

## **CROP PRODUCTION AND FOOD SUPPLY TRENDS IN BOTSWANA**

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### Introduction

When Botswana attained political self determination twenty years ago, the country was just emerging from a prolonged and devastating drought. Twenty years later, the country is almost emerging from yet another prolonged drought with equally devastating effects on agricultural production. This time around, the effects of drought have not only been felt in Botswana, but have affected almost all the countries of sub-Saharan Africa, drawing world attention to the resultant food crises and the way these countries have managed their economies during the two decades of political independence.

Sub-Saharan Africa has been performing exceptionally poorly in food production compared to other world regions. Poor performance, together with deterioration in terms of trade in Africa's major commodities (agricultural), runaway debts and balance-of-payments problems, unfavourable political developments, and high rates of population growth have created the severe food shortages experienced lately in the region. This tragic situation has forced the governments of sub-Saharan Africa to re-assess and re-define in policy-terms, the role that agriculture in general, and food production in particular, should play in their national development efforts [see OAU PLAN of Action; SADC Project Papers on Food and Agriculture; World Bank, 1981 Report; FAO, 1981].

In Botswana, the food crises has not had the tragic consequences such as experienced in Mozambique, Ethiopia, the Sahel countries, etc. But the natural environment and the way it has been managed might suggest that this country's food situation is not far from reaching tragic crisis level. For one thing, the country experiences a regular cycle of droughts, [the most severe occurring every twenty years or so (Botswana Society, 1979 )], and is thus seriously handicapped in food production. For another, the soils are one of the world's poorest and most unsuited for arable production. In addition, unreliable rains make it generally uneconomic to improve the productivity of the soil through the use of fertilizers (Sims, 1982; Lightfoot, 1982). Furthermore, the natural resource base for food production has deteriorated drastically over the years - particularly since independence, largely through neglect and mismanagement. Until very recently, crop production was never a priority in the country's development efforts.

This paper will review food production trends of the past twenty years and assess how Botswana has coped with (a) drought conditions (b) the pressures of developing a technologically backward arable sector, (c) the competing demands of an export oriented beef industry and domestic oriented crop sector, and (d) the conflicting demands of economic growth and distributional equity. The major aim of this review is to assess the strengths and weaknesses of development efforts in order to identify areas for future intervention.

#### Food Crop Production and Botswana's Food Supply

In common with most developing countries, Botswana derives the bulk (83 percent) of her dietary energy from crops and other vegetable foods. Cereals alone contribute 56 percent of calories, with 49 percent of this deriving from maize and sorghum (FAO, Production Year Book). For the majority of the population in Botswana, food is produced on a subsistence basis. Available data suggest, however, that over the past two decades (except in only two years) the country has never

produced enough to satisfy the dietary needs of its population. And that on average, it has at best managed to produce 50 percent of its cereal requirements.

Even among the farming households, only a tiny proportion actually ever produce enough for their subsistence needs. Under favourable conditions, the majority of these farming households harvest a crop output of 250kg to 600kg per farm. But in order to meet their dietary needs, they should produce at least 1260kg per farm (Alverson, 1979; Oland et al, 1982). The large production deficit means that, as Otzen (1981) and Grivetti (1981) observed in their village case studies, most of the households are usually out of supply for up to six months after harvesting their crops. The problem is further exacerbated by the fact that production is characterized by large fluctuations.

Since the 1960's drought, for instance, production of cereals has reached peaks of up to three times the 1961-65 output average. There was an 8 percent drop after the 1976 peak, a rise of up to 50 percent of the 1976 peak, then another plunge during the current drought to about 1/6 of 1976 (Botswana Agricultural Statistics). Although these output variations can be directly attributed to fluctuations in rainfall, they are also reflective, to some degree, of human responses to both environmental and socio-economic conditions (such as lack of an effective food policy).

Botswana's physical ecology is very harsh and quite unsuited to crop farming. However, Botswana have been producing food under these uncompromising conditions for quite some time. Available evidence suggests that from the 1920's until independence, domestic production was fairly near self-sufficiency (98 percent) except in times of drought (Opschoor, 1981; Heisey, 1985). However, since independence and the 1960s drought, self-sufficiency has never risen above 50 percent except in only two years. Botswana has therefore been continuously receiving food aid since independence. Commercial imports have

also been rising in relation to increasing demand for food. Developments since independence have tended to favour livestock and export beef improvements at the expense of food crop production, even during the 1966-78 period when, by Botswana standards, the rainfall regimes were reasonably normal.

The crop sector has on average been attracting only a fifth of development funds channelled into agriculture. Crop producer prices have also been fixed at 50 percent to 60 percent below world market prices (Botswana Agricultural Memo, 1980). By contrast, livestock (beef) production has enjoyed guaranteed and higher world market prices via the European Economic Community, and has been generously subsidized in the form of infrastructure, credit facilities, and disease control services. The incentives and market opportunities for livestock have been so lucrative that it takes little if any efficiency to make comfortable profits in this sector.

This development has worked against crop production in that, with the rising profitability of commercialized livestock production, ownership of cattle has increasingly come to determine the level of productivity in arable sector. Whereas formerly, with the mafisa system, farmers could have had indirect access to cattle; in recent times, cattle owners are less willing to have their livestock used as mafisa, preferring instead, to breed them for sale. This is particularly significant considering that a tiny proportion of farmers own a disproportionate percentage of the national herd.

Studies done since the late 1970's show that families with inadequate draught resources (ie. those owning less than 40 herd of cattle or none at all) tend to plough smaller tracts of land, plough and plant late as a result of later access to draught power, and therefore, harvest lower outputs. Those with 40 or more cattle tend to make the most of the short rainy season by ploughing and planting early and on larger tracts of land - thereby ensuring themselves higher output during normal rainfall years. However, these studies also show that as a

rule, Botswana's large farmers have come to eschew crop farming in favour of livestock breeding (Odell, 1980; Litschauer and Kelly, 1981; Opschoor, 1981; Gulbrandsen, 1984). This means that farmers with the most adequate resources and the greatest capacity to significantly alter the level of food crop output in this country do not participate in crop production. Data show that within the freehold farming sector, less than 45 percent of the 360 commercial farmers engage in crops. For communal land tenure areas, data are not disaggregated enough for us to determine the proportion of large farmers not participating in crop production.

The 1975 Rural Incomes Distribution Survey indicates that the richest 90 to 99 percent of rural household do not get any income from crops. Furthermore, although annual agricultural statistics do not indicate which classes of farmers participate at what level, they do suggest that among the country's 84,600 agricultural farmholds 22 percent are purely cattle or cattle and smallstock owners. Another six percent keep smallstock only: but these are unlikely to be rich farmers. Despite their low participation in crop farming, the few large farmers who do engage in arable production make a disproportionately high contribution to total food output.

Since 1980 for instance, commercial farms have contributed between four percent and 15 percent of total sorghum output from one to three percent of the total land planted with sorghum. In that period, these farms accounted for less than one percent of all the farms planting sorghum. During the same period, commercial farms made up less than one percent of farms planting maize accounted for seven percent of the maize land, but produced 24 to 72 percent of the total maize output (Botswana Agricultural Statistics).

Within the communal land tenure sector during the same period, farms over 10 hectares made up two to four percent of the sorghum farms; accounted for 12 to 30 percent of the sorghum land and contributed 16 percent of the total sorghum output.

Similarly with maize, the big farms made up two percent of the maize farms, five to 25 percent of the area planted with maize, and produced up to 82 percent of the total maize output produced in the traditional sector. Together the big farms account for at least 1/4 of the sorghum output and at least 60 percent of the maize output produced in the 1980s.

For the earlier period, data are not available on the contributions of these large farms to food output. The earliest available data are for 1971 when commercial farms accounted for one percent of sorghum production and two percent of maize output. In terms of trends, it is difficult to see whether or not these farms are becoming the dominant producers of maize/sorghum because of the paucity of data for the 1960s to mid 1970s. However, Heisey (1985) suggested that there might be a general trend towards the big farmers dominating production. In the light of recent policy developments on food, this phenomenon is likely to become more apparent (the National Food Strategy now puts greater emphasis on the development of the commercial/large-scale farms to meet the food demand of the domestic market).

On the whole, although the big farms have considerable resources to further improve the quality of their crop production, their investment in arable farming has been relatively low. In an economic analysis of crop production based on the 1975 Rural Incomes Distribution Survey (RIDS), Lucas (1981) noted, for instance, that despite the bigger land areas allocated to large farmers (i.e. larger cattle owners) there was a weak upward trend in yield per unit of land with cattle ownership up to 80 herd, followed by a sharp decline among the biggest cattle owners. He thought that this decline might be explained in terms of the extensive farming techniques used by the big farmers.

The 1980 Botswana Agricultural Sector Memorandum also noted that farmers generally failed to adopt the technological innovations and high yielding inputs advanced by the

government's Department of Agricultural Research. Other studies indicate that large farmers may not even incur cash costs for their cropping activities (Galbraamsen, 1980; Opschoor, 1981) since they usually produce enough crops for seeds as well as consumption and sale.

In the more recent years, however, large farmers have become more active in maize production where they are improving their investment levels (e.g. buying motorized farming technology like tractors, harrows, etc). Although data are very scarce, it is most probable that in the earlier development programmes for the arable sector the large farmers in the traditional sector were the chief beneficiaries. Even in recent years with the Arable Lands Development Programme, a good percentage of the participants are large farmers with over 10 hectares and with over 40 head of cattle [See ALDEP evaluation report].

There is, however, still much room for development in terms of yield rates in the large-farm sector. The 1981-84 agricultural statistics show that yield rates still generally decline with the increase in land area, rising a bit among farmers over 10 hectares. In 1981 for instance the smallest farms had an average yield of 244kg per harvested hectare compared to 347kg among farms over 10 hectares. The large farms' output superiority is more a function of land area cultivated than productivity per unit of land.

It is estimated that it is technically possible, under prevailing ecological conditions in Botswana, to achieve yields of two tons per hectare. But this yield does not seem to have been achieved even in the commercial farm sector. These farms normally produce sorghum yields 2/5 greater than those of the large traditional farms, and maize yields 2/3 higher. However, the best average yield rate they have so far achieved has been one ton per hectare of maize (Botswana Agric. Statistics).

In terms of household food availability, the production trends in the small-farm sector are particularly significant as this sector accounts for over 90% of crop farming households. Indicators suggest that although the number of farming households has doubled over the past two decades, the level of food output has not changed. Opschoor (1981) estimates that average yield rates were around 270kg per hectare (90kg per acre) in the 1930s and 1960s, and around 270kg per hectare (weighted) between 1970 and 1980. Current data suggest 250kg per hectare is still the average yield rate, but this has dropped since the deepening of the current drought.

The implication of this stagnant level of production is that Botswana's farmers have not improved their farming technology in line with the level of output required by their growing numbers and the commercial economic setting of modern Botswana. Yet, since the early 1960s efforts have been made by government to encourage investment in improved technology and farming practices. Up till 1974, development thinking and policy direction in Botswana (as in other parts of the world then) tended to focus on encouraging a minority of resource-rich subsistence farmers to adopt new and higher-yielding technologies, and to act as models for other, less progressive and lesser-endowed to emulate.

Since 1974, there has been a gradual shift towards broadening access to new technology to a wider spectrum of subsistence farmers. By 1979, Government had begun to initiate development programmes specifically geared towards ameliorating the production constraints of the resource-poor farmers who form the majority of arable producers. The Arable Lands Development Programme (ALDEP), in particular, has been the major effort towards developing the small farm arable sector, with the Accelerated Rainfed Arable Project, and Drought Relief Programmes complementing it.

ALDEP was initiated to directly benefit some 11,000 small subsistence farmers (17 percent of Botswana's crop farms)



during its first phase of five years. The project was meant to upgrade the farming technologies of farms by improving their supply of draught power and providing basic implements, fencing and on-farm water supply on a graded and selective basis determined by the farmers' economic circumstances. The project proposed no change in the basic method of land preparation and cropping patterns other than to advocate for change in the investment pattern. It was envisaged that if ploughing were done earlier as a result of this investment in on-farm water and farming inputs, planting would then be timed to make optimum use of the scarce rain water resources. These changes were expected to bring noticeable changes in the level of total output.

At one level, increases in yields per unit of land would be brought about by timely ploughing and planting and, for some, through row-planting and use of fertilizers. At another level, increases would be gained through the expansion of cultivated land. Each farming model would be able thus to increase its output by more than 50 percent so that at full-term of the Project development, the 11,000 farmers would have increased crop output from 595 tonnes during the first year to 21,581 tonnes (ALDEP Appraisal Report, 1981).

Despite available data on rainfall forecasts (see 1979 Symposium on Drought in Botswana) ALDEP's planners failed to take account of the possibility of drought, so that the project tended to be premised on unrealistically favourable rainfall patterns. In the event, the production goals set for the Project were unrealised largely because of the coincidence of its implementation with the drought.

The Project has also been overtaken by events because policy has now shifted away from an essentially equity-oriented thrust to a national food-security focus. The shift in policy, while still retaining the equity orientation of ALDEP has now put medium and large scale producers at the forefront of the country's strategy for food production development. The impact

of this shift, and the resultant re-direction of national resources, have still to be assessed in terms of their impact on food productivity and security at both national and household levels.

### Summary and Conclusion

Statistical data on Botswana's food production over the first two decades of political independence are not consistent and reliable enough to provide discernible trends. However, other indicators such as stagnant yields, the persistent and high volume of food aid imports, the increasing volume of commercial food imports, the rising proportion of the non-agricultural population, etc, taken together, suggest low productivity and an increasing production deficit.

Botswana's physical environment makes agricultural production a particularly risky venture, and development of the sector particularly challenging. However, there are indications that there is scope for increasing land productivity and food crop output, and that this potential has yet to be realized (See Lightfoot, 1982 on the potential for traditional agricultural technology; and reports from agricultural research projects). Government policy for realizing this perceived potential has been to identify producers with the capacity to adapt new, ostensibly higher yielding technologies, and to back them up with research, marketing channels, subsidies and credit facilities. These target producers have varied over the years from "progressive farmers", to "small farmers", and currently, to the multiple class categories of small-rainfed, medium and large commercial farmers; the target group changing mainly in line with other objectives besides increased production that the policy aimed to achieve.

In terms of coping with the physical environment its only towards the second decade of independence that policy begins systematically to make attempts to help producers cope with the drought. Drought relief programmes and the Accelerated Rainfed

Agricultural Programme for instance are meant to ameliorate the effects of drought and help with recovery. Research efforts have also focussed on improving traditional technology to increase yields.

The mechanisms for evaluating the impact of policy on production at household or farm level were not quite in place during the period under review. Evaluations reports on ALDEP and its impact on the other hand have only now begun to improve in reliability. There is also a dearth of empirical data on the nature and capacity of the various classes of food producers to respond to incentives. Social Science literature would suggest however, a general lack of response to new technology. But without systematic evaluation of the economics of such technology and the nature of the response of those participating in particular programmes, conclusions on response remain largely intuitive and too general.

REFERENCES

- Alverson, H.  
1979 Agricultural Development in Botswana: Targets and Constraints (IDM, Gaborone).
- Botswana Government  
1981 Appraisal Report - ALDEP Phase I Project (ADB/IFAD joint Programme).
- \_\_\_\_\_ Botswana Agricultural Statistics (several years)
- \_\_\_\_\_ 1985 White Paper No 2 1985 on National Food Strategy.
- Botswana Society  
1979 Symposium on Drought in Botswana (Botswana Society; Gaborone).

FAO

Production Year Book

- \_\_\_\_\_ 1981 Agriculture, Towards Year-2000 (Rome).
- \_\_\_\_\_ 1982 Preparation of Project Proposals for the Establishment of an Early Warning System for Regional Food Security (SADCC countries AG:TCP/RAF/2202 Mission Report, Rome).
- Grivetti, L.E.  
1981 "Geographical Location, Climate and Weather, and Magis; Aspects of Agricultural Success in Eastern Kalahari, Botswana" in Social Science Information, Vol 29, No.3.
- Gulbrandsen, O  
1984 "Access to Agricultural Land and Commercial Land Management in Eastern Botswana" (Ministry of Local Government and Lands, Gaborone).
- Lightfoot, C.  
1982 "Agricultural Research for Development of Small Farmers: A Closer Look at Traditional Technology" in Botswana Notes and Records Vol. 14).
- OAU  
1981 "Lagos Plan of Action for the Economic Development of Africa, 1980 - 2000 (OAU," International Institute for Labour Studies Geneva).
- Odell, M.  
1980 "Planning for Agriculture in Botswana: A Report on the Arable Lands Survey" (IDM/Ministry of Agriculture, Gaborone).
- Otzen, U.  
1981 "Nutritional Needs Oriented Rural Development Planning for Botswana" in Quarterly Journal of International Agriculture Vol. 20 No 3).

- Oland, K., et al  
1980 Target for Agricultural Development in Botswana Government Printer. Gaborone.
- Opschoor, J.  
1981 "Crops, Class and Climate: Environmental and Economic Constraints and Potential of Crop Production in Botswana" in M.A. Comen et al, (eds) Botswana's Economy Since Independence McGraw-Hill, New Delhi.
- SADCC  
1984 "Proceedings of the 1984 Annual Conference, Lusaka".
- Sims, D.  
1981 "Agroclimatological Information, Crop Requirements and Agricultural Zones for Botswana" Ministry of Agriculture. Gaborone.
- Srivastava, P. & S. Matswe  
1983 Report on Field Visit of ALDEP Monitoring Officers September to November 1983 ALDEP Monitoring and Evaluation Unit, Gaborone.
- World Bank  
1981 Accelerated Development in Sub-Saharan Africa.