AGRICULTURAL RESTRUCTURING

IN

SOUTHERN AFRICA

Papers presented at an
International Symposium
held at Swakopmund, Namibia

24-27 July, 1990

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International Association of Agricultural Economists
in association with
Association of Agricultural Economists in Namibia
(AGRECONA)

First published in 1992 by the Association of Agricultural Economists of Namibia
P.O. Box 21554, Windhoek, Namibia.

Printed in Namibia by Windhoek Printers & Publishers (Pty) Ltd,
P.O. Box 1707, Windhoek, Namibia.

Distributed by the Association of Agricultural Economists of Namibia,
P.O. Box 21554, Windhoek, Namibia.

ISBN 99916/30/10/4

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THE AGRICULTURAL ECONOMY OF BOTSWANA

H K SIGWELE

INTRODUCTION

At independence in 1966, Botswana's agricultural sector was contributing about 40 percent to the Gross Domestic Product. Preliminary estimates for 1987/88 put the contribution at about 4 percent. This dramatic decline is largely due to a quantum jump in the mining and quarrying sectors from almost zero in 1966 to about 45 percent in 1987/88. In 1967/68 agriculture contributed 27 percent or 7 570 jobs to the total formal sector employment of 28 148. Government came second with about 21 percent. Economic transformation in Botswana has resulted in estimated formal sector employment in agriculture of 5 600, or 4 percent of the total formal sector employment of 150 200. The government sector employed about 35 percent of this number. In 1987/88 the commercial sector employed five times as many people as the agricultural sector. The mining sector is capital-intensive and provided jobs to only about 5 percent of 1987/88 estimated formal sector employment.

Despite the relative decline in the agricultural sector's contribution to Gross Domestic Product and total formal sector employment, most people in Botswana will, for a long time to come, depend on this sector for food, income, employment and investable capital. In addition to these important roles, the sector has continued to provide the country with scarce foreign exchange through beef exports, and raw materials for the meat processing, leather and soap industries. When forward and backward linkages between the agricultural sector and the rest of the economy are considered, the role of this sector is far greater than macro-economic indicators show.

Of the estimated 1,3 million people in Botswana, about 76 percent live in the rural areas and derive their livelihood mainly from agriculture, off-farm activities (beer-brewing, basket-making, woodwork, etc.) and remittances. In agriculture, the dominant production activity in terms of income and employment is livestock farming, primarily cattle. However, cattle ownership is heavily skewed with about 40 percent of the farming households without cattle, while over 60 percent of the national herd of 2,3 million is owned by less than 10 percent of the farming households.

Arable farming is primarily subsistence oriented and largely constrained by management and poor weather conditions, both spatially and temporally. Most farming households do not produce enough food for themselves. The majority of farmers plant on average about 4 ha and harvest less than 300 kg per ha of mainly sorghum, maize and pulses. Commercial farmers generally plant more than 50 hectares.

In general, the agricultural sector is dominated by mixed farming (livestock and crop production) as a multifaceted strategy to spread risks, particularly in the traditional sector. The commercial sector is characterised by large cattle holdings ($>$ 100 head) and area planted ($>$ 50 ha). While the traditional sector dominates in the production of cereal crops, mainly sorghum (except in very dry years), the commercial sector specialises in high-value crops such as vegetables, fruit, sunflower and cotton.

AGRICULTURAL POLICY OBJECTIVES

Botswana's agricultural policy objectives are aimed at:

- Providing adequate and secure livelihoods for those involved in agriculture.
- Increasing agricultural output.
- Increasing food self-sufficiency.
- Conserving agricultural land resources.
- Meeting the employment demands of a growing labour force.

These policy objectives are clearly long-term in nature and would require both short and long-run strategies to attain them. For this reason the government approved a White Paper on National Food Strategy in 1985 to facilitate the realisation of some of these objectives.

The objectives of the National Food Strategy (NFS) are primarily to:

- Achieve a broad-base recovery in arable production after the drought period.
- Achieve national self-sufficiency in the main staple crops of maize and sorghum for both food and seed as soon as practically possible.
- Ensure at least a minimum acceptable diet for all Botswana's people.
- Build up and maintain the national capacity to deal with drought and other emergencies (national strategic grain reserve).

It is clear that these objectives are also long-term in nature. However, Government has over the years launched programmes and projects aimed at achieving both the broad agricultural objectives and those of the NFS.

Below is a brief discussion of the performance of the agricultural sector since 1966, including a comparison between the traditional and the commercial production systems.

PERFORMANCE OF THE AGRICULTURAL SECTOR

In the period since independence, Botswana's agricultural sector has been characterised by ups and downs, particularly in the arable subsector. Although the livestock subsector usually withstands drought better than the crop subsector, periodic shortages of grazing and water do affect performance (mostly carcass weight), farmer's income and agricultural employment.

Cattle farming

Figure 1 shows the cattle population from 1965 through to 1988. At independence the cattle population was down to about 1,25 million because of drought, but the national herd increased dramatically over the years till 1982. Intensified animal disease control, especially through free and compulsory vaccination for anthrax and black quarter, expanded provision of water by drilling boreholes, favourable weather conditions, an improved marketing infrastructure and credit facilities are to a large extent responsible for this surge in the cattle population. In addition, owing to the limited alternative investment opportunities outside the cattle subsector, continued government assistance to and the relative profitability of the industry have also contributed to the growth in cattle numbers.

In 1982, the drought started to intensify and the cattle population declined from about 3 million to 2,3 million in 1987. Above average rainfall conditions during 1987/88 resulted in an increase in the cattle population. Preliminary estimates for 1989 indicate that the cattle population is about 2,5 million. While livestock farmers were adversely affected by drought, those holding smaller herds, mostly in communal areas, experienced more cattle

losses because of overgrazing. Limited watering points due to poor distribution of surface and underground water sources country-wide are partly responsible for the historical problem of overstocking. Improvements in production and management indicators, particularly in the traditional/communal sector, have not been impressive. While the government has over the years encouraged the use of improved bulls, provided extension advice on husbandry techniques and provided an improved marketing infrastructure, the performance indicators are still far from satisfactory.

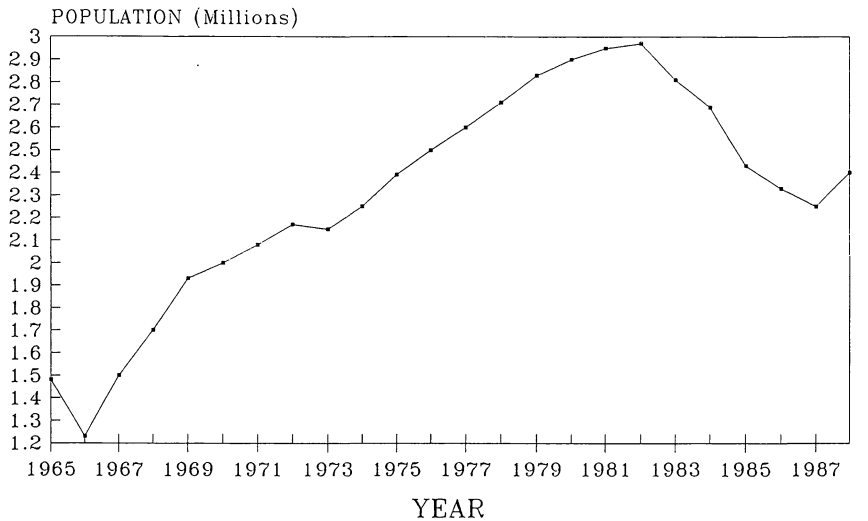

Figure 1: Cattle population (1965 - 1988)

While the freehold/commercial farming subsector records a calving percentage of about 70 percent, the figure for the communal/traditional subsector is barely above 50 percent. However, calving percentage at the government-owned research ranches is estimated at 78 percent. The Tribal Grazing Land Policy (TGLP) ranches which were established to manage cattle on a commercial basis are hardly different from the communal areas in this respect. There is also a difference in other performance indicators between the two production systems. While the annual average off-take rate among freehold/commercial ranches is estimated at 17 percent, the communal subsector records an annual average off-take rate of about 8 percent. The low cattle off-take rate, particularly in the traditional sector, coupled with phenomenal growth of the cattle population since independence, has had an adverse and telling effect on the range land. Overstocking and overgrazing have in turn led to low productivity/animal/hectare.

Livestock farmers often complain of limited slaughter capacity, particularly during the peak periods (February-August). However, a low cattle off-take rate from the communal areas, where 86 percent of the national herd is found, has characterised the traditional sector

since independence. It could be argued that the limited alternative investment opportunities to utilise additional livestock earnings has hitherto been a serious hindrance to Botswana farmers. Despite this structural economic problem, the low cattle off-take rate has been a serious constraint to the development of the sector. The government will have to intensify efforts to improve sustainable livestock development by increasing productivity through the cattle off-take rate.

Cattle mortality is normally about 12 percent during favourable weather conditions. However, during the last drought, cattle mortality reached 22 percent. The traditional subsector experienced higher livestock losses compared to the freehold/commercial subsector. As in the case of cattle off-take, the cattle mortality rate in the freehold/commercial subsector was about half of the cattle mortality rate in communal areas.

On the basis of performance indicators such as calving percentage, off-take rate and mortality rate, the commercial sector is technically, **but not necessarily economically**, more efficient than the traditional/communal sector. To determine economic efficiency between the two production systems will require inter alia data on cost of production and resource use efficiency.

Smallstock

The smallstock population of Botswana (sheep and goats) was estimated at 1,4 million in 1968. This figure remained above 1 million until 1973 when it suddenly fell by half to about 600 000 (see Figure 2). The population fluctuated between 600 000 and 800 000 until 1983, when it started increasing significantly. The decline in smallstock population is associated with poor husbandry techniques that result in high mortality rates, and wet weather conditions which create a favourable environment for disease and insects, particularly ticks. An increase in the smallstock population, particularly goats, during drought periods would largely be due to the fact that they are browsers, unlike cattle. However, smallstock population figures in the period up to 1978 should be interpreted with care because figures from areas such as Kgalagadi and Ghantsi are not enumerated due to inaccessibility and other logistical problems.

The increase in the smallstock population since 1983, when the cattle population was declining during the drought period, has further reinforced the belief that goats and sheep are more resilient than cattle. Although, in 1983, smallstock producer prices were increased by 40 percent by the Botswana Meat Commission (BMC), which may have motivated farmers to improve management because of better returns, it would appear that the drought- resilience of these animals is still an important contributory factor to the increased numbers. However, the marketing of smallstock by-products constitutes a problem because it was originally integrated into the South African market. Unfortunately this market has collapsed and the Ministry of Agriculture is working hard to identify alternative markets.

Over 80 percent of the smallstock population is in the traditional subsector. About 70 percent of smallstock is goats. However, unlike cattle, the distribution of smallstock is less skewed. While smallstock holdings per commercial farm exceed 100, the number of smallstock per farming household in the traditional sector is less than 30. Although there has been a marginal improvement in lambing and kidding percentages in the traditional sector since independence, much needs to be done to raise smallstock productivity. The commercial subsector performs almost twice as well as the traditional sector in terms of off-take rates. The off-take rate of about 5 percent has serious range and environmental implications,

especially in the already overgrazed communal lands. As is the case with cattle, efforts should be intensified to increase off-take rates to restore range productivity. There has been little improvement in this regard since independence. The expansion and promotion of alternative investment opportunities by the government through incentive schemes should help develop a broadly-based diversification strategy. In the long run such a strategy could improve smallstock productivity.

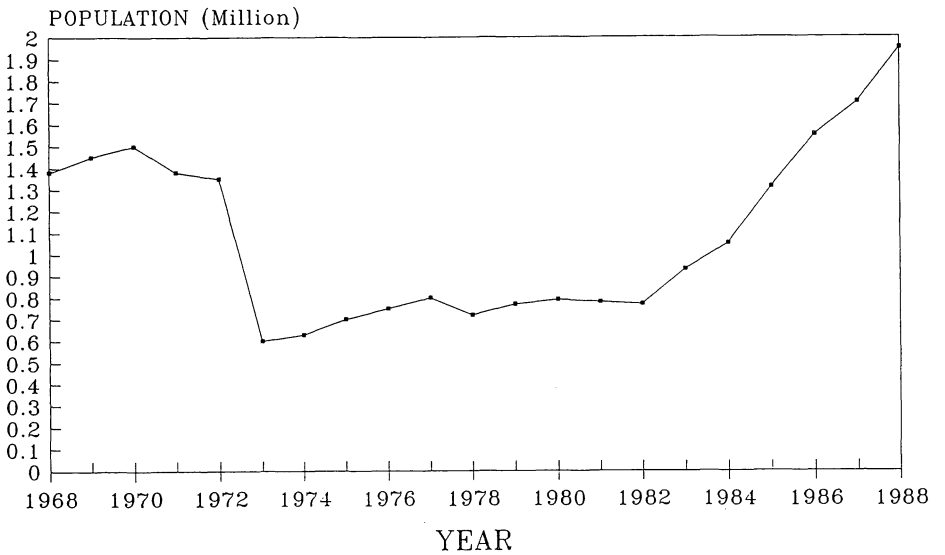

Figure 2: Small stock population (1968 - 1988)

Mortality rates show a similar trend in both the commercial and the traditional subsectors. While the traditional sector experiences an average annual mortality rate of about 30 percent, the commercial sector records half this percentage. Unlike their communal sector counterparts, farmers in the commercial sector raise smallstock for financial gain. Efforts by the government to reduce the high smallstock mortality rates should be intensified to improve both productivity and farmer income.

Other livestock like donkeys, mules, horses, poultry and pigs have increased over time since independence. However, the poultry subsector has experienced phenomenal growth over the last two decades from approximately a quarter of a million in 1970/71 to current projections of over 2 million. The dramatic increase in poultry, particularly chickens, is a result of assistance programmes by the government to increase production to self-sufficiency levels. The Financial Assistance Policy (FAP) introduced in the early 1980s provided farmers with capital grants to purchase stock and has had a tremendous impact on the chicken population. At present Botswana is almost self-sufficient in poultry, red meat and eggs. The commercial subsector has increased its chicken inventory recently because

of the growing local market and the availability of financial and extension packages. However, especially in the traditional subsector, mortality rates due to disease are still very high.

Similarly, the government has put in place extension and financial packages to increase fresh milk production to meet the country's domestic requirements. At present, Botswana is about 25 percent self-sufficient in this commodity. Under the FAP farmers have been able to purchase stock, but the local availability of dairy feed has been a major constraint for this industry.

Arable subsector

The arable subsector in Botswana faces serious agro-climatic instability and is also threatened by the easy entry of relatively cheap food imports from South Africa. Botswana is a member of the Southern Africa Customs Union along with Lesotho, Swaziland and South Africa. Under the Customs Union Agreement, contracting partners are obliged to facilitate an easy flow of goods among the members with the minimum restrictions or controls. The flow of goods from South Africa may be a disincentive for some investors in Botswana to produce food crops.

As a result of unfavourable weather conditions in particular, the performance of the arable subsector has been characterised by serious shortfalls for the last two decades. There has been a strong dependence on commercial imports while in some years, particularly those of severe drought like the 1982-1987 period, food aid has been very important.

Table 1 shows the area planted, domestic production of basic cereals and pulses and the average annual rainfall from 1967/68 to 1988/89. In addition, the table shows cereal food imports from 1975 to 1987. Data for cereal food imports for the period before 1975 are incomplete and highly unreliable. In general, over the last twenty-two years (1967-1988), the area planted has been 242 000 ha. As expected, during the years of higher average rainfall farmers tend to plant more land. Domestic production is usually also higher. Over 70 percent of the area planted is allocated to sorghum because of its drought-resistant characteristics.

It is important to note, however, that while information on average annual rainfall is useful for crop production in Botswana, the critical stages of plant growth (germination, flowering, etc.) are more important than aggregate figures. Unfortunately Botswana's arable subsector has experienced erratic rainfall between seasons and districts, with the result that optimum plant growth/development conditions have been severely restricted. It is not uncommon for rains to stay away just when crop plants start germinating or flowering. Research has confirmed that moisture-availability during the flowering stage of crop plants has by far the greatest impact on yield because of the plants' higher water requirements.

Relative to annual area planted, domestic production over the last two decades has been characterised by more serious fluctuations. In years of drought, like the 1981/82-1987 period, domestic production was less than 10 percent of the country's annual cereal requirements. In fact, during the last five years of this period, food aid imports were twice domestic production. As expected, sorghum generally accounts for about 70 percent of the domestic production of cereals. In some years, **although very few since 1967**, domestic sorghum production was sufficient to meet almost all the nation's requirements for this commodity. The brewery industries, however, have continued to import processed sorghum products because of specific quality standards.

Table 1
Area planted, production of crops (sorghum, maize, beans/pulses, millet and oilseeds), average annual rainfall and cereal imports (1967/68 - 1988/89)

	1967/68	68/69	69/70	70/71	71/72	72/73	73/74
Hectarage planted (1000 hectares)	200	240	202	246	251	139	255
Production (1000 tonnes)[a]	26	62	14	72	86	14	74
Average rainfall (mm per annum)	437	428	360	467	617	291	722
Total cereal imports (1000 tonnes)[c]	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	1975/76*	76/77*	77/78	78/79	79/80	80/81	81/82
Hectarage planted (1000 hectares)	261	255	260	180	287	290	204
Production (1000 tonnes)[a]	77	74	50	10	43	58	19
Average rainfall (mm per annum)	662	587	622	312	513	577	359
Total cereal imports (1000 tonnes)[c]	39	52	76	162	109	79	111
	1982/83	83/84	84/85	85/86	86/87	87/88	88/89
Hectarage planted (1000 hectares)	229	203	211	243	290	360	260[b]
Production (1000 tonnes)[a]	16	9	20	22	22	116	60[b]
Average rainfall (mm per annum)	346	355	289	313	331	603	426
Total cereal imports (1000 tonnes)[c]	174	172	187	185	158	n/a	n/a

a - Production and cereal import figures rounded off to the nearest thousand.
Domestic crop production includes sunflower and groundnuts whose output is insignificant or less than 1 percent of the total.
b - Projected figures.
c - Total cereal imports include wheat, rice and processed products of all the cereals.
n/a - Not available
* - No survey conducted during 1973/74 - 1976/77
Production levels were subjectively determined.
Sources: Agricultural Statistics - 1967/1989, MOA
Central Statistics Office - 1975-1987

As for maize, there has hardly been a year since 1967 when domestic production met the bulk of the country's maize requirements. As one would expect, Botswana's erratic and poor rainfall conditions are not suitable for the sustained production of this crop. As a result, the goal of self-sufficiency for this crop is, at least technically and economically, not really possible. While irrigation could contribute to increased domestic maize production, this strategy may not be economically favourable, given the low yields and high energy costs.

Similarly for other crops, particularly pulses, climatic conditions and the availability of labour have made it difficult to meet the country's requirements for domestic production.

While the government has over the years intensified its resolve to increase basic cereal production to self-sufficiency levels by the introduction of assistance programmes, the cost to the country has been very high given the already unfavourable weather conditions and exceptionally low crop yields (less than 400 kg/ha). In fact, for both maize and sorghum the average cost of production per tonne has been at least twice the price of imported grain. Surely and rationally, such a trend cannot be sustained economically without serious social and economic burdens. Experience in other countries clearly indicates that self-sufficiency or blanket import substitution is often not a wise decision, politically or economically. Botswana has decided to avoid such potential political and economic difficulties despite current healthy financial reserves.

Further, cereal imports as shown in Table 1 generally show an upward trend and a reliance on imports, particularly from South Africa. However, one of the contributory factors to the ever-increasing cereal imports, is Botswana's rapid population growth. At present the country's average population growth rate of about 3,5 percent per annum nullifies the gains from a modest agricultural growth rate. Fortunately, the government is currently formulating a population policy which in the long run should slow down the population growth and thereby minimise pressure on scarce resources, including the agricultural sector.

Besides cereal production, there has been, although very insignificant in terms of area planted and output, production of oilseeds (sunflower, groundnuts and cotton) by large-scale commercial farmers. Unfortunately the absence of local oilseed processing facilities may have been a disincentive for increasing domestic production over the last two decades. Following the establishment of a local vegetable oil processing plant in Gaborone and the use of import parity prices instead of export parity prices as a basis for determining minimum oilseed producer prices, it can be expected that oilseed production may increase in the near future.

Regarding the horticultural subsector, data that are available for the last ten years indicate that over 70 percent of Botswana's vegetable and citrus requirements are met from imports. Currently only twenty percent of Botswana's requirements are met from domestic production from areas such as the South East, Tuli Block, Kasane and Francistown. Besides a critical shortage of water (both surface and underground) for the expansion of the horticultural subsector, the lack of marketing infrastructure, storage facilities and qualified manpower has seriously hampered the development of the industry. Although the government has over years initiated assistance schemes, progress in this subsector has been very slow. Currently the government and the private sector are planning to develop a marketing infrastructure for horticultural producers in the major producing areas of Lobatse, Gaborone and Francistown.

The major horticultural crops grown in Botswana and whose production is encouraged by the regulation of imports are tomatoes, potatoes, onions, cabbage, green mealies and

oranges. Since 1985, the importation of all these commodities except green mealies has been undertaken through the issuance of permits by the Ministry of Agriculture in an effort to encourage domestic production. Unfortunately domestic production is characterised by seasonality and highly localised gluts. This makes distribution from one area to another extremely expensive for the private sector, given the poor road and telecommunications infrastructure in the production areas.

Unlike the major cereal crops, the small-scale farmers do not dominate horticultural production, although there are small producers' syndicates, etc. These high-value crops are almost the monopoly of the larger scale farmers in those areas where water and soil conditions are favourable. The Ministry of Agriculture is, however, planning to encourage backyard vegetable and citrus production among small-scale farmers.

Performance levels between the traditional and commercial subsectors in cereal production indicate that the yield levels between the two are generally in the ratio of 1:2. This means that, on average, the traditional farmers produce about half the output per hectare of large commercial farmers, estimated at about 500 kg/ha. Although the commercial farmers outperform the traditional sector, their yield levels are still very low compared to peasant farmers in neighbouring countries, even during a favourable year. Increase in productivity in the arable subsector should constitute a major challenge for many years to come if susceptibility is the government's economic strategy.

Similarly in horticultural production, the large-scale commercial farmers outperform the small-scale producers by a factor of two. While on the average small-scale farmers produce about 30 tonnes of tomatoes per hectare, their commercial counterparts produce over 50 tonnes per hectare.

The better technical performance of the large-scale commercial farmers over the small-scale producers in arable farming is due to a combination of factors such as access to machinery/draft-power which promotes timely planting, weeding, etc., technology (better and higher yielding varieties), availability of skilled manpower and generally favourable soil and water conditions. The technical superiority of commercial farmers in higher production levels per unit area does not necessarily imply better financial and economic performance. To determine that requires additional information on cost of production, etc.

CRITICAL SECTORAL ISSUES

Policy factors: Self-sufficiency versus food security

One of the major policy objectives of the agricultural sector and the recent National Food Strategy is to increase basic cereal production (sorghum, maize) to self-sufficiency levels. A brief examination of the performance of the arable subsector as presented earlier indicates clearly that, since independence, Botswana has hardly met its cereal requirements from domestic production. While arable productivity (yields) have remained almost stagnant, unfavourable agro-climatic conditions and the limited soil and water resources for both irrigated and dryland farming have contributed significantly to low domestic production.

As a result of the physical, climatic, economic and environmental problems facing the agricultural sector in particular, the government has decided to shift its emphasis from food self-sufficiency to food security. This means that, to improve food access to all people in Botswana, the country will concentrate on producing livestock and crop products that it can afford to produce cost-effectively while paying attention to the environment. For those

commodities that the country cannot produce cost-effectively, the shortfall will be met by imports.

The policy decision to shift from food self-sufficiency to food security was made to ensure long term economic efficiency, sustainability and proper use of the environment. After all, food self-sufficiency only tells us what the physical availability/supply of food is, but does not give an indication of the economic access to it or what household consumption levels are. The purchasing power or disposable income of households largely determines the amount and quality of food consumed. Experience elsewhere in the world has shown that it is easy for few farmers to supply the bulk of the nation's food requirements, yet malnutrition and poverty still remain social eyesores. The agricultural policy shift from self-sufficiency towards food security is primarily aimed at avoiding such eventualities. A draft Agricultural Policy Paper is currently being debated nationally.

Similarly, following the strong drive by the government to diversify the economy, it is hoped this policy initiative will further improve food access through employment creation to increase real income levels.

Productivity in the agricultural sector

The brief analysis of the performance of the agricultural sector as measured against the policy objectives, clearly indicates that the gains are not impressive. The sector has not been able to generate many jobs since independence and has equally not reduced dependency on food imports, particularly in the arable subsector. Range degradation as a result of inefficient grazing and resource management systems has adversely affected the sustained development of the livestock subsector. Overgrazing and overstocking of Botswana's scarce but fragile range lands have been a serious concern. Livestock off-take rates, especially from the traditional sector where the bulk of the livestock is raised, have been very low.

Over the last two decades the agricultural sector in general has been faced with the difficult task, particularly in such a hostile agro-climatic environment, of increasing productivity per unit of resources used (land, labour, capital, etc.). Crop yields have remained almost stagnant between 200-400 kg/ha range for the last two decades or more. While the commercial subsector has tended to produce twice as much grain per hectare as its communal/traditional counterpart, the former's cereal yields are still very low compared to peasant farmers in neighbouring countries. Adoption of modern techniques (winter ploughing, row planting, etc.) for increasing productivity/yield has remained almost remained static since independence. Over 80 percent of the crop farming population still broadcast their fields and very few, if any, apply modern inputs such as fertilizers. Of course, there are objective and rational reasons for farmers' behaviour in failing to adopt the recommended crop husbandry techniques. The high risks inherent in crop farming compounded by low and negative returns in this subsector cannot be easily discounted in the technology transfer process.

Besides unfavourable weather conditions, improvement in agricultural productivity is constrained by present land tenure systems, lack of developed marketing infrastructure, management skills, appropriate biochemical and mechanical technology, limited underground and surface water sources, few alternative investment opportunities for diversification which could relieve the fragile range lands from increased livestock investment and poor access to economic resources such as labour and draft-power.

Table 2 shows the average cold dressed mass for cattle from 1966 to 1988. For the last

twenty two years of BMC throughput, in general, the average cold dressed mass per animal has not changed much since 1966 even in good rainfall years, except for the decline during the 1983-1986 drought period. While the cold dressed mass has remained almost stagnant for the last twenty two years, producer prices have been increasing in both real and nominal terms. In fact, Botswana's beef has access to the European Economic Community whose producer prices are at least 30 percent above world prices. Concerted efforts should be made to improve beef output per animal/hectare at least cost.

Productivity in other livestock enterprises besides cattle still needs significant improvement. Similarly, productivity in the arable subsector per unit of input (land, labour, capital, etc.) will require significant improvements for the long-term sustainability of the sector.

Table 2
Cold dressed weight for cattle at BMC (Lobatse) 1966-1989

Year	Average cold dressed mass in kg
1966	184
1967	213
1968	227
1969	228
1970	197
1971	207
1972	194
1973	202
1975	210
1976	205
1977	208
1978	204
1979	206
1980	203
1981	217
1982	200
1983	195
1984	188
1985	193
1986	190
1987	200
1988	208
1989	216

Source: BMC (1966-1989)

Continued financial assistance to and provision of research and extension, including other services to the agricultural sector as a whole, without a corresponding increase in productivity will not help to sustain the sector, except with heavy subsidies whose social opportunity cost is very high. Improvement in productivity, a critical sectoral issue in the

face of scarce economic resources, should constitute part of a broadly based long-term strategy to increase the viability and sustainability of the sector while paying attention to environmental issues such as agro-chemical pollution, range degradation, deforestation and soil erosion. A programme to improve range productivity and management is about to be implemented by the Minister of Agriculture.

Technology development

To improve productivity in the agricultural sector will require a concerted effort to provide the farming community with high-yielding crop varieties which are drought resilient and pest resistant. Higher crop yields, which are a *sine qua non* for the sustained development of the arable subsector because they reduce costs per unit of output, should form a major technological challenge for Botswana. Current crop yields of less than 500 kg/ha are not only by far too low to meet household subsistence needs, but also, for that matter, make it difficult for commercial farmers to service their loans. To date both groups of farmers produce about half their break-even yield which creates serious food-security and financial problems. Similarly, the horticultural yields of many famers, which are currently low, will need to be increased to improve household income and cover their costs.

Besides Botswana's crop yields being low, most cereal varieties grown in Botswana take long to mature. The majority of the country's sorghum and maize varieties mature after four months which, in a production system characterised by erratic rainfall between seasons and areas, constitutes a serious constraint. Given Botswana's agro-ecological system, a technology strategy that develops both short- and long-season crop varieties should be vigorously pursued.

One of the major contributions to record crop harvests in both industrial countries and Asia during the Green Revolution has been a dramatic increase in crop yields. High-yielding crop varieties, together with complementary inputs such as pesticides, fertilizers and machinery, have led to grain surpluses in these countries. Admittedly, favourable weather conditions have played a role, but technological breakthrough in its various forms has made a major contribution.

While exotic and early-maturing breeds have been introduced in the livestock subsector, productivity per animal per hectare still requires more improvement to reduce production costs. Exotic cattle breeds like Brahman, Simmentaler, Bonsmara, etc. are being widely used by farmers in the country to increase beef production. Similarly, smallstock and poultry producers are also purchasing exotic breeds to improve productivity. Although the dairy industry is still at infant stage, the use of exotic breeds such as the Jersey, Friesland and others is already very popular. Despite the availability of these high-yielding livestock breeds, including access to an Artificial Insemination Service at subsidized rates, productivity per animal still needs to be dramatically improved to reduce the cost of production.

Of course, low productivity in the livestock subsector, despite the wide use of exotic breeds and developed animal disease programmes, is partly a result of poor grazing management systems and the tendency by the majority of the traditional farmers to consider quantity as more important than livestock quality. Generally, livestock holdings in terms of numbers is still a preferred traditional custom.

Despite a biological technological breakthrough in the form of early maturing and relatively heavier breeds, Botswana's extensive production system is, in addition to poor livestock productivity, a major subsectoral issue. Most livestock farmers graze their cattle

in vast areas because of the apparent abundance of empty land. Unfortunately Botswana's land resources in general and grazing land in particular is finite and cannot be expanded without causing serious disruptions to other land users and competitors (crop farming, human settlement, urban development and wildlife).

The challenge to the agricultural sector regarding the development of technology through research, and the exchange of germplasm, etc. to improve productivity and the viability of the sector, should remain strategic sectoral agenda issues. The perception that Botswana's agricultural sector should be developed through extensive use of land by both arable and livestock subsectors will need to be changed. Such a strategy may, in the long run, prove resource-inefficient and cause serious environmental problems. Already the haphazard felling of trees and the removal of stumps to increase arable production is a concern. Investment in technology, including critically important research areas such as livestock fodder, soil and water conservation and machinery, particularly for small-scale cattle owners and women-headed households, should be a major challenge for this decade or longer in Botswana. Fortunately, a study to review and eventually strengthen Botswana's agricultural research system to develop technology is underway. After review, the agricultural research strategy should not only strengthen technology development at the various Research Stations, but should also forge more productive links with extension and farmers. Strong and continuous farmer participation in technology development has generally proved beneficial and sometimes cost-effective. A research strategy for agricultural development that does not take into account the objective physical, economic and institutional problems faced by farmers is unlikely to pay off in the long-run.

National as well as regional and international resources, including co-operation with organisations such as SADCC, FAO, IITA, ILCA, ILRAD, INCRISAT, etc. should be mobilized to assist Botswana in developing technology for the betterment of the agricultural sector. Already the Ministry, through the Department of Agricultural Research, is collaborating with SADCC/SACCAR in testing crop varieties for use by farmers in Botswana. In addition to this vital collaborative research effort to develop appropriate technology, the Department also works closely with SACKER under the Land Management Programme to enhance water harvesting/conservation techniques in order to improve moisture availability for crops. Generally, experience and evidence from other countries indicate that the returns of agricultural technology development could be very high and far-reaching for the economy.

Water development

The critical shortage of both surface and underground water in the major agricultural production areas has constituted a serious bottleneck in the sector, even in colonial days. The development of irrigation has, besides the limited availability of fertile soils, been constrained by the lack of water. For instance, the **Southern Okavango Integrated Water Development Study**, Phase I (MMRWA, 1987), indicates that about 50 000 ha of relatively good soils are located along the Gomare-Nokaneng-Habu axis and yet, because of the shortage of water, this potential may not be fully tapped.

Similarly, regarding the livestock subsector, the shortage of surface and underground water sources has led to overstocking certain areas, particularly in the eastern part of the country, which has led to localized overgrazing and range degradation. Some of the relatively sparsely populated areas in the western parts of the country could be developed for

livestock farming if water could be found. In some areas only salty water has been discovered. As a result of the poor distribution of surface and underground water sources, the potential of certain parts of the country to raise overall agricultural productivity is not realised.

Fortunately, through the development of the **National Water Master Plan** by the Ministry of Mineral Resources and Water Affairs, it is expected that a long-term strategy to make use of Botswana's scarce water resources will, inter alia, take into account the needs of the agricultural sector to promote diversification.

Land tenure and use

Botswana has three types of land tenure systems. These include the tribal system, which holds about 70 percent of the country's physical land, the state system and the freehold system. Following the establishment of the Tribal Grazing Lands Programme (TGLP) ranches in the mid-1970s, large-scale cattle farmers who were allocated ranches were ideally supposed to graze them commercially and desist from moving their animals to the communal areas when their ranches are overgrazed. Unfortunately, the existence of dual rights has continued to be a critical and sensitive sectoral issue in the livestock subsector because TGLP ranchers are still by law entitled to graze their animals on communal lands.

There is an ongoing policy debate on whether dual rights should be abolished or retained. For the future of the agricultural sector, dual rights should be abolished. In addition, it is being proposed that, subject to the availability and suitability of land, farmers be allowed to fence grazing land to improve management and productivity.

Price incentives and subsidies

Through its various agricultural and import substitution programmes, the government and the Ministry of Agriculture have over the years tried to provide farmers with an environment conducive to investment despite the adverse agro-climatic conditions. Debate on incentives to encourage and expand agricultural production has continued to dominate both among farmers and in the Ministry of Agriculture. While average cost of production for crops is used as a basis for determining producer prices in certain countries, Botswana has preferred import parity pricing, primarily to enhance economic efficiency. The use of average cost of production to determine producer prices is resisted by some countries because it can lead to resource-inefficiency even in the face of changing technological and market trends. In addition, some input costs like labour may, as is commonly the case, be inappropriately increased because of political decisions to raise minimum wages, yet farm productivity may not have increased or improved. In fact in Botswana, if the average cost of production for food grains is used, the consumer prices will certainly be very high given the low yields and unfavourable agro-climatic conditions. Higher consumer food prices in Botswana will not only adversely affect household competitiveness but also stifle government efforts to industrialise.

For Botswana, all producer prices for cereals and oilseeds are to be based on import parity as the country is deficit in these commodities. The concern cereal farmers have expressed over the use of import parity prices in that the application of these prices does not cover their production, especially among groups with conflicting interests, will remain a critical sectoral issue. There is, as indicated earlier, a draft agricultural policy document that is currently being debated nationally to consider, among other things, the proposal to base

all crop producer prices on import parity.

However, unlike in many countries, farmers in Botswana are still free to sell their grain (internally) at a price determined by demand and supply. The Botswana Agricultural Marketing Board (BAMB) only serves as a residual buyer for those farmers who may not find a market for their grain. In some countries, farmers are obliged to sell to parastatal organisations at prices determined by these agencies.

In the livestock subsector, particularly cattle and smallstock, the pricing policy has primarily been based on export prices, since the country faces a surplus in these commodities.

Although the government continues to review livestock prices, both producers and consumers have expressed concern over these prices.

As indicated earlier, prices will remain crucial to the development of the agricultural sector as major signals influencing production, marketing and consumption decisions in the econonmy. After all, prices determine farmers' income and his/her costs (on the input side).

The role of subsidies in the economy in general, and the agricultural sector in particular, has been crucial and more often than not a sensitive area both in national economies and international organisations. Not only have agricultural subsidies been associated with distortions, they have in recent years been applied by countries to undermine the export and production potential of others through "dumping". Subsidised produce has in many areas undercut competing local products and hence constituted a disincentive to increasing domestic production.

Following the **Midterm Review of the NDP VI** (MFDP, 1987), the Ministry of Agriculture and government have decided to apply targeted subsidies in those enterprise/areas where net social benefits are higher. In addition, subsidies will be provided to the farming community for a limited period as their permanent institutionalisation in the sector could contribute to further distortions and economic inefficiency. Besides, blanket subsidies in the economy are generally difficult to sustain in the long run. However, the agricultural sector will continue to provide subsidies for combatting economically important diseases and pests such as foot and mouth, anthrax, black quarter, quelea birds and locusts. If such diseases and pests are left to the individual farmers to control, the losses to the country could be extremely high. In fact, foreign earnings from the livestock subsector would disappear immediately and several households would suffer.

In addition to providing subsidies for combatting to economically important diseases and pests, the government will continue to extend financial assistance to long-term programmes like forestry and the construction of dams. Besides being capital-intensive, the private sector is generally not very keen on programmes such as these.

In a country like Botswana, where water is a very scarce commodity for development and industrialisation, government initiative regarding water development is crucial. Similarly, to promote long-term land productivity in an environment highly susceptible to drought and hence wind and soil erosion, afforestation of scarce agricultural land is paramount and critical to sustain the sector.

Although still considered controversial and sensitive, subsidies do play a role in promoting a rapid adoption of viable technologies. The widespread use of improved bulls and high yield crop varieties in Botswana and in many parts of the world is associated with the initial provision of subsidies. As the agricultural sector undergoes changes and is also expected to generate productive employment, the role of targeted subsidies will require

critical examination to facilitate early adoption of technically and economically proven technologies.

Manpower development and productivity

The agricultural sector, like many key sectors in the economy, has continued to face a critical shortage of qualified personnel in many areas such as animal health, irrigation, horticulture, range, forestry, dairy, fisheries and farm machinery. Despite the concerted efforts by the government during all development plans to increase qualified manpower through training, the supply of scarce skilled personnel has not met demand hence the reliance on expatriates.

While the Botswana Agricultural College will continue providing technical skills in general agriculture with certificate and diploma training and a recently introduced degree programme, specialised training will be obtained from overseas and within the region, as has been the case before. The provision of qualified personnel will improve the absorptive capacity of the Ministry to implement programmes and projects efficiently and timeously for the benefit of the country. The proposed Centre for Inservice and Continuing Education at the recently established faculty of Agriculture will present specialised courses and seminars/workshops for agricultural personnel to improve their knowledge on better and more efficient methods of developing the agricultural sector. In addition, the Centre will explore ways and means of holding short but practical courses for farmers in areas such as farm machinery and repair, crop and animal husbandry, soil and water conservation.

Unlike in the past, manpower training in the agricultural sector will cater for both the public and private sectors. The private sector, which plays a key role in generating productive employment, is currently starved of qualified manpower. In many instances, farmers have continuously complained of a critical shortage of qualified people in dairy, horticulture and maintenance of farm machinery.

Role of government and private sector in agricultural development

In many countries, including Botswana, the role of the government in agricultural development has been considered crucial and yet, in some cases, very sensitive and controversial, depending on the interests involved. While some countries have advocated the government's full participation in production, marketing and pricing, other countries have preferred a supportive role. This approach also characterises Botswana's agricultural strategy.

The role of the Ministry of Agriculture and indeed the government will be to continue providing the necessary services and infrastructure to encourage farmers **themselves** to increase production and productivity. The government will continue to provide research and extension services to farmers and will also promote access to infrastructure such as roads, schools, health centres, etc. As a matter of policy, the Ministry will not engage in agricultural production, except as research initiatives. Experience from several countries has shown that, in general, the government is not efficient in agricultural production, let alone marketing. However, in some remote areas, the government may in the interim engage itself in agricultural marketing and provision of inputs through its agencies, such as cooperative- and rural-based agricultural offices.

The marketing of agricultural produce and the provision of inputs including the maintenance of farm machinery, has generally been undertaken more efficiently by the

private sector. It is the Ministry of Agriculture and the government's long-standing policy that these important functions should as much as possible be left to the private sector. However, this policy strategy requires constant examination, as the private sector may sometimes be constrained by the lack of technical and financial resources which in turn could adversely affect its capacity and capability.

ROLE OF FINANCIAL INSTITUTIONS AND AGRICULTURAL DEVELOPMENT

Besides serving as savings agencies for the farming community, financial institutions have a crucial role to play in the agricultural sector. In a dynamic and technological agricultural economy, the adoption of modern techniques of production and marketing normally requires the purchase of inputs to improve productivity. High-yielding animal breeds, crop varieties and the use of inputs such a fertilizers, pesticides, etc. require financial resources which, in most cases, are not within reach of many farmers. Consequently, access to credit by the farming community to purchase modern inputs is very important. While the National Development Bank, a parastatal organisation, is the single largest source of credit to the farming community, the commercial banks together with the Cooperative Bank have provided almost half of the total credit to the agricultural sector over the period indicated. It is hoped that as the government and the farming community become more concerned with low productivity and the environmental effects of present production methods, the financial institutions, particularly the commercial banks, will from time to time review their lending policies not only to increase in real terms credit to farmers, but to ease conditions to improve the cashflow situation of many farmers. Farmers do face serious cashflow problems when they are not selling produce, which in turn, may adversely affect the adoption of modern techniques to improve productivity and manage scarce land resources through conservation.

As the economy and the agricultural sector undergo structural and technological changes, periodic review of such policies will be necessary to determine the critical and appropriate roles of both the public and private sectors.

Institutional factors and coordination with other ministries/agencies

Some of the critical sectoral issues presented in the preceding paragraphs indicate that they are portfolio responsibilities of other Ministries or agencies and that the Ministry of Agriculture therefore has no direct control over them. The provision of roads, housing and water are few examples. To promote agricultural development and improve overall productivity in the sector will require a concerted effort to minimise the adverse effects of institutional constraints by forging a productive working relationship and cooperation with the relevant agencies. For instance, the Ministry of Agriculture needs to coordinate its policies and projects with agencies that provide infrastructure, water, energy, meteorological data, etc.

Future strategy for agricultural development

The future of the agricultural sector lies in diversifying the production base to broaden the scope for more sources of rural income and employment. This could in turn improve food security at both the national and household levels. The policy shift towards diversification is intended to minimise risks and promote overall development. In particular, the government plans to vigorously explore the development and growth of viable livestock and crop enterprises, including veld products, to broaden the income base of rural

households. It is hoped that such a strategy will promote household food security.

Further, the long-term sustainability of the agricultural sector depends on shifting from food self-sufficiency to food security. The former, given the climatic, economic and environmental factors, could cause serious and probably irreparable damage to the political and economic being of the country.

MACROECONOMIC ENVIRONMENT FOR THE AGRICULTURAL SECTOR

Since the agricultural sector operates in a broad economic environment, it is also essential that the macroeconomic setting in the country facilitates the efficient and sustained development of the sector. It is no secret, notwithstanding fluctuating world commodity prices and protectionism by industrial countries, that one of the major economic problems facing many Third World countries including African States to date, is largely a poor and unstable macroeconomic environment. For instance, it is not uncommon for currencies to be overvalued, administering interest rates which favour certain sectors, discriminating against agriculture in the name of so-called **'rapid industrialisation'** and heavily taxing exports. It does not matter at the end of the day whether a country has well-written or well-financed sectoral projects if the macroeconomic policy environment is not equally well- developed. After all, projects, like sectors, do not operate in a vacuum but in a complex political, economic and institutional setting.

Generally, macroeconomic policies are designed to benefit the whole economy, not only one specific sector. However, sometimes the likely impact of these policies on each sector of the economy needs to be assessed.

Although Botswana's monetary policy is at present considered relatively free of distortions compared to those of other countries, extreme care is necessary in areas such as interest and exchange rates. Generally, an overvalued pula, particularly relative to the rand (RSA), may encourage importation of cheap food and other agricultural commodities which could discourage domestic production. Similarly, subsidised interest rates for agricultural loans (as is the case at present) may adversely affect resource efficiency. For farm machinery, with the prevailing low yields, subsidised capital loans may lead to over-capitalisation and increased farmers' indebtedness. Such a development may not augur well for the sector's goal to be selfsustaining.

Regarding fiscal policies, to minimise the adverse effects of critical sectoral constraints like technology, water shortage, etc. on the sector and improve agricultural production and productivity, additional public expenditure will be required. The diversification strategy, among other things, calls for the development of alternative but economically viable technologies which to date are not available yet. The government will be required to spend additional resources on developing these technologies according to the specific agro-climatic and economic conditions of each region or area.

The existing Income Tax Act allows farmers to claim against capital costs as well as expenditure items such as prevention of soil erosion, planting of trees, making firebreaks, etc. Normally these developments require high initial capital investments. If a provision to claim against such costs had not been available, the long-term productivity of Botswana's agricultural land would be adversely affected. For instance, the widespread outbreak of wild fires has become a common phenomenon in Botswana, yet the agro-climatic environment is drought-prone and highly fragile. Continued public education on the environment coupled with such income tax relief measures could prove beneficial in the long run. However,

although the BMC throughput tax enables the government to recover much from beneficiaries of livestock subsidies, there is a need to determine the impact of this tax on off-take rates. Similarly, the government has recently adopted the Income Tax Act which exempts farmers owning 300 cattle and less from paying tax. It remains to be seen whether such a tax dispensation may in fact not aggravate the range degradation in the communal areas.

Besides fiscal and monetary measures, the government's wage policy may, if not well-administered and examined, contribute to the decline of the agriculture sector. A unilateral imposition of a minimum agricultural wage irrespective of labour's productivity, etc. may adversely affect the performance of the sector. There are plans by the government to consider introducing a minimum wage for farm workers.

It is important that the country's overall macroeconomic environment does not discriminate unduly against any single sector over an extended period.

In summary, the attainment of the agricultural policy objectives will hinge upon improving performance. This can be achieved by paying particular attention to key sectoral issues and providing solutions to these issues in an integrated approach, diversifying the production base to other alternative but potentially viable enterprises/subsectors and ensuring as far as possible a stable but relatively distortion-free macroeconomic environment.