

Potential welfare benefits of agricultural transformation in Botswana: A computable general equilibrium model analysis

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Abstract

This paper analyses the agriculture sector's performance, and quantitatively evaluates the development impact on the Botswana economy of the agricultural transformation strategy. The evidence shows that the agriculture sector witnessed an upward trend during the period 2006-2011. The main contributing factor to this upward trend appears to be good rainfall. The thrust of the quantitative insights emanating from simulations of advancement in farming technologies supports the policy stance that transforming agriculture by raising its productivity levels would lead to improvement in aggregate welfare. A 5% increase in Hicks-neutral technological progress in agriculture translates into 0.6% improvement in overall economic well-being that is proportionally distributed across rural and urban households. These findings clearly suggest that the improve-agricultural-productivity policy needs to include a component that will allow farm-workers' incomes to increase and prevent inequalities in the distribution of income from increasing as agricultural output expands.

Keywords: agricultural productivity, performance, quantitative insights, farming technologies, farm worker's incomes.

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Introduction

This paper reviews recent trends in the agriculture sector and quantitatively evaluates the welfare impact of the agricultural transformation strategy in Botswana. The motivation for the paper is the repeated policy pronouncements in the various Budget Speeches and in the tenth National Development Plan (Government of Botswana (GoB, 2009) that agricultural transformation achieved through productivity growth will translate into broad-based economic development. As such, the Government has been intensifying its productivity-raising investment programme. The agriculture sector has been observing an upward trend in recent years. This is largely attributed to good rainfall. A quantitative evaluation of the likely consequences of the agricultural transformation strategy suggests that raising levels of agricultural productivity can lead to economic development with broad-based economic growth. Notwithstanding, improvements in the agricultural technology manifests itself in the reduction of farm-workers' incomes, suggesting that a terms-of-trade policy that allows farm-workers' incomes to increase as agricultural output increases should be part of the productivity-raising package. While descriptive statistics are used in the analysis of the agriculture sector's performance, a computable general equilibrium (CGE) modelling framework is used to evaluate the development impact of the agricultural transformation strategy.

The rest of the paper proceeds as follows: the next section starts with a review of the agriculture sector performance. It ends with an argument for the improve-agricultural-productivity initiative. It is followed by a section that provides a brief description of the CGE model used to undertake the simulations for this paper and the database. The penultimate section reports the simulation results and this is followed by concluding remarks.

Recent trends in Botswana's agriculture sector

A distinguishing feature of Botswana's agriculture sector, which contributed 42% to gross domestic product (GDP) and 27% of formal sector employment at independence in 1966, is that its performance has been weak (GoB, 2009). This is mainly attributable to poor agro-climatic conditions: rainfall is highly variable, droughts are recurrent and can last up to seven years and only 4% of the country is suitable for agriculture. The weak performance of the sector is exacerbated

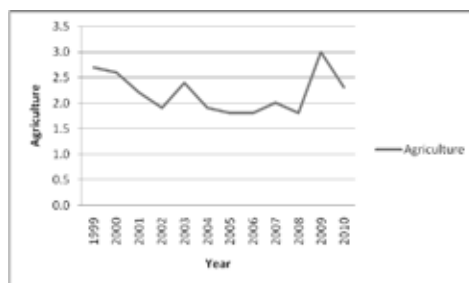
by poorly developed infrastructure and limited access to markets and poor marketing facilities. According to the Government of Botswana only 45% of farmers have access to roads, 17% to electricity, 22% to telecommunication, 64% to water for livestock, 39% to grain storage and 52% to markets (GoB 2009). As a consequence, the development of the agro-industrial and supply chain that is needed to drive the growth of associated sub-sectors, such as food processing, transport and manufacturing has been slow. Another distinctive characteristic of the sector is that it is dominated by small-scale and subsistence-oriented farming for both the livestock and arable sub-sectors. Another feature of the sector is that it is dominated by the livestock sub-sector. Specifically, beef typically contributes over 80% of the sector's GDP. Finally, the sector is characterised by low levels of productivity and limited progress in farming technologies.

Notwithstanding the structural weaknesses bedeviling this sector, the Government has repeatedly stressed that the agriculture sector has the potential to be a substantial contributor to national development objectives of a broad-based economic growth, economic diversification and poverty eradication. This position is borne out of a concern that most Batswana are predominantly resident in rural areas and derive their livelihoods directly from agricultural production activities. Consequently, the Government has introduced a new agricultural strategy which focuses on transforming this sector from the traditional, subsistence-oriented, high-risk, rain-fed and low-productivity system to a viable commercial venture (GoB, 2009). This is to be accomplished through increases in agricultural productivity. The primary productivity-raising investment programme would be the development of the physical and institutional infrastructure for the marketing of agricultural output, irrigating, upgrading management practices, improving technologies, developing institutions for the effective dissemination of knowledge, improving seeds and fertilisers, mechanisations, and the value of products, among others (GoB, 2009). Unlike its predecessors that were largely influenced by the social justice norm and offered financial grants and subsidies, the current agricultural strategy appears to be conceived out of economic considerations. This public investment programme should induce progressive down-ward shifts in the agricultural production functions, with the outcomes being, among other things, sustainable household welfare gain, the development of agro-based industries and reduced food imports.

Recent trends in the agriculture sector's performance are portrayed

in Figure 1. As can be seen, there has been a decline in the relative contribution of the agriculture sector to GDP. However, the sector has witnessed an upward trend since 2007. The sector's contribution to GDP has increased marginally from 1.6% in 2007 to about 2% in 2010. The downward trend in the agriculture sector is an inevitable consequence of economic development. Economic development is a process where the other sectors, particularly industrial and service sectors, increase their share contribution to the GDP. As this happens, the contribution of agriculture in the economy must necessarily fall.

Figure 1: Agriculture sector's contribution to GDP (1999-2010)



Source: CSO (2010)

Although the relative importance of the agriculture sector is small, the size of the sector has been, in absolute terms, increasing in the last ten years, with sharp increases registered in the last five years. Agricultural output increased from around 1000 tonnes to about 2500 tonnes in 2010 (CSO, 2010). The data recently provided by the Bank of Botswana Financial Statistics (2011) reveals that this sector grew at an annual average rate of 18% during the period 2005-2010.

In accordance with the Government of Botswana (GoB 2009), productivity levels in agriculture are low, particularly for the arable sub-sector. This is mainly due to unfavourable agro-climatic conditions and poor farming technologies. Figure 2 below compares productivity levels in cattle sub-sector across the years 2004, 2006, 2007 and 2008. As can be seen, productivity in the cattle sub-sector has been increasing marginally between 2004 and 2007 as measured by calving rates, while off-take rates have been on a downward trend over the 2004-2008 period.