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**The Challenge of Agriculture, Environment and Sustainable Development in Botswana**

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**Abstract:** One of the objectives of agricultural development in Botswana is the increase of agricultural productivity in both arable and livestock production in order to increase farm incomes and thus help to make agriculture a sustainable activity. This paper looks at the challenges that Botswana faces in meeting this objective while minimizing any land degradation that may accompany the process of increasing agricultural productivity. The prospects of achieving increases in agricultural productivity are also examined in the light of new opportunities in agriculture such as the National Master Plan for Arable Agriculture and Dairy Development (NAMPAADD) and the Revised National Policy for Rural Development. The selective use of existing technologies that minimize land degradation in the process of achieving sustainable increases in agricultural productivity and the relevance of socio-economic factors such as marketing and credit in facilitating sustainable increases in agricultural productivity with minimum degradation to the environment are highlighted.

### 1. Introduction

The need to increase agricultural productivity in both crop and livestock production in Botswana in order to satisfy the food, industrial, employment and income requirements of a growing population has been a major policy objective of successive national development plans such as National Development Plan 7 (1991-1997), National Development Plan 8 (1997/8-2002/03) and National Development Plan 9 (2003/04-2008/09). Although much of the low productivity in agriculture has been attributed to the harsh semi-arid and arid climate of the country there is the optimism that the potential of agriculture in crop and livestock production is yet to be tapped. Government policy is therefore to “ensure the long term viability of the agricultural sector and its competitiveness in both domestic and international markets (Republic of Botswana, 1007, p. 245). Given the policy objective of the Government of Botswana to seek to generate increases in agricultural productivity there is the likelihood of increased pressure being exerted on agricultural and non-agricultural resources and on the environment. The paper therefore seeks to examine some of the anticipated pressures and also looks at the relevant intervention measures necessary to achieve a sustainable agricultural development given recent initiatives such as the National Master Plan for Arable Agriculture and Dairy Development (NAMPAADD).

This paper is divided into four sections. The first section is the introduction to the paper. The second section looks at the challenge agricultural development in Botswana. The third section examines the likely impacts of pressures on the environment as efforts are made to intensify increases in agricultural productivity. The fourth section dwells on the relevant intervention measures needed to achieve sustainable development in Botswana. The fifth section, which is also the conclusion to the paper, dwells on the recommendations that arise from issues discussed in the paper.

### 2. The Challenge Agricultural Development in Botswana

Yields of crops have generally been low with the base yield for cereals produced on traditional farms estimated to be 200 kg/ha while the estimate for commercial farms has been put at 1,000 kg/ha. It is anticipated that by the end of NDP 9 in 2009, targets of 500 kg/ha and 2,500 kg/ha would have been achieved by traditional and commercial farms, respectively (Republic of Botswana, 2003, p. 201). It is estimated that Botswana's crop yields are roughly one-third of the yields of neighbouring whose rainfall regimes are better and whose management systems are better developed than Botswana's (MFDP, 1994, p.

95). Table 1 shows that the low crop yields in the arable sub-sector have resulted in food deficits which have been met by food imports mostly from South Africa and Zimbabwe.

Although productivity in the livestock sub-sector is known to be better than that of the arable sub-sector, the livestock sub-sector is also known to exhibit low productivity despite the widespread use of exotic breeds and a developed control programme against diseases. Problems in the traditional cattle sector where about 86 per cent of the herd is managed have included a generally poor grazing management system resulting in the overgrazing of rangelands and low off-take, calving and mortality rates of 10, 50 and 12 per cent, respectively. The corresponding figures in the freehold or commercial cattle sector are 17, 60-70 and 5 per cent, respectively (Republic of Botswana, 2003, p. 181).

**Table 1: Annual Cereal Balance Sheet during NDP 8**

| Year    | Maize/Sorghum (000 metric tons) |                |          |
|---------|---------------------------------|----------------|----------|
|         | Requirements                    | Gross Harvests | Deficits |
| 1997/98 | 230.5                           | 28.4           | -202.1   |
| 1998/99 | 214.5                           | 10.02          | -204.3   |
| 1999/00 | 218.9                           | 18.7           | -200.2   |
| 2000/01 | 209.0                           | 20,7           | -188.3   |
| 2001/02 | 188.0                           | 11.2           | -169.8   |

Source: Botswana National Early Warning Unit, 1997/98- 2001/20002. Quoted in Republic of Botswana, 2003, p. 177.

Table 2 presents information on the performance of the agricultural sector during the period 1997/08 to 1999/2000. The data show that agriculture's contributions to the Botswana's gross domestic product (GDP) during the period 1997/98, 1998/99 and 1999/2000 were 3.4, 3.0 and 2.6 per cent, respectively. Thus the sector's contribution to GDP declined by almost 31 per cent during the period under study compared to the higher contributions of mining and other sectors. The growth rate of the agricultural sector also declined from 5 per cent to 0.9 per cent and stagnated at 0.9 per cent during the period under consideration. Although there were initial declines in the growths of mining and other sectors, they were able to recover considerably compared to the agricultural sector.

**Table 2: Agriculture's Contribution to the Botswana's Economy**

|   |          |          |           |
|---|----------|----------|-----------|
| Sector Contribution to Total GDP        | 1997/98  | 1998/99  | 1999/2000 |
| Nominal GDP (P Million)                 | 20,162.6 | 21,523.7 | 25,362.7  |
| <b>Contribution in percentage terms</b> |          |          |           |
| Agriculture                             | 3.4      | 3.0      | 2.6       |
| Mining                                  | 38.0     | 31.1     | 33.1      |
| Other                                   | 58.6     | 65.0     | 64.3      |
| <b>Annual Average Growth (%)</b>        |          |          |           |
| Total GDP (1993/94 prices)              | 8.1      | 4.1      | 8.1       |
| Agriculture                             | 5.0      | 0.9      | 0.9       |
| Mining                                  | 9.5      | 1.0      | 12.1      |
| Other                                   | 8.4      | 8.4      | 7.1       |

Source: Adapted from 2001 Republic of Botswana, Annual Economic Report. Quoted in Republic of Botswana (2003) *National Development Plan 9*, p. 176.

The poor performance of the agricultural sector as indicated in Table 2 has been attributed to "endemic drought, unfavourable agricultural conditions (i.e., poor soils, low rainfall, insufficient infrastructure, diseases and pest outbreaks, poor farming practices, low adoption of technologies to enhance productivity, lack of security of tenure, poor organization of market for domestic produce), conflict of government policies (e.g., drought relief programme during the ploughing season, dual grazing rights, ...), high input costs, inaccessible credit for agriculture and the consequent inability of the sector to attract able-bodied and innovative entrepreneurs who could improve productivity" (Republic of Botswana, 2003, p. 176). Despite this poor state of affairs, the agricultural sector is considered an important sector in Botswana's economy

due to the sector's linkages to rural and urban households, agro-processing, manufacturing, foreign exchange generation through trade and employment generation in the rural areas.

### **3. The Challenge of Environmental Sustainability**

#### **1.1 Land degradation and causes of land degradation**

As efforts are made to increase agricultural productivity in Botswana, there is the likelihood of pressure being exerted on environmental resources resulting in environmental degradation. It has been said that "environmental resources do not exist outside of the environmental milieu. Instead, they are intrinsically intertwined into the fabric of environmental processes. These processes, by and large, determine the quantity and quality of the resources. Some of these processes are purely natural, while others are a consequence of man's exploitation of resources. One consequence of human use of the environment which carries grave implications for the quality and quantity of environmental resources is environmental degradation" (Sefe and Acquah, 1995, p. 161). Environmental degradation has been defined as "the reduction in potential productivity or a destruction of the biological potential of the land" (Sefe and Acquah, 1995, p.162).

This section of the paper briefly looks at the phenomenon of environmental degradation, especially its causes and its various forms. Land degradation, although affected by the physical processes of soil erosion, is generally thought to be human induced phenomenon. Improper land use practices are thought to be the trigger needed to accelerate soil erosion which results in land degradation. Population pressure is often cited as a major cause of land degradation. This situation arises when the land exceeds its carrying capacity. However, there have been instances in which despite a high population density, effective measures have been taken to ensure a well planned land use system in the form of terraces which have contributed to a sustainable use of the land. There have also been instances in which land degradation has occurred without population pressure being a cause. Therefore population pressure may not necessarily be the causal agent of land degradation. Poverty has also been mentioned as a cause of land degradation. The poor peasant is assumed to be too busy trying to survive or fend for himself than being concerned with saving his immediate surroundings.

#### **1.2 Aspects of environmental degradation in Botswana**

Aspects of environmental degradation which are of relevance to sustainable agricultural development include rangeland pasture degradation, growing pressure on water resources, pollution in rural areas and damage to soils arising from inappropriate use of ploughing equipment (Republic of Botswana, 1992, pp. v-vi). These aspects of environmental degradation are examined briefly as follows:

##### **Rangeland Pasture Degradation**

Overgrazing of rangelands have arisen as a result of overstocking of the range beyond the range's carrying capacity. Degradation of rangelands in Botswana is usually seen in the form of "trampling, by loss of the grass and browse cover leading to exposure of the soil so that it becomes prone, initially to erosion by wind and water and ultimately through the complete removal of vegetation to desertification to desertification in extreme cases (Republic of Botswana, 1988, p.48). Increases in livestock levels, especially cattle, have been attributed to low off-take rates as a result of the reluctance of some farmers, especially small scale farmers to sell their animals. The animals are considered a stock of wealth, hence assuring the owners of good standing in the society.

##### **Growing Pressure on Water Resources**

Pressure on water resources in Botswana stem from a rapidly growing demand resulting from an increased population growth, increased urbanisation, rising incomes and standard of living and increased human activity requiring water, especially in the south-eastern part of the country. Growing pressures on water

resources are also exacerbated by the fact that the country's surface water resources are located in the north, far from the areas greatest demand in the south-east (Republic of Botswana, 1992, p.v.)

### **Pollution in Rural Areas**

Pollution in the rural areas have increasingly been in the form of water pollution in the form of increasing nitrate content levels in groundwater stemming from cow-dung and other faecal matter. Pit latrines, sewage ponds and boreholes are major routes of contamination. Other sources of environmental pollution have included the contamination of soils and vegetation through chemical emissions from mining operations. Chemical fertilizers and pesticides have also been found to be sources of chemical pollution

### **Degradation of Top Soils through Inappropriate Use of Ploughing Equipment**

This problem exists and can be minimised with the co-operation of appropriate mechanisation personnel in government extension services.

## **4. The Challenge of Sustainable Development in Botswana**

### **4.1 Measures to deal with environmental degradation and pollution**

The appropriate measures to deal with or minimise environmental degradation and pollution are in place. What is required is the enforcement of measures to stem or minimise levels of degradation and pollution to make the environment sustainable for increased agricultural activity to raise productivity levels.

### **4.2 Opportunities for increasing agricultural productivity through the national master plan for arable agriculture and dairy development (NAMPAADD) and other programmes**

#### **4.2.1 NAMPAADD**

NAMPAADD generally seeks to improve the performance of the agricultural sector, especially the arable sector “ by modernising it through the introduction of improved technologies, efficient use and management of human, land, and water resources, and mechanization and commercialisation of agricultural production” (Republic of Botswana, 2003, p. 188). The following strategies are to be adopted to facilitate the performance of the rain-fed agricultural sub-sector under NAMPAADD:

- Provision of accurate maps showing location of lands suitable for rainfed farming in the target districts
- Targeting of full-time dedicated farmers who aspire to progress to be commercial farmers through the use of mechanized and modern farming systems, and acquisition of improved technology and management skills.
- Formation of cultivation groups to be provided with requisite training in crop husbandry practices.
- Agricultural centres will be established and located within the production areas to serve several cultivation units.
- Pilot agricultural service centres will initially be set up and managed by Government but will be managed by private entrepreneurs once their viability is proven
- Government will establish pilot farms to demonstrate new technologies to facilitate their quick adoption by farmers.

### **4.3 Other programmes**

Other programmes to be facilitated by Government to improve agricultural productivity include irrigated agriculture, dairy farming, and agricultural insurance and credit. With regard to insurance, the facility is being set up to minimize farmer risks which result from annual and seasonal climatic variability and from other natural disasters. The insurance fund is also to facilitate investment in agriculture. Farmers experiencing genuine losses will be liable for compensation in areas where mean annual yields of crops are economically viable. Access to credit will be facilitated by Government through specialised agricultural credit institutions.

## 5. Conclusion

This paper has discussed the important policy objective of increasing agricultural productivity in both crop and livestock production in order to improve agricultural incomes, reduce importation of food, provide employment and provide raw materials to industries. A factor militating against this noble objective is the harsh climate in Botswana. However, the Government is determined to succeed in this venture. Thus given the political will and the relevant resources the likelihood of success in increasing agricultural productivity in Botswana is bright.

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