



## Agriculture and Food Security Policy Brief

### Reflecting on the Challenges of Attaining a Green Economy<sup>1</sup> for Botswana

#### Introduction

This policy brief aims to raise awareness on the status, challenges and opportunities of the agriculture sector in Botswana. The policy brief captures progress to-date in improving production on the various sub-sectors of agriculture. It reflects on the challenges of the sector in light of climate change and the crises of food and energy prices, especially so against the backdrop of a global outcry to (i) reduce the numbers of people living in poverty and extreme hunger, and (ii) to reduce the rate at which the earth is losing its biodiversity and their habitats. These factors are most pertinent at this time when the atmosphere is currently suffering from an ever rising concentration of carbon dioxide and other Green House Gases, and freshwater systems are progressively shrinking. The balance between the global demands for poverty reduction and food security, and those of environmental sustainability translate into a complex national development agenda which this policy brief attempts to articulate for the benefit of appropriate reforms in the agricultural sector.

#### Status of Agriculture

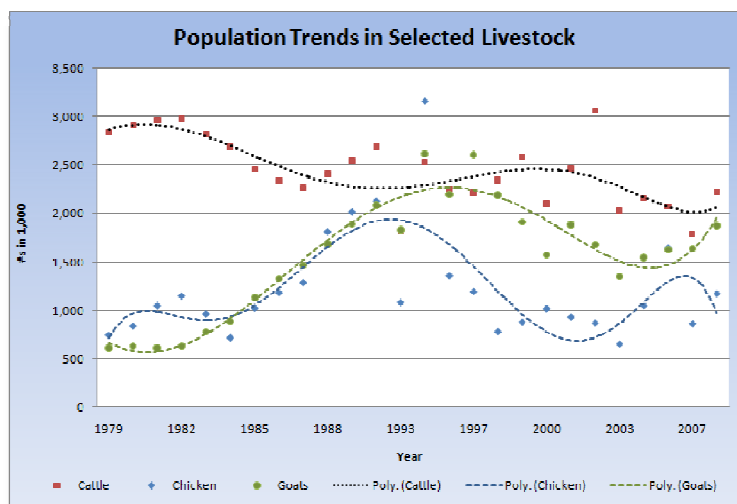
The Agricultural sector in Botswana covers both crops and livestock production. Traditional farming is the most dominant in terms of numbers of people involved and the geographical coverage. The majority of farmers are small-scale farmers who typically need continued assistance in capacity building to commercialize agriculture. An effective and vibrant extensive service is therefore an important input in improving the performance of the sector and its resilience to market changes and climate change. The beef industry is the only sub-sector of the agriculture sector that has constantly remained a significant contributor to the national Gross Domestic Product (GDP). The Agriculture sector has experienced a steady decline in its contribution to GDP over past 42 years. The poor performance of the sector therefore represents an added challenge to the fight against poverty. From a 42.7% share in GDP at independence in 1966, agriculture has fallen to 1.9% as at 2008 (Ministry of Finance and Development Planning, 2010).

According to NDP 10, only 45% of farmers have access to roads, 17% electricity, 22% telecommunication, 64% water for livestock, 66% water for domestic use, 43% water for irrigation, 39% grain storage, 52% markets and 54% sanitation (Ministry of Finance and Development Planning, 2010). This has resulted in slow agro-industrial and supply chain development that is needed to drive the growth of associated sub-sectors such as food processing, transport and manufacturing. The livestock sector has fared much better over the years, compared to the crop sector. The volumes and diversity of livestock has shown increases (with minor fluctuations owing to drought and diseases), except for cattle. Poultry and piggery have shown significant increase. As expressed below in Figure 1, poultry has shown some relative increase although with high levels of fluctuations mainly due to diseases (Statistics Botswana, 2012). Goats have had a steady growth from very low levels in 1979. Cattle population has reduced slightly from 3.06 million to 2.22 million (see Figure 1). Productivity indicators for livestock show improvements

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<sup>1</sup> A Green Economy is one that results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities (United Nations Environment Programme, 2011). Operationally, it entails adoption of low carbon options, greater resource efficiencies and social inclusion.

reduced mortality rate, increased birth rates but limited change in offtake. In real terms, the livestock value has been declining over the years. The specific period reported in the Livestock Accounts Report is 1980 till 2003 (Department of Environmental Affairs, 2007).

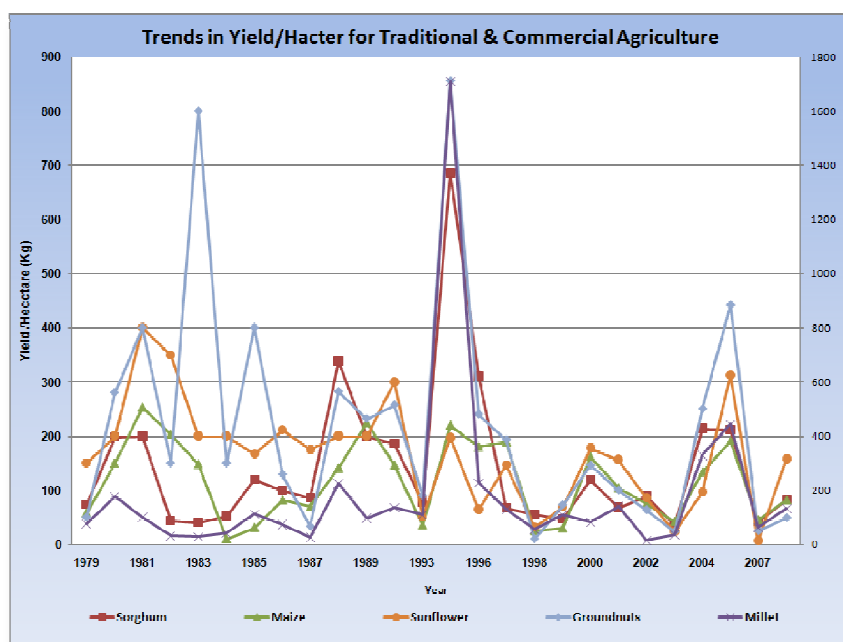


**Figure 1:** Trends in livestock population between 1979 and 2008 expressed as polynomial trends for cattle, goat and chicken (Statistics Botswana, 2012).

limits on its growth posed by recurring drought, limited skills, inadequate market access, marketing facilities and inadequate use of improved technology.

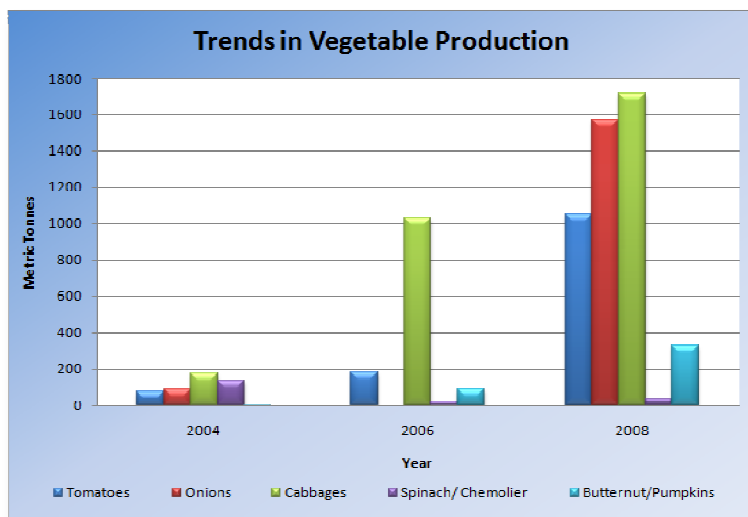
About 70% of rural household derive their livelihoods from agriculture, through subsistence farming. Crop production is mainly based on rain-fed farming. The industry is dominated by small traditional farms with an average size of five hectares. About 63,000 arable farms fit under this category, while only 112 farms are larger than 150 hectares (Statistics Botswana, 2012).

The trend between 1979 and 2008 as shown in Figure 2 points to a reasonably high potential for selected crops in the small-scale farming with production per unit area (kg/ha) going beyond 1,600kg/ha for millet, followed by sorghum and groundnuts. The three crops exhibit a consistently higher production efficiency. Due to their high protein value, they deserve to be promoted and supported through a range of policy instruments as a means of addressing rural poverty and nutrition.



**Figure 2:** Trends in crop productivity for traditional and commercial farming systems. NB: Millet is placed on a secondary axis (right) as its figures dwarf those of other crops. (Statistics Botswana, 2012).

Technological advances have been made in the dairy and horticulture sub-sectors through the National Master Plan for Arable Agriculture and Dairy Development (NAMPAADD) where extension services have been revamped



through training of extension workers and demonstration farms established. NAMPAADD also covers irrigation agriculture for horticultural production. There are still mixed results but with promising increases in production in selected fruit and vegetable crops (see Figure 3). The volumes of produce are clearly rising especially in tomatoes, cabbage and onion. Spinach appears to be declining while butternut is gaining only marginally.

Figure 3: Trends in vegetable production (2004 - 2008)(Central Statistics Office, 2008), (Central Statistics Office, 2010), (Statistics Botswana, 2012).

shows general increases in volume. Orange continues to dominate the production landscape while melons and bananas experience sporadic production.

Fruit production data collected only from farms specialising in fruit production (see Figure 4 below)

### Challenges Facing the Agriculture Sector

Major challenges facing the sector include production volumes and efficiency. Lack of infrastructure and support services hamper production but are themselves a result of a number of systemic gaps. Many of the production farms are scattered apart making it difficult to provide services such as roads, electricity, water, telecommunications and extension services.

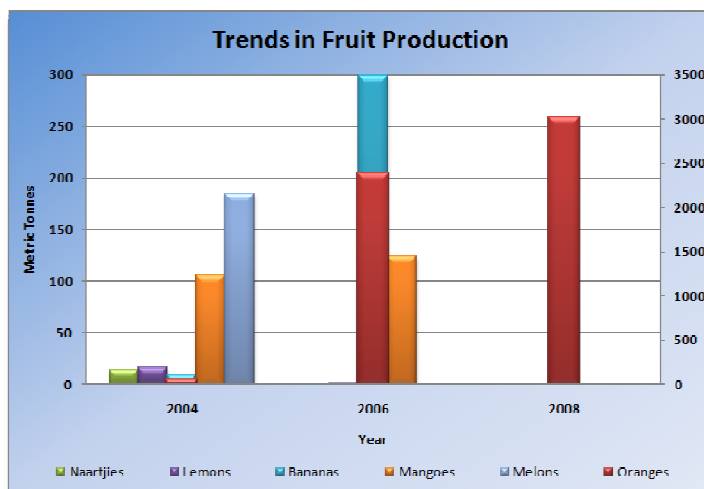


Figure 4: Trends in fruit production (2004 - 2008)(Central Statistics Office, 2008), (Central Statistics Office, 2010), (Statistics Botswana, 2012).

**Access to Water:** Nearly all of the grain is produced through rain-fed agriculture. This reliance on rainfall makes production (see Figure 2 above) as unreliable as the rainfall it intricately depends on. Soil moisture retention is low in many of Botswana’s soils. This is also exacerbated by soil caking and layering resulting from inferior tilling technologies (Sustainable Agriculture and Rural Development, 2007). This challenge of limited soil moisture severely limits rain-fed agriculture in Botswana. Other water-related challenges have to do with irrigation. Here the challenge is of underutilisation of water resources for irrigation. Of the estimated 210,000m<sup>3</sup> of wastewater generated country-wide, only around Gaborone city is used for extensive horticulture. Due to low rainfall, estimated to decline even further due as a result of climate change (Department of Metereological Services, 2011), the use of underground water for irrigation requires careful consideration. A number of aquifers are already being over-harvested just for human consumption (see Figure 5 below) (Central Statistics Office, 2009). The national water accounts of 2006

show that agriculture is the highest user of water but also the least productive (Department of Environmental Affairs, 2006) . Vis-à-vis achieving a Green Economy, the livestock sector needs to increase productivity to justify the levels of water consumption. Opportunities include reducing amount of time spent by animals on the range before offtake, increasing the calving frequency through systematic weaning, and placing emphasis on high productivity crops such as millet, sorghum and groundnuts.

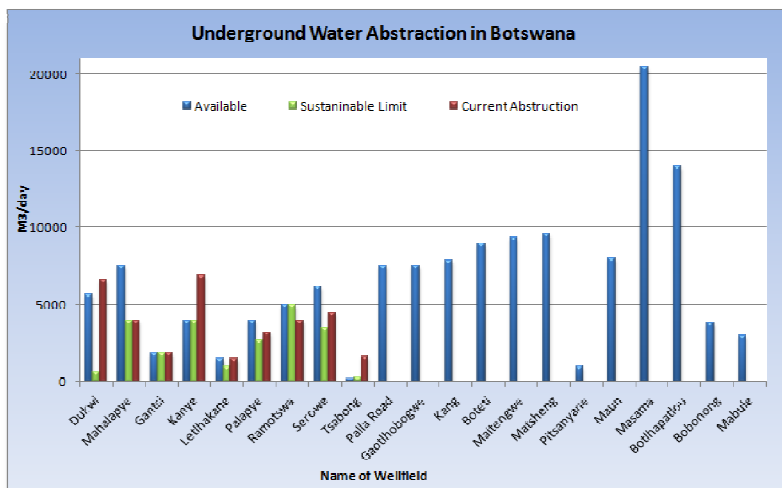


Figure 5: Record on underground water usage and sustainable limits (Central Statistics Office, 2009). nature as this will reduce the costs of supporting infrastructure.

**Land-use Planning:** The allocation of agricultural land has been user-driven with limited planning at community of district level on the location of various types of production system. This has made development of support infrastructure virtually inconceivable. The implementation of National Master Plan for Arable and Dairy Development (NAMPAADD) and related programmes aimed at improving productivity and access to inputs and markets will achieve better results if the land-use planning targets to congregate activities of similar

**Livestock Production:** Livestock has remained a significant sub-sector mainly due to the cattle industry. The main challenge is the weak linkages with markets. An extension service in its current state is concentrating on production and less on consumption. The Botswana Meat Commission (BMC) fails to meet its quota in the export market. Where it has, the prime markets have been inaccessible because of the sporadic supply and the differences in size of animals being slaughtered.

Other challenges, affecting the broad range of farm animals is the lack of clustering of production centres. These affect the ability to access essential services such as water, energy, extension services, markets and product interchange (e.g. poultry manure and horticulture).

**Gender and Agriculture:** Access to land is the one area where progress has been significant and has direct positive implications for address gender disparities in the agricultural sector. This has been made possible by legal reforms on inheritance and marital laws. A number of systemic gaps however persist; including energy provision for extraction of underground water needed for livestock, and lack of social services (health and education) that will allow women to inhabit production land while pursuing their other roles of child-care. As shown in Figure 6, 21% of agricultural water-points use manual labour to extract underground water for livestock. This system disenfranchises women as they may lack the required power or torque to draw water and thus lose livestock or other assets in payment for the labour.

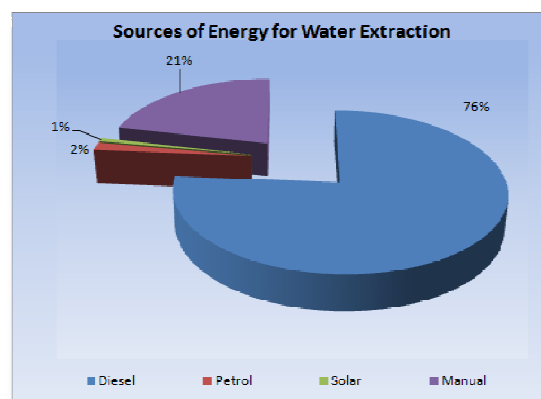


Figure 6: Sources of water energy used for extracting underground water for livestock consumption (CSO, 2008).

**Climate Change:** The decline in rainfall and rise in

extreme weather events is a unique challenge to the agriculture sector as it puts to test many of the systems that have been in place over decades. The agricultural sector was identified as one of the most vulnerable to climate change in Botswana (Department of Meteorological Services, 2011). The heavy reliance of the sector on rainfall makes it vulnerable. The crop subsector has proven to be the most vulnerable. An added challenge is that of weather forecast and prediction of extreme weather events. Forecasting needs to be long-term to allow farmers to make choices on the crops to plant. Early detection of extreme weather events is also essential to allow farmers to prepare mitigation measures. The frequency and intensity of flush rains poses its peculiar set of challenges affecting both the water and agriculture sector but requiring a coordinated response between the two.

**Agriculture and Biodiversity Conservation:** A majority of Green Economy challenges within the Agriculture sector in Botswana relate to the geographical expansion of the sector into natural habitats such as Wildlife Management Areas (WMAs). Other challenges have been around fencing and the severance of wildlife migration routes. *Vis-à-vis* on-farm activities; loss of habitat for wildlife especially as a result of bush-clearing for cropland, the indiscriminate use of pesticides and the poisoning of predators remain challenges. Loss of crops and livestock to wildlife is also rife in areas where agricultural land borders onto WMAs. Due to the limited application of fertilisers in many of the traditional farmsteads, there is no evidence of nitrate pollution. This however is a subject for further research.

Migratory species of wildlife have also suffered declines and remain vulnerable to droughts due to the fragmentation habitats resulting from veterinary disease control fences. The economic losses associated with habits fragmentation place and even greater burden on the agricultural sector to raise efficiency levels to offset the said costs.

Certain grass species such as thatching grass (*Eragrostis pallens*) has been declining in areas of high livestock density and in-turn placing the burden on the agricultural sector to offset the economic losses. Other factors contributing to plant-related biodiversity include wild fires and droughts. The sequencing of the events of drought, fire and livestock grazing has a more important role than the mere occurrence of these events. The management of the factors is often impeded by the low capacity and authority of local communities for formulating and implementing Participatory Integrated Land-Use and Management Plans (PILUMPs).

**Information, Technology and Extension:** Technology in agriculture represents an important input essential for raising productivity levels. Technology in the context of this policy brief includes both introduction of new equipment (as commonly understood) and new on-farm practices of using the same equipment and other resource differently and more efficiently. This policy brief therefore proposes that extension be an integral part of technological innovation required to scale-up productivity in agriculture. A broad range of areas of technology include breeding, weaning, scheduled animal-sales, tillage, crop rotation and other technologies generally defined as conservation agriculture<sup>2</sup>.

### Opportunities

Botswana's agriculture is laden with opportunities for meeting the green economy targets although it has remained relatively small for many decades. Its growth, now evident in a few of its subsectors, is coming at an opportune moment where the momentum and resources for governments to invest in Green Economy are brooding. Through careful selection of strategies and technologies, growth-limiting factors such as land, water and energy can be tackled in ways that bring efficiencies, decent jobs and environmental sustainability. The following opportunities are discussed in light of the challenges identified above and collectively, they represent a proposal for the agricultural sector's Green Economy agenda.

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<sup>2</sup> Conservation agriculture is gaining popularity and relevance as many production systems whose premise had been purely economic gains prove inadequate in addressing today's growing problems of ecological limits. It is a *holistic* and *sustainable* farming approach that applies three interlinked principles to mimic natural ecosystem processes: minimum soil disturbance through reduced or no tillage; permanent organic soil cover through cover crops, mulch and residues; and diversified crop rotations and associations.

**Organic Production:** Due to the low levels of commercialisation in many of the agricultural sub-sectors, opportunities for attaining organic production are abound. Cattle production is still primarily free-ranging and a tracer system exists. What lacks is a system that matches supply-led to production-led agriculture so that producers are an integral and active part of the global value-chain. Without such a system, a lot of the organic produce will struggle to reach prime markets and will go to waste. Crop production also remains abundant with organic farming opportunities whose efforts can be unlocked by such low-cost initiatives as labelling requirements at retail-level. Lucrative markets for organic products do also have stringent supply-chain management requirements – an element that speaks to the level and quality of agricultural extension services and intermediary services such as transport, packaging and storage.

**Irrigation Expansion:** In a water-scarce country irrigation presents opportunities for increased food security. With water saving technologies such as drip irrigation, production per m<sup>3</sup> of water can be increased. These systems are being practiced at Glenvalley and Dikabea irrigation projects and require methodical monitoring to allow for successful country-wide roll-out following the geographical footprint of the wastewater treatment facilities. The volume of wastewater produced daily is still a lot more than that consumed in irrigation – representing underproduction. Challenges of land availability around greywater sources are another consequence of limited local-level land-use planning.

**Participatory Integrated Land Use and Management Planning:** A number of the opportunities listed in this policy brief are grounded on the existence of a sound system for land and resources planning that emanates from community-level, cascading to district and national levels. It is through such a system of planning where local natural resources are mapped and utilisation programmes generated that address the diverse resources, identify areas for agriculture, commerce, tourism, ecological reserves. The lack of such a system at community level leads to conflicting land-uses that only exacerbate ecological inefficiencies such as over grazing, livestock predation, and suboptimal enterprises of tourism, poultry, etc. This system will stimulate local economic development and increase jobs, while lowering ecosystem disintegration and vulnerability to climate change.

**Increased Meat and Crop Production:** Based on the value-chain concept, meat production in Botswana still has potential to grow substantially even within the current resource-levels of rangeland, water and energy. The transformation needed is about market-led production where farmers understand that “someone is waiting in restaurant for a specific cut from part of their cow’s carcass”, and that a calf should be weaned for another to be born to complete the production cycle. This system applies to smallstock too. Inputs to production and access to markets are also essential, and have largely been addressed except for the negating factors of scattered distribution of production centres (farms). Other value-chain opportunities for optimising efficiencies within the livestock sub-sector include local utilisation of skins, hides, tallow and other products from abattoirs.

Crop production has the highest productivity in millet, sorghum and groundnuts. These crops deserve heightened policy attention through extension, value-chain linkages with producers and inputs-markets support. They represent the most efficient use of land and their local consumption can address nutrition and food security problems and in-turn, enhance child survival.

**Energy Efficiency:** Energy is an essential input into many agricultural processes. In the livestock sector alone, manually-operated systems especially in water pumping are reducing productivity and inclusivity. Reliance on fossil fuel is increasing volatility. Options for solar and biogas deserve policy attention for two reasons; (i) to reduce volatility within the sector and (ii) turn the agriculture into a low-carbon sector. The current BPC-Lesedi, a renewable energy franchise, is offering services in water pumping and solar lighting with IRRs of over 15%.

Energy for agriculture also presents challenges both in-terms of access and quality. The remoteness of many farms makes grid-electricity uneconomical because of high connection costs and transmission losses. Localised production, especially through hybrid solar-biogas plants can address many of the sector’s energy challenges.

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