pula)	Unit Quantity	Value (Pula)
<b>RETURNS:</b>				
Production	Kg.	.39	115.00	44.85
<b>COSTS:</b>				
Draft Power				
Plough	S.D.		.35	
Cultivate	S.D.			
Plant	S.D.			
Labor				
Plough	M.D.		.70	
Plant	M.D.		.16	
Cultivate	M.D.			
Hoe	M.D.		.85	
Pest Control	M.D.		3.29	
Harvest & Cart	M.D.		1.45	
Thresh & Bag	M.D.		1.10	
Other	M.D.		.30	
Total	M.D.	1.00	7.85	7.85
Seed	Kg.	.37	20.00	7.40
Bag	No.	.75	2.00	1.50
<b>Total Costs</b>				<b>16.75</b>
<b>Gross Margin</b>				<b>28.10</b>

Source: MOA, 1984.

**TABLE: Sorghum Crop Budget for Pandamatenga Large-Scale  
(500 hectare) Commercial Farms, 1988/89 Prices.**

Item	Unit	Sorghum Bad Weather	Sorghum Good Weather
Yield per Hectare	kg	730	1139
Actual Price	P/Kg	.37	.37
Import Parity	P/Kg	.27	.27
Revenue at Actual Price	P/Ha	270.10	421.43
Revenue at Import Parity	P/Ha	197.10	307.52
Variable Costs, Excluding Labor:	P	250.20	250.20
Fuel and Lubricants	P/Ha	32.40	32.40
Fertilizer	P/Ha	115.00	115.00
Herbicide	P/Ha	19.00	19.00
Pesticide	P/Ha	22.00	22.00
Seed	P/Ha	11.00	11.00
Repairs and Maintenance	P/Ha	47.40	47.40
Harvest Hire	P/Ha	50.00	50.00
Interest on Working Capital (8%	P/Ha	20.80	20.80
Subsidy	P/Ha	-67.40	-67.40
Labor Costs:	P/Ha	34.80	34.80
Wage Rate assuming 6 hrs/m.d.	P/hr	.97	.97
Number of man hours	Hrs.	35.88	35.88
Hired (%)	1		
Family (%)	0		
Number of mandays		6.00	6.00
Fixed Costs:	P/Ha		
Land Development	P/Ha	25.20	25.20
Manager's Salary	P/Ha	18.60	18.60
Depreciation	P/Ha	93.80	93.80
Interest on Fixed Capital (12%)	P/Ha	10.10	10.10
Economic Price Analysis:			
Revenue (Import Parity)	P/Ha	197.10	307.53
Variable Costs (Excl. Subsidy)	P/Ha	317.60	317.60
Factor Fixed Costs	P/Ha	43.80	43.80
Non-Factor Fixed Costs		103.90	103.90
Net Return		-268.20	-157.77
Private Price Analysis:			
Revenue (Actual P)		270.10	421.43
Variable Costs (Incl. Subsidy)	P/Ha	250.20	250.20
Factor Fixed Costs	P/Ha	43.80	43.80
Non-Factor Fixed Costs		103.90	103.90
Net Return		-127.80	23.53
Net Return per Farm		-63900.00	11765.00

Source: MOA, 1989.

Allowing for the subsidy as entered in the above table (P 67.40 per hectare), the breakeven yield at border prices is approximately 1473 kg/Ha and, at actual prices, 1075 kg/Ha. At border prices and eliminating the subsidy, the breakeven yield is about 1725 kg/Ha. Given potential yields of over 2000 kg/Ha, commercial production at a profit is theoretically possible even if subsidies are eliminated.

## MAIZE

### I. Introduction.

Maize production is risky under rainfed conditions in Botswana. Production under irrigation or Molapo (recession flood farming), however, is fairly stable. Kalahari Early Pearl is the main, open pollinated variety grown in Botswana. Hybrids like PN 473, R201, and CS4141 are also grown.

TABLE: Maize (MT)

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	8500	0	2100
1975	5000	6200	28700
1976	6000	2400	62637
1977	9500	700	35400
1978	10159	9000	14000
1979	24153	1050	2250
1980	23000	0	11600
1981	15000	100	21415
1982	17505	270	12400
1983	38908	106	8495
1984	47363	90	490
1985	47869	27	1435
1986	40000	0	1435
1987	NA	NA	3000
1988	NA	NA	12000

SOURCE: FAO.

TABLE: Flour of Maize (MT)

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	15000	0	NA
1975	20000	100	NA
1976	20000	5	NA
1977	25000	60	NA
1978	31494	360	NA
1979	40267	1570	NA
1980	49000	780	NA
1981	43000	180	NA
1982	51939	198	NA
1983	89393	229	NA
1984	45919	112	NA
1985	35704	80	NA
1986	40000	80	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

## II. Demand Assessment:

The following tables indicate levels of consumption over the past few years and projected consumption into the next century.

**TABLE: Maize Consumption. (MT)**

	1981	1982	1983	1984	1985	1986
Opening Stock	8600	9700	7700	2950	1400	1400
Production	21400	12400	8500	500	1450	3550
Imports	10250	17400	38800	47000	47600	39000
Exports	100	400	100			50
Closing Stock	9700	7700	2950	1400	1400	3800
Wholegrain	30450	31400	51950	49050	49050	40100
Other Maize Imports	100	130	125	300	215	250
Maize Meal Imports	38200	50100	35850	33300	31500	37360
Maize Rice and Samp	3300	3700	4700	6380	6350	8100
Maize Grain Equiv.	82450	98813	102794	99025	96631	97238

Source: Ministry of Mineral Resources and Water Affairs.

**TABLE: Projected Maize Consumption**

Year	Demand '000 MT	Population '000
1987	100.0	1169.2
1988	102.1	1211.8
1989	104.5	1255.7
1990	107.3	1301.0
1991	110.1	1347.6
1992	112.8	1395.4
1993	115.5	1444.4
1994	118.3	1494.8
1995	121.3	1546.7
1996	124.3	1600.2
1997	127.4	1655.2
1998	130.4	1711.6
1999	133.3	1769.5
2000	136.2	1829.2
2001	138.8	1890.7
2002	141.7	1954.1
2003	144.4	2019.1
2004	146.8	2085.9
2005	148.9	2154.6

Source: Ministry of Mineral Resources and Water Affairs.

The above table assumes a current population growth rate of 3.64 percent per annum which will decline toward 3 percent per annum through the year 2010. The calculations also reflect assumptions

about the effects on consumption patterns resulting from expected changes in per capita income and dietary preferences.

### III. Increased Production Potential:

Irrigation is expanding rather rapidly. With this expansion, production of maize can be expected to increase, though the economics of installing improved irrigation (as opposed to natural flood, or molapo, irrigation) militate against irrigated maize production in favor of fruit and/or vegetable production. It is highly unlikely that Botswana will reach self-sufficiency in maize production within the foreseeable future.

### IV. Production Costs:

The following table was derived from a country-wide farm income survey conducted by the Ministry of Agriculture and, consequently, reflects average values for the country as a whole. Greater gross margins are, therefore, possible.

TABLE: Average Gross Margin, Maize, Traditional Sector.

Item	Per Farm	Per Hectare
Area Ploughed (Ha)	1.64	
Total Yield (Kg)	825.48	503.34
Average Percent Marketed	21.00%	
Average Price (P/Kg)	.22	.22
Output (Gross Return) (P)	178.87	110.74
Total Variable Costs (P)	106.19	64.75
Gross Margin	72.68	45.99
Average Labor Input (Man days)	14.97	9.13
Gross Margin per Man day (P/MD)	4.86	5.04

Source: MOA, 1989.

The following table was derived from a rural income survey and reflects average values for the top one-third producers in terms of gross-margin achieved. The results reflect drought year production levels; yield level, therefore, is considerably below potential.

**TABLE: Gross Margin per Hectare, Maize, Top One Third Farms, Traditional Sector.**

Item	Unit	Unit Price (Pula)	Unit Quantity	Value (Pula)
<b>RETURNS:</b>				
Production	Kg.	.28	221.00	61.88
<b>COSTS:</b>				
Draft Power				
Plough	S.D.		.68	
Cultivate	S.D.			
Plant	S.D.			
Labor				
Plough	M.D.		1.35	
Plant	M.D.		.10	
Cultivate	M.D.			
Hoe	M.D.		.70	
Pest Control	M.D.			
Harvest & Cart	M.D.		1.13	
Thresh & Bag	M.D.		.78	
Other	M.D.		.49	
Total	M.D.	1.00	4.55	4.55
Seed	Kg.	.28	25.00	7.00
Bag	No.	.75	4.00	3.00
<b>Total Costs</b>				<b>14.55</b>
<b>Gross Margin</b>				<b>47.33</b>

Source: MOA, 1984.

The following table was derived from farm enterprise budgets for irrigated commercial farms in the Tuli Block. Both enterprises produce other crops besides maize including wheat, potato, cabbage, etc. Maize is the least profitable major commodity produced on the farms. There is no indication of the total hectareage planted to maize.

**TABLE: Gross Margin Calculation, Commercial Maize Production, Irrigated, Tuli Block**

Item	Unit	Farm A: Small-Scale 43 HA (1987/88)	Farm B: Large-Scale 449 HA (1986/87)
Number of Hectares	Ha	1	1
Yield	Kg/Ha	7000	4600
Actual Price (Wholesale)	P/Kg	.34	.22
Border Price	P/Kg	.28	.24
Revenue at Actual Price	Pula	2380.00	1012.00
Revenue at Border Price	Pula	1960.00	1104.00
Variable Costs, excl. Labor:		1924.60	1023.00
Seeding/seed	P/Ha	49.00	12.00
Fertilizer	P/Ha	606.00	160.00
Tractor (Diesel/lt)	P/Ha	142.00	
Tractor Operations	P/Ha	96.60	45.00
Chemicals	P/Ha	101.00	286.00
Irrigation	P/Ha	628.00	384.00
Combine Harvesting	P/Ha		75.00
Packing	P/Ha		61.00
Other Variable Costs	P/Ha	110.00	
Transport to Wholesaler	P/Ha	192.00	
Labor Costs	P/Ha	335.16	38.00
Economic Price Analysis:			
Revenue (border price)	P/Ha	1960.00	1104.00
Non-labor costs (no subsidy)	P/Ha	1924.60	1023.00
Total Labor Costs (no subsidy)	P/Ha	335.16	38.00
Net Return	P/Ha	-299.76	43.00
Private Price Analysis:			
Revenue (Market Price)	P/Ha	2380.00	1012.00
Non-labor costs	P/Ha	1924.60	1023.00
Labor Costs	P/Ha	335.16	38.00
Net Return	P/Ha	120.24	-49.00

Source: Botswana Development Corporation.

## MILLET

### I. Production History:

Millet - Serere 6A is the only release variety. More promising line are tested in cooperation with SADCC/ICRISAT.

TABLE: Millet (MT)

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	1270
1975	0	25	4000
1976	0	0	3500
1977	0	5	3000
1978	0	0	2500
1979	0	0	900
1980	0	0	2270
1981	0	0	1880
1982	0	0	450
1983	70	2	435
1984	330	0	715
1985	125	30	1850
1986	0	0	1000
1987	NA	NA	1000
1988	NA	NA	3000

SOURCE: FAO.

### II. Costs.

TABLE: Average Gross Margin, Millet, Traditional Sector.

Item	Per Farm	Per Hectare
Area Ploughed (Ha)	.68	
Total Yield (Kg)	274.75	404.04
Average Percent Marketed	5.00%	
Average Price (P/Kg)	.29	.29
Output (Gross Return) (P)	80.98	117.17
Total Variable Costs (P)	54.78	80.56
Gross Margin	26.20	36.61
Average Labor Input (Man days)	15.91	23.40
Gross Margin per Man day (P/MD)	1.65	1.56

Source: MOA, 1989.

**TABLE: Gross Margin per Hectare, Millet, Top One Third Farms, Traditional Sector.**

Item	Unit	Unit Price (Pula)	Unit Quantity	Value (Pula)
<b>RETURNS:</b> Production	Kg.	.42	108.00	45.36
<b>COSTS:</b>				
Draft Power				
Plough	S.D.		.48	
Cultivate	S.D.			
Plant	S.D.			
Labor				
Plough	M.D.		.95	
Plant	M.D.		.08	
Cultivate	M.D.			
Hoe	M.D.		.78	
Pest Control	M.D.		2.33	
Harvest & Cart	M.D.		1.98	
Thresh & Bag	M.D.		2.23	
Other	M.D.		.01	
Total	M.D.	1.00	8.36	8.36
Seed	Kg.	.32	10.00	3.20
Bag	No.	.75	2.00	1.50
<b>Total Costs</b>				<b>13.06</b>
<b>Gross Margin</b>				<b>32.30</b>

Source: MOA, 1984.

## WHEAT

### I. Production History:

Wheat production in Botswana is largely limited to a few irrigated commercial and government farms. Research is being conducted to develop higher yielding varieties better suited to Botswana.

TABLE: Wheat (MT)

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	360
1975	20	180	550
1976	20	100	570
1977	35	360	600
1978	10	290	600
1979	10	280	600
1980	20	250	600
1981	0	410	1000
1982	0	532	1000
1983	0	684	1000
1984	1737	734	1000
1985	17123	189	1000
1986	10000	0	1000
1987	NA	NA	1000
1988	NA	NA	1000

SOURCE: FAO.

TABLE: Flour of Wheat (MT)

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	7000	0	NA
1975	13000	5	NA
1976	14000	0	NA
1977	16000	50	NA
1978	17000	140	NA
1979	18000	400	NA
1980	21000	490	NA
1981	22000	15	NA
1982	19528	0	NA
1983	19486	105	NA
1984	24310	128	NA
1985	15212	310	NA
1986	16000	0	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

## II. Demand Assessment:

The following table indicates estimates of consumption based on trade and changes in estimated stock levels nationwide.

**TABLE: Wheat Consumption. (MT)**

	1981	1982	1983	1984	1985	1986
Opening Stock					5000	10000
Flour Imports	19900	19500	19500	24300	13300	-5000
Wheat Imports				1700	17100	28000
Closing Stock				5000	10000	2250
Wheat Grain Equiv.	24875	24375	24375	27075	28725	29500

Source: Ministry of Mineral Resources and Water Affairs.

The following table projects consumption levels based on predicted population growth rates and expected changes in per capita income, urbanization, and dietary preferences.

**TABLE: Projected Wheat Consumption**

Year	Demand '000 MT	Population '000
1987	30.0	1169.2
1988	31.5	1211.8
1989	33.1	1255.7
1990	34.7	1301.0
1991	36.5	1347.6
1992	38.7	1395.4
1993	41.0	1444.4
1994	43.4	1494.8
1995	46.0	1546.7
1996	48.8	1600.2
1997	51.7	1655.2
1998	54.8	1711.6
1999	58.1	1769.5
2000	61.6	1829.2
2001	65.3	1890.7
2002	68.6	1954.1
2003	72.0	2019.1
2004	75.6	2085.9
2005	79.4	2154.6
2006	83.3	2225.1
2007	87.5	2302.8
2008	91.9	2387.7
2009	96.5	2471.7
2010	101.3	2546.8

Source: Ministry of Mineral Resources and Water Affairs.

## LIVESTOCK

### Overview

Livestock production accounts for about 80 percent of the value of the agricultural sector output. Most traditional producers engage in mixed farming enterprises that include crop production and cattle raising. About 200 of the approximately 360 commercial, freehold farms specialize in cattle production. The remainder generally raise both crops and livestock, but cattle production generally predominates. Traditional producers also tend to keep goats and sheep. About 60,000 farmers with grazing animals annually produce some 200,000 cattle and 30,000 head of goats and sheep for the commercial market. Some small swine and poultry enterprises serve the main population centers, but because the bulk of feed ingredients for these species is imported, production is limited to supplying an urban market which can support the necessary higher product prices.

The major constraints to increased production seem to be related to socio-cultural issues. Production decisions are generally not based on commercial economic factors, but rather on issues related to family and group survival. They are, thus, based on extreme risk aversion rather than on production or profit maximization.

During the 10 year period from 1978-87, the floor price for cattle sold to the Botswana Meat Commission (BMC) has risen from 71 Pula per 100 kg chilled dressed weight to 165 Pula, a 230 percent increase. During the 10 year period between 1976 and 1986, the prices of sheep and goats also increased; goats increased from 0.71 Pula per kg carcass to 2.14 Pula, and sheep increased from 0.95 to 2.72 Pula per kg carcass. Most of the goat meat processed by BMC is exported into South Africa as well as some lamb and mutton. The remainder is consumed locally.

## CATTLE

### I. Production History:

In 1988 the national herd was composed of about 2.4 million head of cattle, a decrease of about 17 percent from the 1981-82 high of 2.9 million. The decline most probably reflects the effects of the 1982-87 drought. About 435,500 head of cattle are on freehold or leasehold (commercial) ranches; the remaining 1.97 million head are on tribal land under communal (traditional) grazing arrangements. Average holding size within the traditional sector was 37.2 head in 1988, as compared to 871.0 among commercial farmers engaged in beef cattle production. Yet, this latter figure is actually bimodal in nature, with about 56 percent of the commercial herd owners having less than 500 head, and 14 percent having less than 100 head of cattle. About 70 percent of the traditional cattle keepers have less than 31 head of cattle.

The majority of cattle are marketed for meat through the Botswana Meat Commission (BMC) which is the official export agent for the country.

TABLE: Beef and Veal (MT)

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	10383	29250
1975	40	30000	39480
1976	80	31312	43542
1977	130	28843	40846
1978	100	20562	30317
1979	120	30959	47235
1980	150	16091	28593
1981	40	24653	42696
1982	24	29677	47000
1983	18	29020	42156
1984	41	22618	41074
1985	12	23045	35892
1986	0	23000	33001
1987	NA	NA	34200
1988	NA	NA	36075

SOURCE: FAO.

### II. Demand Assessment:

Because of the absence of data on domestic household consumption of beef and beef products, it is difficult to measure actual levels of demand. A proxy indicator that may help describe changes in the level of demand is the beef throughput of municipal abattoirs, which has been increasing at an annual rate of about 15 percent since 1974 -- that is at a rate more than four times the rate of population growth. However, much of this

growth is attributable not to increases in per capita consumption, but to urbanization. Nevertheless, because the urban areas are the major domestic market for marketed beef, the use of municipal abattoir throughput as a proxy for domestic demand growth does have value.

The export market appears to be greater than current production can supply. Botswana has never fulfilled it's EEC quota.

### **III. Increased Production Potential:**

There is significant room for increased productivity through adoption of better herd and range management practices by traditional producers. Moreover, there is great potential for extensive expansion into marginal areas through further development of water resources, particularly borehole based water supplies.

### **IV. Production and Marketing Costs and Constraints:**

#### **A. Production constraints.**

Most traditional farmers still view livestock as a source of status, store of wealth, and means of ploughing their fields. Many are reluctant to sell animals unless experiencing major cash needs. Nonetheless, traditional farmers are responsive to market prices.

Land tenure issues and capital availability constrains expansion of cattle production into marginal areas. Capital is required for development of water resources.

#### **B. Marketing Constraints.**

Cattle markets in Botswana are well developed. An extensive set of market institutions have been created to facilitate beef exports and slaughter for the domestic market. These serve both the commercial and traditional farm sectors.

### C. Costs.

The following two tables are derived from rural income surveys and reflect average values for the traditional sector as a whole. Potential gross margins are significantly higher.

**TABLE: Average Gross Margin, Cattle, Traditional**

Item	
Average Price per Head (P)	282.70
Opening Inventory	39.6
Opening Value (P)	11194.92
Additions:	
Births	4.5
Purchases	.1
Gifts In	.2
Subtractions:	
Deaths	11.4
Sales	1.7
Gifts Out	.6
Home Consumption	.2
Closing Inventory	30.50
Closing Value (P)	8622.35
Change in Inventory	-9.10
Change in Inventory Value (P)	-2572.57
Gross Income	-706.75
Cash Costs Incurred:	
Feeds	18.70
Water	18.70
Medicine	3.10
Labor	107.70
Other	7.50
Total variable Costs (P)	155.70
Gross Margin (P)	-862.45
Gross Margin per Head (P)	-21.78

Source: MOA, 1989.

**TABLE: Average Gross Margins per Herd, Traditional Sector.**

Item	Unit	1978	1979	1980	1981	1982	1983	1984
Animals	No.	30.8	31.8	32.4	50.7	63.4	67.2	40.7
L.U.	No.	23.7	24.3	24.8	39.7	49.0	52.3	31.6
Offtake	Pula	216	309	399	495	811	1083	1076
Appreciation	Pula	224	188	207	593	765	260	-429
Livestock Purchases	Pula	26	30	45	54	25	49	25
Var. Costs	Pula	40	40	48	62	98	109	86
Gross Margin	Pula	375	427	511	973	1453	1186	536
Per Animal	Pula	12.2	13.4	15.8	19.2	22.9	17.6	13.2
Per L.U.	Pula	15.8	17.6	20.6	24.5	29.7	22.7	17.0
Per M.D.	Pula	2.9	3.9	4.4	7.8	13.7	10.1	5.4

Source: MOA.

The following table reflects the average gross margin for the top one third traditional cattle producers in terms of gross margin achieved.

**TABLE: Gross Margin per L.U., Cattle, Top One Third Farms, Traditional Sector.**

Item	Unit	Unit Price (Pula)	Unit Quantity	Value (Pula)
Sales	No.	180.69	2.10	379.45
Gifts (Net)	No.	194.50	.20	38.90
Home Consumption	No.			356.85
Appreciation	No.			1017.49
Total	No.			1792.69
Labor	M.D.	.53	92.60	49.08
Livestock Purchases	No.			23.81
Feed Stuffs	No.			6.00
Watering Fees	No.			4.60
Veterinary Supplies	No.			5.30
Other Costs	No.			3.90
Total Costs				92.69
Gross Margin				1700.00
Average Herd Size	L.U.		30.00	(39.6 animals)
Inventory Change			13.90%	
Birth Rate			65.80%	
Death			7.00%	
Offtake			6.30%	

Source: MOA, 1984.

## DAIRY

### I. Production History.

Domestic production supplies only about twenty-five percent of domestic consumption. During the colonial area, production of cream for sale in the South African markets was a widespread and important aspect of the cattle industry in Botswana. Because of rises in prices for beef and the lack of adequate milk and cream marketing channels, production declined dramatically. Most milk and milk products are now imported. Botswana has 39 commercial milk producers with approximately 1,600 dairy cows. Commercial milk production averages around 8,500 liters per day and has been rising at roughly a 2 percent annual rate. Milk is also produced by traditional farmers and is sometimes sold at the village level. Very few traditional farmers sell milk to local processing plants. Botswana currently imports roughly 75 percent of its fresh milk and 100 percent of its manufactured dairy products from South Africa.

Six dairy processing plants operate in the country: two in Gaborone and one each in Lobatse, Selebi-Phikwe, Francistown, and Orapa. The nation's largest dairy, a privately owned facility in Gaborone, has a capacity to produce 15,000 liters per day, though it currently processes less than one-half this amount. Most of this dairy's fresh milk supplies are imported. In comparison, the Gaborone Dairy Marketing Cooperative has a capacity of approximately 5,000 liters per day and processes over 4,000 liters. Most of the Cooperative fresh milk supplies are from domestic sources.

TABLE: Cheese (Skim Cow Milk) (MT)

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	NA
1975	65	0	NA
1976	80	0	NA
1977	85	0	NA
1978	100	0	NA
1979	120	0	NA
1980	120	0	NA
1981	160	0	NA
1982	197	0	NA
1983	185	0	NA
1984	311	0	NA
1985	173	1	NA
1986	180	0	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

**TABLE: Cow Milk, Whole, Fresh (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	66500
1975	2000	0	70000
1976	2000	0	75250
1977	2400	0	80500
1978	3000	0	84000
1979	3500	0	87500
1980	3700	10	91000
1981	4700	0	91000
1982	5717	15	94500
1983	5428	0	98000
1984	6217	17	94500
1985	6819	0	96250
1986	7000	0	98000
1987	NA	NA	99750
1988	NA	NA	101500

SOURCE: FAO.

**TABLE: Dry Whole Cow Milk (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	NA
1975	600	0	NA
1976	450	0	NA
1977	700	0	NA
1978	950	0	NA
1979	2200	20	NA
1980	2100	20	NA
1981	1700	0	NA
1982	2080	6	NA
1983	1759	0	NA
1984	2563	9	NA
1985	5321	13	NA
1986	3000	0	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

**TABLE: Goat Milk (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	2075
1975	0	0	2425
1976	0	0	2500
1977	0	0	2575
1978	0	0	2625
1979	0	0	2675
1980	0	0	2750
1981	0	0	2825
1982	0	0	2875
1983	0	0	2925
1984	0	0	3000
1985	0	0	3075
1986	0	0	3125
1987	NA	NA	3200
1988	NA	NA	3250

SOURCE: FAO.

**TABLE: Milk Dry (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	NA
1975	600	0	NA
1976	450	0	NA
1977	700	0	NA
1978	950	0	NA
1979	2200	20	NA
1980	2100	20	NA
1981	1700	0	NA
1982	2080	6	NA
1983	1759	0	NA
1984	2563	9	NA
1985	5321	13	NA
1986	3000	0	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

**TABLE: Milk Fresh (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	NA
1975	2088	1	NA
1976	2076	2	NA
1977	2495	1	NA
1978	3170	1	NA
1979	3825	0	NA
1980	4600	10	NA
1981	5130	0	NA
1982	6428	15	NA
1983	5940	0	NA
1984	7493	17	NA
1985	7641	0	NA
1986	7835	0	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

**TABLE: Butter (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	200	0	NA
1975	100	0	NA
1976	95	0	NA
1977	95	0	NA
1978	100	0	NA
1979	180	0	NA
1980	110	0	NA
1981	90	0	NA
1982	114	0	NA
1983	114	0	NA
1984	488	0	NA
1985	115	1	NA
1986	115	0	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

**TABLE: Butter of Cow Milk (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	200	0	NA
1975	100	0	NA
1976	95	0	NA
1977	95	0	NA
1978	100	0	NA
1979	180	0	NA
1980	110	0	NA
1981	90	0	NA
1982	114	0	NA
1983	114	0	NA
1984	488	0	NA
1985	115	1	NA
1986	115	0	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

## II. Demand Assessment:

Domestic production supplies only about twenty-five percent of domestic consumption. Periodic shortages of processed dairy products such as cheese indicate that demand is significantly greater than consumption levels.

## III. Production and Marketing Costs and Constraints:

### A. Production Constraints.

Production constraints include:

- Capital constraints.
- High costs of feed, especially during the winter season.
- High costs of dairy cows which must be imported.
- Need to develop higher yielding cross-breeds.

### B. Marketing Constraints.

Marketing problems do not appear to be severely constraining commercial milk and milk product production. Existing dairy plants have capacity to expand their intake of locally produced milk.

### **C. Costs.**

In the intensive system, research results indicate that Friesian cows can give respectable lactation yields in Botswana when provided appropriate husbandry and feeding. At an average daily yield of 14 liters, over the whole lactation, a daily margin over feed costs of Pula 1.44 was obtained. This is equivalent to 10 thebe per kilogram of milk produced.

## HIDES

### I. Production History:

TABLE: Cattle Hides, Fresh (MT)

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	3750
1975	0	0	4700
1976	0	0	5300
1977	0	0	4921
1978	0	0	3734
1979	0	0	5724
1980	0	0	3520
1981	0	0	5035
1982	0	0	5928
1983	0	0	5481
1984	0	0	5544
1985	0	0	4804
1986	0	0	4356
1987	NA	NA	4500
1988	NA	NA	4625

SOURCE: FAO.

TABLE: Goatskins, Fresh (MT)

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	532
1975	0	0	480
1976	0	0	460
1977	0	0	460
1978	0	0	480
1979	0	0	504
1980	0	0	438
1981	0	0	420
1982	0	0	440
1983	0	0	460
1984	0	0	480
1985	0	0	494
1986	0	0	510
1987	NA	NA	520
1988	NA	NA	530

SOURCE: FAO.

**TABLE: Hides and Skins (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	NA
1975	0	2380	NA
1976	0	3325	NA
1977	0	3435	NA
1978	0	1835	NA
1979	0	4035	NA
1980	0	1525	NA
1981	0	3027	NA
1982	19	6998	NA
1983	21	6238	NA
1984	61	5324	NA
1985	110	4628	NA
1986	105	4645	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

## **POULTRY**

### **I. Production History:**

Botswana came very close to self-sufficiency in poultry meat and egg production in 1984 and again in 1986. In 1984, chicken meat imports amounted only to about 500 kgs. This compares with average imports of close to 400 MT per year between 1975 and 1983. Because of production problems associated with severe weather and disease, imports increased again in 1985 and 1987. In 1987, imports totaled some 84 MT. Most rural families keep chickens on an extensive system basis, and near the urban areas several moderate-sized commercial units are supplying birds and eggs. Most of the commercial units are located in the eastern part of the country. In 1988, there were about 73,100 chicken farms controlling nearly 1,809,800 birds. About 0.4 percent of the farms are commercial, controlling about 44.2 percent of the birds.

Pullets are imported mainly from the Republic of South Africa. Zimbabwe is also a potential supplier, but difficulties with Newcastle disease and a 10 percent surcharge on poultry imported from Zimbabwe have discouraged this source.

In the traditional sector, chicken production is generally managed on a free-range basis and is mainly a woman's activity, undertaken for home consumption of meat and eggs.

Egg production has increased significantly in the 1980's. In 1986, production exceeded demand such that two large egg producers went out of business. By May 1987, however, a shortage of eggs developed because of increased per capita consumption. This shortage has increased imports, but not to the level of the early 1980's when about 300 MT were imported per year.

**TABLE 1: Production, Imports, and Estimated Consumption.**

	1982	1983	1984	1985	1986	1987
<b>PRODUCTION:</b>						
Chickens (MT)	175	259	590	922	1140	1690
Eggs (Case) *	1200	28800	27117	32600	37288	43200
Hatching Eggs (Case) *	0	637	283	925	329	732
<b>MEAT IMPORTS: (MT)</b>						
Chicken	274.0	169.0	.5	33.8	8.5	84.0
Turkey	1.8	4.0	3.55	14.5	50.0	21.4
Duck	2.25	3.45	1.15	1.3	1.2	.5
Geese	0	0	.05			
Guinea Fowls		.2	.4			
Pheasants			.4			
Quails		.1				
<b>EGG IMPORTS: (Case) *</b>						
Table Eggs	4533	3573	8590	2455	1276	3383
Hatching Eggs		36	112	112	810	2415
<b>PER CAPITA CONSUMPTION</b>						
Table Eggs (Number)	2	11	12	11	12	14
Chicken Meat (Kgs.)	.45	.41	.55	.86	.99	1.48

\* Case= 30 Dozen.

Source: MOA.

**TABLE 2: Chicken Meat (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	344
1975	230	0	480
1976	250	0	560
1977	340	0	640
1978	400	0	720
1979	500	0	760
1980	650	0	840
1981	700	0	1000
1982	285	1	1080
1983	188	11	1160
1984	10	2	1440
1985	39	0	1760
1986	30	0	1840
1987	NA	NA	1840
1988	NA	NA	1920

SOURCE: FAO.

**TABLE 3: Meat, Poultry, Fresh (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	NA
1975	230	0	NA
1976	250	0	NA
1977	340	0	NA
1978	400	0	NA
1979	500	0	NA
1980	650	0	NA
1981	700	0	NA
1982	285	1	NA
1983	188	11	NA
1984	10	2	NA
1985	39	0	NA
1986	30	0	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

## II. Demand Assessment:

Table 1 above indicates the estimated levels of per capita consumption of chicken meat and eggs. Poultry consumption has been increasing at a faster rate than for meat as a whole. This may be due in part to large increases in beef prices in the past few years. Nevertheless, per capita poultry consumption in Botswana is significantly below consumption rates for other developing countries and can be expected to increase at a faster rate than the rate of population growth. Given Botswana's rapid growth in per capita incomes, domestic poultry consumption (meat and eggs) may be increasing at annual rates approaching 5 to 7 percent.

## III. Production and Marketing Costs and Constraints:

### A. Production constraints.

The main constraints to poultry production include disease and dependence on pullet imports from South Africa, which has been subject to frequent shortages. Much of the poultry feed is also imported from South Africa. Most inputs can be produced domestically. High prices for imported inputs also serves as a constraint on production.

In recent years, input prices have been rising faster than product prices causing a narrowing of producer margins.

## **B. Marketing Constraints.**

Most production and marketing is conducted by the private sector. These markets are highly competitive and seem to operate efficiently.

Input markets are constrained by the lack of domestic suppliers. Most inputs are imported from South Africa although they could be produced locally.

## **C. Costs.**

Production costs and margins were estimated at one of the more efficiently run farms in the country. In a rough breakdown, day old chicks were estimated to cost approximately P 1.00 apiece. Feed costs over a the seven week period before slaughter ran about 60 thebe per bird. Other operational costs averaged around P 2.00 per bird. At an average weight of 1.3 kg at slaughter, the return to management could average as high as P 0.90 to P 1.00 per bird.

Broiler prices are set with reference to South African prices and domestic costs of production. The current PAMA wholesale price is P 3.30/Kg. Other private producers are charging P 3.50/Kg with volume discounts sometimes reducing this to P 3.25/Kg. Recently, domestic broiler prices have been less than those in South Africa. Retail prices average 7 percent above this.

Egg prices are similarly determined by the need to remain competitive with South African prices and the level of domestic production costs. At the farm gate, these average P 50.20 per case or P 1.67 per dozen. At the retail level these average P 2.00 to P 2.20 per dozen. While some companies import day old chicks, most import pullets at 18-20 weeks or just before the point of lay. This is the major production expense, followed by feed costs. A small market exists for hens which have completed their production cycle.

## **IV. Investment Possibilities and Profitability Assessments:**

Because of the high costs of imported inputs, investments in hatcheries and poultry feed production appear to be profitable possibilities.

Given the current high growth rate of consumption and the expected continued growth in poultry consumption, investment in poultry production appears to be a promising possibility, despite the aforementioned withdrawal of two major producers from the industry.

## SMALLSTOCK

### I. Production History:

Botswana has a smallstock population of approximately 1.7 million goats and 260,000 sheep. Since the onset of the drought in 1981, the country's goat population has doubled with a particularly sharp increase between 1983 and 1985. Since 1980, the sheep population increased by 50 percent. Roughly 99 percent of goats and 98 percent of sheep are owned by traditional farmers. Almost three-quarters of traditional farmers own goats and 16 percent own sheep. Fifty-six percent of commercial farmers own goats and 46 percent own sheep. Goats and sheep are kept mainly for meat, although pelts and fiber are important products among the relatively few Karakul sheep farmers in the Western region. The average herd size in the traditional sector is about 26 goats and 15 sheep; in the commercial sector, the average herd size is about 136 goats and 135 sheep.

Infestations of parasites and other disease problems have at times have resulted in high mortality rates, and a general reduction in animal productivity. While vaccines exist for the major infectious diseases, few traditional farmers vaccinate their animals.

The majority of goats held by traditional farmers are disposed of through home slaughter. Traditional farm sheep sales are marginally higher than estimated numbers slaughtered at home. Most commercial smallstock are sold on national markets. Traditional farmers accounted for 92 percent of goat sales and 70 percent of sheep sales in 1986.

TABLE: Mutton and Lamb (MT)

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	980
1975	3	60	784
1976	4	30	672
1977	4	30	588
1978	8	0	560
1979	18	0	546
1980	20	0	636
1981	50	0	484
1982	51	0	644
1983	44	0	658
1984	13	16	672
1985	27	76	700
1986	30	80	728
1987	NA	NA	756
1988	NA	NA	784

SOURCE: FAO.

**TABLE: Meat Sheep Fresh (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	NA
1975	3	220	NA
1976	4	100	NA
1977	4	80	NA
1978	8	0	NA
1979	18	0	NA
1980	20	0	NA
1981	50	0	NA
1982	51	0	NA
1983	44	0	NA
1984	13	23	NA
1985	27	76	NA
1986	30	80	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

**TABLE: Goat Meat (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	3192
1975	0	160	2880
1976	0	70	2760
1977	0	50	2760
1978	0	0	2880
1979	0	0	3025
1980	0	0	2630
1981	0	0	2880
1982	0	0	2640
1983	0	0	2760
1984	0	7	2880
1985	0	0	2964
1986	0	0	3060
1987	NA	NA	3120
1988	NA	NA	3180

SOURCE: FAO.

**II. Demand Assessment:**

The BMC holds a permit issued by the South Africa Meat Board to sell 13 tons per week to South African markets. Most of this meat is packaged and delivered in refrigerated trucks to markets in Johannesburg and Durban. The limited size of this export market is perceived as a significant constraint. Limited export demand caused the BMC to discourage smallstock intake during the 1970s. A recent consultancy (GITEC, 1987) has suggested there remains room for expansion of deliveries to the South African

markets.

It is difficult to assess domestic consumption of smallstock products because most traditional sector production is slaughtered informally, usually at home. Data from the municipal abattoirs shows no significant changes in smallstock throughput. It is generally believed that demand is increasing at a lower rate than that for beef and perhaps at a lower rate than population and per capita income growth. However, no accurate figures exist.

#### **IV. Production and Marketing Costs and Constraints:**

##### **A. Marketing Constraints.**

High transport costs from the production areas to the slaughter houses is a major problem.

The principal marketing agent purchasing smallstock for slaughter on formal markets is the Botswana Meat Commission (BMC). The structure of market services provided by the BMC for smallstock is similar to that provided for cattle. Sales are derived largely from the traditional farm sector. Two major constraints limit the development of these markets: demand is currently limited, particularly in the export market; and domestic marketing costs are high relative to the value of the product. Smallstock slaughter capacity is not a market constraint.

Farmers can also sell smallstock to private butchers who slaughter at their village facilities and through the municipal abattoirs.

Roughly 75 to 85 percent of BMC smallstock intake is exported to South Africa. The remainder is sold on domestic markets.

## B. Costs.

The following table reflect average gross margins derived from farm income surveys covering the entire country. Potential gross margins can be assumed to be significantly higher than these average figures.

**TABLE: Gross Margin, Goats, Traditional Sector.**

Item	
Average Price per Head (P)	40.63
Opening Inventory	32.2
Opening Value (P)	1308.29
Additions:	
Births	12.3
Purchases	.2
Gifts In	.5
Subtractions:	
Deaths	5.9
Sales	1.2
Gifts Out	4.4
Home Consumption	1.2
Closing Inventory	36.50
Closing Value (P)	1483.00
Change in Inventory	4.30
Change in Inventory Value (P)	174.71
Gross Income	272.22
Cash Costs Incurred:	
Feeds	.20
Water	2.30
Medicine	.40
Labor	19.30
Other	.60
Total variable Costs (P)	22.80
Gross Margin (P)	249.42
Gross Margin per Head (P)	7.75

Source: MOA.

**TABLE: Gross Margin, Sheep, Traditional Sector.**

Item	
Average Price per Head (P)	50.06
Opening Inventory (Head)	21.6
Opening Value (P)	1081.30
Additions: (Head)	
Births	6.6
Purchases	.0
Gifts In	.8
Subtractions: (Head)	
Deaths	4.4
Sales	.4
Gifts Out	.2
Home Consumption	.8
Closing Inventory (Head)	23.20
Closing Value (P)	1161.39
Change in Inventory (Head)	1.60
Change in Inventory Value (P)	80.10
Gross Income (P)	140.17
Cash Costs Incurred:	
Feeds	.10
Water	2.40
Medicine	.00
Labor	21.10
Other	1.60
Total variable Costs (P)	25.20
Gross Margin (P)	114.97
Gross Margin per Head (P)	5.32

Source: MOA.

#### **V. Investment Possibilities and Profitability Assessments:**

Because of the slow growth in demand for smallstock products, there is little indication of any potentially profitable investment opportunities in this sector.

## SWINE

Swine production is a minor enterprise in Botswana. There are about 13,000 pigs, located primarily in the eastern part of the country. Many of the ingredients of commercial feeds must be imported and are therefore relatively expensive. There are three major sources of prepared swine feeds and current supply is adequate, though the quality of feed is sometimes low. There are about 25 to 35 commercial swine producers.

Major production losses occur due to piglet mortality, especially because of overlying and diarrhea. MMA (mastitis, metritis, and agalactia) is sometimes seen in sows, and poor sanitation and management can be observed. Veterinary support is not adequate at times.

There are two major marketing constraints:

- Competition from South African imports.
- The domestic supply to processors is subject to frequent shortages.

Prices paid to producers are favorable.

**EDIBLE OILS****ANIMAL FATS AND OILS**

The following tables outline the trade and production history of animal fat in Botswana.

**TABLE: Fat of Cattle (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	930
1975	0	0	1128
1976	0	0	1272
1977	0	0	1181
1978	0	0	896
1979	0	0	1374
1980	0	0	845
1981	0	0	1208
1982	0	0	1423
1983	0	0	1315
1984	0	0	1331
1985	0	0	1153
1986	0	0	1045
1987	NA	NA	1080
1988	NA	NA	1110

SOURCE: FAO.

**TABLE: Fat of Goats (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	133
1975	0	0	120
1976	0	0	115
1977	0	0	115
1978	0	0	120
1979	0	0	126
1980	0	0	110
1981	0	0	105
1982	0	0	110
1983	0	0	115
1984	0	0	120
1985	0	0	123
1986	0	0	127
1987	NA	NA	130
1988	NA	NA	132

SOURCE: FAO.

**TABLE: Fat of Pigs (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	16
1975	0	0	30
1976	0	0	27
1977	0	0	24
1978	0	0	19
1979	0	0	13
1980	0	0	13
1981	0	0	11
1982	0	0	11
1983	0	0	11
1984	0	0	15
1985	0	0	19
1986	0	0	19
1987	NA	NA	19
1988	NA	NA	20

SOURCE: FAO.

**TABLE: Fat of Sheep (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	42
1975	0	0	34
1976	0	0	29
1977	0	0	25
1978	0	0	24
1979	0	0	23
1980	0	0	27
1981	0	0	21
1982	0	0	28
1983	0	0	28
1984	0	0	29
1985	0	0	30
1986	0	0	31
1987	NA	NA	32
1988	NA	NA	34

SOURCE: FAO.

## VEGETABLE OILS

### I. Production History:

Annual national production of groundnut and sunflower in Botswana are low compared to sorghum and maize and compared with demand. Agronomically, both crops are adapted to the climatic conditions found in Botswana. The low production levels, therefore, reflect poor market development and poor production practices.

TABLE: Fixed Vegetable Oils (MT)

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	550	0	NA
1975	1800	134	NA
1976	2751	0	NA
1977	1251	0	NA
1978	1808	0	NA
1979	2172	6	NA
1980	3303	18	NA
1981	3510	38	NA
1982	3567	7	NA
1983	1475	16	NA
1984	1867	0	NA
1985	1350	0	NA
1986	1000	0	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

TABLE: Flour/M meal of Oilseeds (MT)

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	NA
1975	9600	0	NA
1976	8300	0	NA
1977	11500	0	NA
1978	14000	0	NA
1979	18000	0	NA
1980	24000	0	NA
1981	25000	0	NA
1982	25000	0	NA
1983	25000	0	NA
1984	25000	0	NA
1985	25000	0	NA
1986	25000	0	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

**TABLE: Groundnuts In Shell (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	500	3629
1975	30	100	2500
1976	0	400	2500
1977	8	350	2500
1978	4	700	2000
1979	8	360	220
1980	3	343	1400
1981	5	71	1975
1982	72	10	270
1983	30	230	825
1984	27	128	590
1985	42	6	800
1986	0	0	1000
1987	NA	NA	1000
1988	NA	NA	1000

SOURCE: FAO.

**TABLE: Groundnuts Shelled (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	NA
1975	80	420	NA
1976	40	450	NA
1977	40	0	NA
1978	30	0	NA
1979	40	0	NA
1980	90	0	NA
1981	45	0	NA
1982	38	201	NA
1983	11	212	NA
1984	45	38	NA
1985	81	0	NA
1986	72	0	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

**TABLE: Oil of Groundnuts (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	NA
1975	330	0	NA
1976	1000	0	NA
1977	250	0	NA
1978	1100	0	NA
1979	670	0	NA
1980	1800	18	NA
1981	1500	0	NA
1982	1753	1	NA
1983	88	0	NA
1984	54	0	NA
1985	27	0	NA
1986	0	0	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

**TABLE: Sunflower Seed (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	250
1975	30	40	400
1976	8	400	500
1977	25	1000	1100
1978	25	1000	1200
1979	40	1100	900
1980	40	0	1400
1981	80	100	1190
1982	11	112	654
1983	6	389	167
1984	12	148	390
1985	3	224	500
1986	0	225	500
1987	NA	NA	500
1988	NA	NA	500

SOURCE: FAO.

**TABLE: Oil of Sunflower Seed (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	NA
1975	650	60	NA
1976	550	0	NA
1977	1000	0	NA
1978	700	0	NA
1979	1500	0	NA
1980	1500	0	NA
1981	2000	38	NA
1982	1811	2	NA
1983	1381	16	NA
1984	1812	0	NA
1985	1291	0	NA
1986	1000	0	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

**TABLE: Cottonseed (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	886
1975	0	0	2000
1976	0	0	2000
1977	0	0	2000
1978	0	0	2000
1979	0	0	2000
1980	0	0	2000
1981	0	0	2000
1982	0	0	2000
1983	0	0	2000
1984	0	0	2000
1985	0	0	2000
1986	0	0	2000
1987	NA	NA	2000
1988	NA	NA	2000

SOURCE: FAO.

**II. Demand Assessment:**

FAO human nutritional standards recommend a minimum consumption of 20 kg of oil per capita per year. To calculate the base oil requirements for Botswana, it was assumed that animal and vegetable oil sources satisfied 70 percent and 30 percent of the recommended amount, respectively. Given a population of 1 million, the total national vegetable oil requirement to meet the FAO standard would be 6,000 MT/year. About 20,000 hectares of groundnuts would be required to produce this amount of oil,

assuming sustainable annual yields of 600 kg/Ha with extractable oil content of 48 percent. Using only sunflowers, approximately 37,500 hectares would be required assuming a sustainable yield of 400 kg/Ha with extractable oil content at 40 percent.

Assuming a 3 percent annual rate of population growth and not allowing for increased demand affects of expected increased per capita incomes and urbanization, about 11,000 MT of vegetable oil will be required by the year 2000, assuming again that 70 percent of oil requirements are met from animal sources.

### **III. Increased Production Potential:**

Research data indicates that sunflower and groundnut seed yields can exceed 1 MT/Ha on approximately 200 mm of rainfall. This yield level should be possible greater than 75 percent of the time, based on rainfall probabilities. Research is needed to identify and to adapt practices for farmers' production, ones which maximize rainfall use efficiency. Groundnut yields equalled or exceeded 600 kg/Ha 71 percent of the time. This means that roughly 7 out of 10 years the minimum level would be achieved. Sunflower yields equalled or exceeded 400 kg/Ha 75 percent of the time. Roughly 7-8 years out of 10 would produce yield greater than 400 kg/Ha. The oil content of groundnuts ranged from approximately 42.9 percent to 51.7 percent. The oil content of sunflower ranged from 30.0 percent to 53.5 percent depending on variety and year.

### **IV. Production and Marketing Costs and Constraints:**

#### **A. Production constraints.**

Production practices include broadcast planting which reduces cost/risk but is detrimental to stand establishment. Unlike sorghum, sunflower and groundnut seeds are extremely expensive, therefore planting procedures must be optimized to reduce costs. In general, crop husbandry, soil husbandry, and resource investment in the crop enterprise tends to be minimal because the probability of crop failure is relatively high. The major environmental factor affecting yield is rainfall. Seasonal rainfall amounts and distribution within the season are erratic. This is the major production constraint. Annual average rainfall is approximately 500 mm with extreme variation between years. However, there is a 75 percent probability that at least 215 mm will be received in any year in the Gaborone area. Higher amounts are likely in other regions. Approximately 200 mm of rainfall is sufficient to produce groundnut and sunflower yields greater than 1 MT per ha.

## B. Costs.

Botswana Agricultural Marketing Board's (BAMB) purchase price for either crop varies depending on the location. The purchase price tends to decrease as the distance to the Tlokweng Gate (the main export gate) increases. For example, purchase price at Gaborone and Gantsi (Kalahari) for shelled groundnuts was P 47.05 and 41.15 per 55 kg bag, respectively, and for sunflower was 8.35 and 3.70 per 40 kg bag, respectively, in 1988. Because no oil extraction facilities are located in Botswana, most of the purchased oilseed crop is exported. Producer prices, therefore, reflect transport cost to the export depots.

TABLE: Average Gross Margin, Groundnuts, Traditional Sector.

Item	Per Farm	Per Hectare
Area Ploughed (Ha)	.34	
Total Yield (Kg)	33.25	97.79
Average Percent Marketed	.00%	
Average Price (P/Kg)	.77	.77
Output (Gross Return) (P)	25.71	75.30
Total Variable Costs (P)	20.24	59.53
Gross Margin	5.47	15.77
Average Labor Input (Man days)	3.72	10.94
Gross Margin per Man day (P/MD)	1.47	1.44

**TABLE: Summary Of Estimated Costs Per Hectare For  
Groundnuts Using Unimproved Traditional System**

ITEM	UNIT	COST/ UNIT	QUANTITY	COST (PULA)
<b>PART A: BASIC COST ANALYSIS</b>				
ASSUMING YIELD OF 124 KGS./HA				
<b>VARIABLE COSTS:</b>				
Seed	Kgs.	1.11	30.0	33.30
Plough/Plant Labour	Hours	.35	54.1	18.94
Weeding Labour (hand-hoe)	Hours	.35	32.6	11.41
Harvest Labour (by hand)	Hours	.35	118.4	41.44
Cart Labour (field to compound)	Hours	.35	4.1	1.44
Threshing Labour (by hand)	Hours	.35	1.3	.46
Transport Labour (to farm gate)	Hours	.35	3.1	1.09
<b>SUB-TOTAL</b>				<b>108.08</b>
<b>FIXED COSTS</b>				
Depreciation: Draught Animals	Ha	8.00	4.0	32.00
Equipment	Ha	1.50	1.0	1.50
Interest	Pula	141.58	.1	14.16
<b>SUB-TOTAL</b>	Pula			<b>47.66</b>
<b>TOTAL COST</b>	Pula			<b>155.74</b>
<b>PART B: SENSITIVITY ANALYSIS</b>				<b>TOTAL COST (Pula/Ha.)</b>
Yield at 600 kgs./Ha				305.26
Yield at 400 kgs./Ha				254.11
Plough/Plant labour at 32 person hours/Ha.				148.01
Labour valued at P0.53/hr.				198.09
Labour at 6 hours per day				143.51
<b>PART C: TOTAL LABOUR ALLOCATION/HA</b>				<b>213.6 MAN-HOURS</b>

SOURCE: Arthur Kaplan (1989)

**TABLE: Summary Of Estimated Costs Per Hectare For Groundnuts Under Improved Traditional System**

ITEM	UNIT	COST/ UNIT	QUANTITY	COST (PULA)
<b>PART A: BASIC COST ANALYSIS</b>				
ASSUMING YIELD OF 400 KGS./HA.				
<b>VARIABLE COSTS:</b>				
Seed	Kgs.	1.11	30.0	33.30
Ploughing Labour	Hours	.35	54.1	18.94
Fertilizer	Kgs.	.30	115.0	34.50
Harrowing Labour	Hours	.35	10.0	3.50
Planting Labour	Hours	.35	9.2	3.22
Cultivating Labour (inter-row)	Hours	.35	1.1	.39
Harvest Labour	Hours	.35	380.0	133.00
Cart Labour	Hours	.35	12.0	4.20
Threshing Labour	Hours	.35	4.0	1.40
Transport Labour	Hours	.35	12.0	4.20
SUB-TOTAL	Pula			236.65
<b>FIXED COSTS:</b>				
<b>Depreciation:</b>				
Draught Animals	Ha	49.14	1.0	49.14
Equipment	Ha	1.50	4.0	6.00
Interest	Pula	291.79	.1	29.18
SUB-TOTAL	Pula			84.32
TOTAL COST	Pula			320.97
<b>PART B: SENSITIVITY ANALYSIS</b>				<b>TOTAL COST</b>
				<b>(Pula/Ha.)</b>
Yield at 600 kgs./Ha.				392.37
Ploughing labour at 32 manhours/Ha				309.29
Labour valued at P0.53/hr.				375.60
Labour at 6 hours per day				295.76
No fertilizer applied				286.47
Captan fungicide applied				321.88
Seed savings from row planting at 5 kgs./Ha. (without Captan)				312.58
<b>PART C: TOTAL LABOUR ALLOCATION/HA</b>				<b>482.40</b>
				<b>MAN-HOURS</b>

SOURCE: Arthur Kaplan (1989)

**TABLE: Summary Of Estimated Costs Per Hectare For Groundnuts Under Improved System Using Tractor**

ITEM	UNIT	COST/ UNIT	QUANTITY	COST (PULA)
<b>PART A: BASIC COST ANALYSIS</b>				
ASSUMING YIELD OF 600 KGS./HA				
<b>VARIABLE COSTS:</b>				
Seed	Kgs.	1.11	30	33.30
Ploughing	Ha	24.56	1	24.56
Fertilizer	Kgs.	.30	115	34.50
Harrowing	Ha	24.56	.60	14.74
Planting	Ha	24.56	.80	19.65
Cultivating	Hours	24.56	.80	19.65
Harvesting Labour	Hours	.35	570	199.50
Cart Labour	Hours	.35	19.70	6.90
Threshing Labour	Hours	.35	6.20	2.17
Transport Labour	Hours	.35	15.10	5.28
<b>SUB-TOTAL</b>	Pula			<b>340.60</b>
<b>FIXED COSTS:</b>				
Depreciation:				
Tractor & Mach.:				
Ploughing	Ha	9.02	1	9.02
Harrowing	Ha	9.02	.60	5.41
Planting	Ha	9.02	.80	7.22
Cultivating	Ha	9.02	.80	7.22
Road Tax	Ha	.01	1	.01
Interest	Pula	369.48	.10	36.95
<b>SUB-TOTAL</b>	Pula			<b>65.83</b>
<b>TOTAL COST</b>	Pula			<b>406.43</b>
<b>PART B: SENSITIVITY ANALYSIS</b>				<b>TOTAL COST</b>
				<b>(Pula/Ha.)</b>
Yield at 1000 kgs./Ha				549.58
Labour at 6 hours per day				352.97
No fertilizer applied				371.93
Captan fungicide applied				407.03
Seed savings from row planting at 5 kgs./Ha (without Captan)				400.88
<b>PART C: TOTAL LABOUR ALLOCATION/HA</b>				<b>621.90</b>
				<b>MAN-HOURS</b>

SOURCE: Arthur Kaplan (1989)

**TABLE: Average Gross Margin, Sunflower, Traditional Sector**

Item	Per Farm	Per Hectare
Area Ploughed (Ha)	.02	
Total Yield (Kg)	.00	.00
Average Percent Marketed	.00	
Average Price (P/Kg)	.00	.00
Output (Gross Return) (P)	.00	.00
Total Variable Costs (P)	1.76	88.00
Gross Margin	-1.76	-88.00
Average Labor Input (Man days)	.08	4.00
Gross Margin per Man day (P/MD)	-22.00	-22.00

Source: MOA.

**TABLE: Summary Of Estimated Costs Per Hectare For Sunflower Under Unimproved Traditional System**

ITEM	UNIT	COST/UNIT	QUANTITY	COST
<b>PART A: BASIC COST ANALYSIS - ASSUMING YIELD OF 150 KGS/HA</b>				
<b>VARIABLE COSTS</b>				
Seed	Kgs.	.25	30.00	7.50
Plough/Plant Labour	Hour	.35	54.10	18.94
Weeding Labour	Hour	.35	32.60	11.41
Harvest Labour	Hour	.35	34.50	12.08
Cart Labour	Hour	.35	2.80	.98
Threshing Labour	Hour	.35	6.90	2.42
Transport Labour	Hour	.35	3.10	1.09
SUB-TOTAL	Pula			54.42
<b>FIXED COSTS</b>				
Draught Animals	Ha	8.00	4.00	32.00
Equipment	Ha	1.50	1.00	1.50
Interest	Pula	87.92	.10	8.79
SUB-TOTAL	Pula			42.29
<b>TOTAL COST</b>	<b>Pula</b>			<b>96.71</b>
<b>PART B: SENSITIVITY ANALYSIS TOTAL COST</b>				<b>Pula/HA</b>
Yield at 400 Kgs/Ha				126.34
Yield at 250 Kgs/Ha				109.02
Plough/Plant labour at 32 person hours/Ha.				88.97
Labour valued at P0.53/hr.				120.81
Labour at 6 hours per day				84.97
<b>PART C: TOTAL LABOUR ALLOCATION PER HECTARE</b>				<b>134 M.H.</b>

SOURCE: Arthur Kaplan (1989)

**TABLE: Summary Of Estimated Costs Per Hectare For Sunflower Under Improved Traditional System.**

ITEM	UNIT	COST/UNIT	QUANTITY	COST
<b>PART A: BASIC COST ANALYSIS ASSUMING YIELD OF 250 KGS/HA</b>				
<b>VARIABLE COSTS</b>				
Seed	Kgs.	.25	30.00	7.50
Ploughing Labour	Hour	.35	54.10	18.94
Fertilizer	Kgs.	.30	200.00	60.00
Harrowing Labour	Hour	.35	10.00	3.50
Planting Labour	Hour	.35	9.20	3.22
Cultivating Lab.	Hour	.35	1.10	.39
Harvest Labour	Hour	.35	57.50	20.13
Cart Labour	Hour	.35	5.00	1.75
Threshing Labour	Hour	.35	12.50	4.38
Transport Labour	Hour	.35	7.50	2.63
SUB-TOTAL	Pula			122.44
<b>FIXED COSTS</b>				
Depreciation:				
Draught Animals	Ha	49.14	1.00	49.14
Equipment	Ha	1.50	4.00	6.00
Interest	Pula	165.26	.10	17.76
SUB-TOTAL	Pula			72.90
<b>TOTAL COST</b>	<b>Pula</b>			<b>195.34</b>
<b>PART B: SENSITIVITY ANALYSIS</b>				<b>TOTAL COST</b>
(Pula/Ha.)				
Yield at 400 kgs/Ha				227.64
Ploughing labour at 32 man-hours/Ha.				187.49
Labour valued at P0.53/hr.				218.75
Labour at 6 man-hours per day				185.68
No fertilizer applied				135.34
Seed savings from row planting at 10 kgs/Ha				192.63
<b>PART C: TOTAL LABOUR ALLOCATION PER HECTARE</b>				<b>156.90</b>
				<b>MAN-HOURS</b>

SOURCE: Arthur Kaplan (1989)

**TABLE: Summary Of Estimated Costs Per Hectare For Sunflower Under Improved System Using Tractor.**

ITEM	UNIT	COST/UNIT	QUANTITY	COST
<b>PART A: BASIC COST ANALYSIS ASSUMING YIELD OF 400 KGS/HA</b>				
<b>VARIABLE COSTS</b>				
Seed	Kgs.	.25	30.00	7.50
Ploughing	Ha	24.56	1.00	24.56
Fertilizer	Kgs.	.30	200.00	60.00
Harrowing	Ha	24.56	.60	14.74
Planting	Ha	24.56	.80	19.65
Cultivating	Ha	24.56	.80	19.65
Harvesting Labour	Hour	.35	92.00	32.20
Cart Labour	Hour	.35	8.00	2.80
Threshing Labour	Hour	.35	20.00	7.00
Transport Labour	Hour	.35	12.00	4.20
SUB-TOTAL	Pula			192.30
<b>FIXED COSTS</b>				
<b>Depreciation:</b>				
<b>Tractor &amp; Machinery:</b>				
Ploughing	Ha	9.02	1.00	9.02
Harrowing	Ha	9.02	.60	5.41
Planting	Ha	9.02	.80	7.22
Cultivating	Ha	9.02	.80	7.22
Road Tax	Ha	.01	1.00	.01
Interest	Pula	221.18	.10	22.12
SUB-TOTAL	Pula			51.00
<b>TOTAL COST</b>	Pula			<b>243.30</b>
<b>PART B: SENSITIVITY ANALYSIS</b>				<b>TOTAL COST</b>
(Pula/Ha.)				
Labour at 6 hours per day				231.75
No fertilizer applied				171.75
Seed savings from row planting at 10 kgs/Ha				240.80
<b>PART C: TOTAL LABOUR ALLOCATION PER HECTARE</b>				<b>142.90</b>
				<b>MAN-HOURS</b>

SOURCE: Arthur Kaplan (1989)

## HORTICULTURE

### FRUIT

#### I. Production History:

The citrus industry in Botswana is small and developed far below potential. Two groups of oranges are grown: Navels and Valencias. It is not known if Botswana can produce high Navel yields, although in the Tuli Block, Kasane, and Maun the temperatures during the period September to December are above the optimum for the fruit to develop. A number of new citrus hybrids have been developed, some with a flavor equal to the best sweet oranges and with a skin that peels easily. Grapefruit grows well in eastern Central District and northern Botswana. It has a very restricted market in Botswana because it is relatively sour and the pith is bitter. About 200 Ha is planted to citrus, primarily oranges. Yields are in the range of 42 MT per hectare for fully producing trees.

The following table shows citrus imports since 1980. Fresh oranges have been one of the most expensive import items. About 20 percent of the total citrus consumed in the country is produced locally. The majority of the citrus imported are oranges.

TABLE: Citrus Imports.

Year	Quantity (MT)		Value (Pula)	
	Fresh Citrus	Other Fresh Fruit	Fresh Citrus	Other Fresh Fruit
1980	1445	1962	433542	850113
1981	1101	2412	455036	1196571
1982	1564	2556	649248	1405825
1983	2436	2414		1602064
1984	2243	2618	932854	1858637
1985	2350	2839	1043409	2337985
1986	1773	2544	838425	2081592
1987	1631	4747	1043155	5178219
Totals	14543	22092	5395669	16511006

Source: Customs and Excise; External Trade Statistics.

One potential solution to the lag in income during the tree maturation is the potential to interplant the orchard with vegetables. This should aid in producing income for the farmer and provide jobs to others while the trees are maturing. Extreme care must be taken, however, particularly with tillage, to prevent damage to the trees. Under ideal circumstances, it would be best to capitalize the orchard properly so that the supplemental income is not necessary for the economic survival of

the orchard. To accomplish this goal it is suggested that concessionary financing be made available using lower interest rates and terms until full production is achieved.

**TABLE: Citrus Fruit NES (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	800	0	NA
1975	1200	0	NA
1976	1500	80	NA
1977	1100	0	NA
1978	1300	0	NA
1979	1300	0	NA
1980	1400	0	NA
1981	1400	0	NA
1982	1279	3	NA
1983	1838	35	NA
1984	2826	33	NA
1985	2350	38	NA
1986	2400	40	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

**TABLE: Oranges (MT).**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	218
1975	0	0	300
1976	0	0	350
1977	0	0	400
1978	0	0	450
1979	0	0	450
1980	0	0	450
1981	0	0	450
1982	0	0	500
1983	0	0	500
1984	0	0	500
1985	0	0	500
1986	0	0	500
1987	NA	NA	500
1988	NA	NA	500

SOURCE: FAO.

## **II. Demand Assessment:**

Current domestic consumption of citrus products is about 2000 MT per year. Utilizing expected population and per capita income growth scenarios, demand for citrus products can be estimated to exceed 4000 MT around the year 2000. Demand for all fresh fruit can be similarly projected to exceed 14000 MT around the year 2000.

## VEGETABLES

### I. Production History:

Horticultural production supplies only about 10 to 15 percent of estimated demand. Commercial farms produce the largest proportion of domestic production. Farm sizes vary widely, from 2 to 50 ha, with the majority in the 2 to 10 ha range. The average farm produces 4 to 6 crops. The current yields of vegetables are variable. No official, actual yield values are available nor are exact local production estimates available. Vegetable production probably does not exceed 1500-2000 MT per annum. The largest production block is in central Botswana and the Tuli Block region. There are also several smaller individual producers in the areas south of Gaborone. Crops produced include: squash, pumpkin, cabbage, tomato, potato, onion, beetroot, carrot, swiss chard, and green mealies.

**TABLE: Vegetable Imports**

Year	Quantity (MT)			VALUE (PULA)		
	Potatoes	Onions	Others	Potatoes	Onions	Others
1981	2662	476	4559	612910	164468	1547574
1982	2669	735	5073	655378	212092	1874908
1983	4584	903	4860	1258433	288352	2183593
1984	4307	1171	6654	1151074	387108	2396880
1985	5659	1380	6808	1582829	441923	2645054
1986	4476	1214	5318	1326007	495513	2049460
Totals	27232	6494	36601	7251618	2135976	13837263

Source: Customs and Excise (External Trade Statistics)

The seven most widely used vegetable crops consumed in Botswana are as follows:

**TABLE: Top Seven Vegetables for Botswana**

Crop	
Potato	37.30%
Tomato	17.70%
Cabbage	8.70%
Onion	7.30%
Squash(marrow)	6.80%
Carrot:	3.60%
Beetroot	2.80%
All Others	15.80%
Total	100.00%

**TABLE: Roots and Tubers, Total (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	800	0	NA
1975	1650	1400	NA
1976	1000	15	NA
1977	1400	5	NA
1978	1500	15	NA
1979	1700	150	NA
1980	2000	250	NA
1981	2000	115	NA
1982	2669	0	NA
1983	3094	382	NA
1984	5285	1060	NA
1985	5659	796	NA
1986	6000	800	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

**TABLE: Onions (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	590
1975	400	0	1000
1976	450	0	1000
1977	550	0	1000
1978	650	0	1000
1979	550	0	1000
1980	600	0	1000
1981	600	0	1000
1982	735	36	1000
1983	903	233	1000
1984	1171	354	1000
1985	1380	145	1000
1986	1400	145	1000
1987	NA	NA	1000
1988	NA	NA	1000

SOURCE: FAO.

**TABLE: Potatoes (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	800	0	NA
1975	1650	1400	NA
1976	1000	15	NA
1977	1400	5	NA
1978	1500	15	NA
1979	1700	150	NA
1980	2000	250	NA
1981	2000	115	NA
1982	2669	0	NA
1983	3094	382	NA
1984	5285	1060	NA
1985	5659	796	NA
1986	6000	800	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

**TABLE: Flour of Potatoes (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	NA
1975	80	0	NA
1976	130	0	NA
1977	60	0	NA
1978	95	0	NA
1979	140	0	NA
1980	50	0	NA
1981	60	0	NA
1982	71	0	NA
1983	222	0	NA
1984	21	0	NA
1985	29	0	NA
1986	30	0	NA
1987	NA	NA	NA
1988	NA	NA	NA

SOURCE: FAO.

**TABLE: Onions, Dry (MT)**

YEAR	IMPORTS	EXPORTS	PRODUCTION
1970	0	0	590
1975	400	0	1000
1976	450	0	1000
1977	550	0	1000
1978	650	0	1000
1979	550	0	1000
1980	600	0	1000
1981	600	0	1000
1982	735	36	1000
1983	903	233	1000
1984	1171	354	1000
1985	1380	145	1000
1986	1400	145	1000
1987	NA	NA	1000
1988	NA	NA	1000

SOURCE: FAO.

Most of the imports sold in Botswana are purchased in the Johannesburg Wholesale Market and transported to Gaborone. Additionally, quantities may be imported directly into Francistown from the same or other sources, particularly Bulawayo. It is likely this quantity is much larger than reported.

## II. Demand Assessment:

Projecting current levels of consumption forward at a constant rate of 5.5 percent per year, demand by the year 2000 can then be expected to exceed 32,000 MT. The 5.5 percent figure reflects population growth and expected increases in per capita income and changes in consumption patterns resulting from increased urbanization. The current per capita consumption figure indicates that rural consumption is approximately 5 kg per year while urban consumption is 90 to 100 kg per year.

A major point of concern should be the basic estimated population shift from rural to urban discussed earlier. If this shift from rural to urban does occur and if the population has adequate income with which to make purchases, it becomes almost impossible to predict what the total consumption figures could be.

The following table projects demand utilizing 1980 consumption levels and assumes a steady increase in population of 3 percent per year. It does not reflect expected changes in per capita income nor dietary changes resulting from urbanization.

**TABLE: Total Estimated Annual Demand By Commodity**

Crop	1980 Consumption (MT)	Projected * Consumption Year 2000 (MT)
Potato	5222	9432
Tomato	2478	4476
Cabbage	1218	2200
Onion	1022	1846
Spinach	950	1716
Carrot	504	910
Beetroot	390	704
Pumpkin	560	1011
Sweet Potato	392	708
Green Bean	266	480
Lettuce	240	433
Cucumber	224	405
Cauliflower	140	253
Green Mealie	100	181
Spinach	56	101
Leeks	56	101
Eggplant	28	51
Pepper	42	76
All others	112	202
<b>Total</b>	<b>14,000</b>	<b>25,286</b>

\* Assuming 3.0% annual population growth only

### III. Increased Production Potential:

Estimates of potential yields and mean wholesale prices were used to produce the following table.

TABLE: Estimated Potential Crop Yields/Gross Revenue.

Crop	Yield Per Ha (MT)	Estimated Unit Price (Pula)	Estimated Gross Revenue /Ha (Pula)
Cabbage	55	.15/Kg	8250
Onion	40	.30/Kg	12000
Tomato	30	.45/Kg	13500
Potato	25	.28/Kg	7000
Spinach (x 3 cutting)	95	.25/Kg	23750
Kale	62		
Rape	62		
Green Pepper	8		
Beetroot	15	.40/Kg	6000
Pumpkin	20		
Squash	15		
Watermelon	10		
Carrot	20	.35/Kg	7000
Mealies	16	.25/Kg	2500

Source: MOA, Horticultural Department; Hortifacts.

### IV. Production and Marketing Costs and Constraints:

#### A. Production constraints.

Constraints limiting production include the following.

- Lack of adequate direction to existing farmers from MOA, due to inadequate staffing and staff training.
- Inadequate extension efforts.
- Improper training of farmers and extension agents.
- Lack of trained TA staff to supervise both implementation of projects and extension agents who serve the farmers.
- Inadequate agricultural credit requiring examination of existing requirements and their impact on horticultural development.
- Lack of adequate extension packages for farmer training.
- Insufficient infrastructure (farm-to-market roads) and telecommunications.
- Lack of proper input supply sources.
- Lack of a defined marketing procedure.
- Lack of adequate transport.
- Lack of market facilities.
- Lack of storage facilities.
- High cost of irrigation and other equipment.
- Lack of developed water resources.

## **B. Marketing Constraints.**

A large majority of fresh fruit and vegetables are bought/sold through local traders. There can be many layers of handling and resale, all contributing to markup at each level. It is difficult to say exactly what each level adds for its margin, but the incremental range appears to be 15 to 25 percent of the price.

Since 1981, eight regional producers' associations have been established to facilitate trade to local markets. The total composition of the eight marketing associations is approximately 240 farmers representing an estimated 480 ha country wide. The range in individual farmer size is 2-8 ha. It is unlikely that all of this area produces only vegetables. The two largest groups are the Southeast Growers Association, covering Gaborone and Lokatse, and the Tshukudi Horticultural Management Association based in Francistown. The activities of these Associations are coordinated by a National Horticultural Board. Regional producers associations purchase produce from members for sale at group managed retail shops. Members of each association are required to sell through their grouping, though they sometimes sell better quality produce independently. The retail shop charges the farmer 7 percent of the selling price as a commission.

Currently there are several constraints facing the marketing of fresh vegetables. These include the following:

- Lack of adequate infrastructure from the farm gate to the consumer.
- Lack of available, reliable and affordable transport.
- Lack of adequate marketing facilities and a defined marketing system.
- Lack of farmer knowledge regarding pricing, packaging, and proper produce grading.
- Post harvest storage and handling facilities.
- Basic lack of communication between the producers, traders/wholesalers, and GOB/MOA.

The road transport system is inadequate from farm gate to consumer area markets. The feeder road system in the country is still very underdeveloped and, especially for the purposes of vegetable transport, is very inadequate. This increases costs and results in high prices that are not attractive to retail merchants.

Inadequate horticultural marketing facilities have contributed toward poor production levels because farmers are not able to

find a ready market for their produce. Small producers are forced to sell independently or in small groups, offering poor quality and poorly graded commodities at uncompetitive prices compared to produce imported through the established marketing system in the Republic of South Africa or Zimbabwe. Large farmers, especially along the Tuli Block, prefer to sell in the Republic of South Africa or Zimbabwe because of earlier market access. This has weakened the resolve to form strong marketing associations.

A major marketing constraint is the lack of competitiveness of domestic producers with South African suppliers, largely because of higher domestic costs of production, high transport costs from producing to consuming regions, and well established links between South African producers and Botswana markets.

### C. Costs.

A major constraint is the high transport cost between regions with irrigation potential and the main consumption centers. There are three areas of the country with substantial irrigation potential: the Southern Okavango delta, the Chobe enclave and the Tuli Block. The principal center of consumption lies in the southeastern region of the country encompassing Gaborone and Lobatse. Francistown represents a second consumption center. The estimated cost of transport between Johannesburg and Gaborone is P 55 to P 100 per MT depending on the size of the vehicle and density of the load. In comparison, transport costs between Chobe or Maun and Gaborone start at approximately P 140/MT, and from Tuli to Gaborone these range around P 65 to P 120/MT. Northern producers may be able to compete with South African supplies in northern markets, but they may find this difficult in the southern markets.

An alternative source of supply for the southern markets may be small-scale irrigation schemes based on dam irrigation. Yet transport costs for smaller loads are higher than those for the larger loads available from Johannesburg. Accordingly, smaller producers situated near urban areas may gain a higher payoff from the production of highly perishable crops.

The following table presents the unit cost of transport for the major vegetable items.

**TABLE: Unit Cost per Package Given Various Levels of Transport Costs (Pula)**

Crop	Transport Cost per MT		
	P 50	P 100	P 150
Cabbage	1.19	2.38	3.57
Potato	.75	1.49	2.34
Onion	.75	1.49	2.34
Carrot	.05	.10	.15
Beetroot	.05	.10	.15
Citrus	.75	1.49	2.34
Tomato	.75	1.49	2.34

The following table is an attempt to estimate gross returns for six important crops. It requires emphasis that these estimated production costs based upon available local information and should be subject to review. Additionally, it should be noted that the costs contain no provision for any capital costs, nor repayments on irrigation system, nor necessary hand tools.

**TABLE: Estimated Crop Cash Flow (Pula)**

Crop	Estimated Cash Expense	Estimated Potential Revenue	Estimated Gross Return Per ha
Potato	5,447	7,000	1,553
Tomato	9,775	13,500	3,745
Cabbage	3,548	8,250	4,702
Carrot	3,260	7,000	3,740
Beetroot	3,200	6,000	2,800
Onion	4,316	12,000	7,684

With further analysis the per kg unit production costs of the six major vegetable items can be estimated as follows.

**TABLE: Unit Cost of Production**

Crop	Estimated Cash Expense	Estimated Yield (MT)	Cost per MT
Potato	5447.35	25	217.90
Tomato	9755.40	30	325.18
Cabbage	3547.96	55	64.50
Carrot	3260.35	20	163.02
Beetroot	3199.57	15	213.30
Onion	4315.80	40	107.90

The following table compares estimated wholesale prices (delivered to Gaborone) and the estimated unit cost of production in Botswana.

**TABLE: Wholesale Prices and Cost of Production.**

Crop	Estimated Mean Wholesale Price Per Kg (P)	Estimated Unit Cost of Production Per Kg (P)
Potato	.28	.22
Tomato	.45	.33
Cabbage	.15	.07
Carrot	.35	.16
Beetroot	.40	.21
Onion	.30	.11

It is estimated that for each hectare of fresh vegetables, five laborers are required on a full time basis. The current pay scale for labor varies; however, about P 4.00 per day seems to be a reasonable figure for our purposes. Therefore, assuming a total area requirement of 650 ha would require 3250 full time persons. This is for full time labor help only. It is estimated that seasonal requirements for labor could contribute approximately an equal amount for salaries on an annual basis or a total of approximately P 4 million.

**TABLE: Average Gross Margin, Beans, Traditional Sector.**

Item	Per Farm	Per Hectare
Area Ploughed (Ha)	.48	
Total Yield (Kg)	155.54	324.04
Average Percent Marketed	30.00	
Average Price (P/Kg)	.49	.49
Output (Gross Return) (P)	75.45	158.78
Total Variable Costs (P)	40.16	83.67
Gross Margin	35.29	75.11
Average Labor Input (Man days)	9.67	20.15
Gross Margin per Man day (P/MD)	3.65	3.73

Source: MOA, 1989.

**TABLE: Gross Margin per Hectare, Beans, Top One Third Farms, Traditional Sector.**

Item	Unit	Unit Price (Pula)	Unit Quantity	Value (Pula)
<b>RETURNS:</b>				
Production	Kg.	.43	76.00	32.68
<b>COSTS:</b>				
Draft Power				
Plough	S.D.		.62	
Cultivate	S.D.			
Plant	S.D.			
Labor				
Plough	M.D.		1.23	
Plant	M.D.		.38	
Cultivate	M.D.			
Hoe	M.D.		.16	
Pest Control	M.D.		.31	
Harvest & Cart	M.D.		2.04	
Thresh & Bag	M.D.		.63	
Other	M.D.		.19	
Total	M.D.	1.00	4.94	4.94
Seed	Kg.	.33	40.00	13.20
Bag	No.	.75	1.00	.75
<b>Total Costs</b>				<b>18.89</b>
<b>Gross Margin</b>				<b>13.79</b>

Source: MOA, 1984.

**TABLE: Average Gross Margin, Pumpkin, Traditional Sector.**

Item	Per Farm	Per Hectare
Area Ploughed (Ha)	.13	
Total Yield (Kg)	14.48	111.38
Average Percent Marketed	.00	
Average Price (P/Kg)	.94	.94
Output (Gross Return) (P)	13.65	104.70
Total Variable Costs (P)	1.67	12.85
Gross Margin	11.98	91.86
Average Labor Input (Man days)	.42	3.23
Gross Margin per Man day (P/MD)	28.52	28.43

**TABLE: Average Gross Margin, Cowpeas, Traditional Sector.**

Item	Per Farm	Per Hectare
Area Ploughed (Ha)	.17	
Total Yield (Kg)	.00	.00
Average Percent Marketed	.00	
Average Price (P/Kg)	.00	.00
Output (Gross Return) (P)	.00	.00
Total Variable Costs (P)	11.21	65.94
Gross Margin	-11.21	-65.94
Average Labor Input (Man days)	.67	3.94
Gross Margin per Man day (P/MD)	-16.73	-16.73

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**APPENDIX 1**

**SCOPE OF WORK**

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## Demand Assessment of Agricultural Products in Selected African Countries

### Scope of Work-

### Objective

To develop and produce assessments of domestic and regional demand for specific agricultural commodities in selected African countries and; develop and test a methodology for such demand assessments. In addition, for selected agricultural commodities, assessments of the potential for initiating and expanding domestic agri-business enterprises will be conducted.

### Discussion

There are a number of agricultural commodities and agri-business related processed products which can be produced in selected African countries. The initiation or expansion of production of such commodities can be beneficial for the developing African country in terms of increasing income and employment in agriculture. However, there is very little data available to establish effective demand patterns upon which to base potential agri-business development activities and for determining the potential for the production of these products in African countries.

In addition, some of these potential demand commodities should be analyzed in terms of their potential for expansion or improvement without direct production assistance from AID but through assistance for market analyses, technical advice to existing production operations and/or assistance to African intermediate financial institutions which are currently involved in financing such products.

### Work Plan

1. The contractor will, utilizing current macro production, import and export data, review local data bases and other sources of information to establish detailed demand and production potential for specified commodities. Contractor will also analyze the current potential for agribusiness development and related activities for identified commodities in countries selected by AFR/MDI and AFR/TR. Close consultation with both offices will be necessary during the course of this work.

2. The contractor will concentrate on the following commodities:

- a. Grains
- b. Oilseeds
- c. Livestock Products
- d. Fibers
- e. Vegetables, Fruits and Specialty Crops

#### Work Products

Contractor will prepare analytical reports and proposed methods of demand assessment for AFR/MDI and AFR/TR. Reports will also be prepared for specific commodities for selected African countries. A proposed list of products and countries will be discussed and negotiated between contractor, AFR/MDI and AFR/TR and a format for such reports will be agreed to in advance. Reports will also be submitted regarding agri-business potential for selected commodities and African countries.

Since this is an experimental approach to agri-business development in Africa, effort will be concentrated on developing and testing of the methodology rather than getting extensive coverage. Close and careful work planning with AFR/MDI and AFR/TR will be required by the contractor.

#### Budget

Total amount allocated for this contract is \$100,000. See budget in attachment 2.

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