DETERMINING THE APPROPRIATE SIZE OF ZAMBIA’S STRATEGIC GRAIN RESERVE (SGR) AND OPTIONS FOR FOOD RESERVE AGENCY (FRA) REFORMS

By Auckland N. Kuteya and Paul C. Samboko
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Cover Image: Grain Storage Innovations by a private trader in Mkushi, Zambia.

Picture by: Christabel C. Chabwela - IAPRI
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Any views expressed or remaining errors are solely the responsibility of the authors.

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EXECUTIVE SUMMARY

Introduction

Zambia’s Strategic Grain Reserve (SGR) serves three main objectives: firstly, it facilitates emergency relief during food shortages and crises; secondly, it creates a ready and accessible market for maize farmers to reduce their price risk; and, thirdly, it provides buffer stocks, which can be used to maintain price stability. The SGR is first and foremost a tool to ensure food security but is also a market intervention intended to serve both producers and consumers. This paper reviews the SGR against these objectives, and makes recommendations for its optimal size, structure, and operation.

The performance of the SGR must be assessed in the context of Zambia’s economic position. With the budget deficit estimated at 7.4% of GDP, and debt levels rising, the government has rightly embarked on a fiscal consolidation programme. The SGR is costly to deliver because the government must procure maize, which it often does above market rate, and incur fumigation, transport, and storage costs. Moreover, as the government’s debt position threatens to constrict growth, with the World Bank revising its growth projection for the year in September from 4.3 to 3.3%, the government needs to promote private sector led growth to address the country’s economic challenges, as well as consolidate public finances. The agricultural sector undoubtedly has the potential to drive the country’s development. Therefore, this paper assesses the performance of the SGR within the context of Zambia’s economic position and the twin challenges of fiscal consolidation and private sector growth.

This paper assesses the SGR against its core objective of ensuring food security, but also examines its effect on the market. It considers whether the SGR is a corrective mechanism that provides a profitable market for producers and accessible prices for consumers, or whether it distorts the market by creating inefficiencies. As private sector investment is so important in driving growth in the sector, it assesses how the role of the SGR shapes private sector participation in the market. Its recommendations propose a path for the SGR to ensure food security and serve both farmers and consumers in a way that provides relief for government spending and promotes private sector investment.

Conclusions

The current 500,000 MT size of the SGR exceeds the required amount to ensure food security in times of shortage. The risk of shortages has decreased. On the supply side, private sector investment in irrigation and farming practices have improved the productivity of the sector, with the last deficit in 2005/06, while demand has fallen as rising incomes has seen consumption patterns move away from starchy staples. Furthermore, increased private sector participation has seen more maize stored in the private sector, reducing the pressure on the government to provide storage.

There is no significant relationship between the SGR and maize grain prices. In 2011, the Zambian Government heavily subsidized the price of maize sold by the Food Reserve Agency (FRA) to maize millers with the hope of reducing consumer retail maize meal prices. However, these benefits were not passed along to consumers, as maize meal prices failed to come down, mainly because of the lack of competition within the milling sector.

The operation of the SGR crowds-out private sector participation in the market. Procurement practices have expanded the FRA beyond its original remit to provide a market for isolated communities, and instead it now focuses on and undercuts private sector buyers in urban and
peri-urban areas. Inconsistent stock releases create uncertainty in the market and discourage investment, whereas public FRA storage facilities crowd out investment, which could promote growth and reduce costs.

Recommendations

This paper makes the case for a reformed FRA, which can successfully deliver food security for the population, reduce its distortionary effect on the market and crowd-in, rather than crowd-out private sector investment, all while reducing the burden on the Treasury.

1) **Reduce the size of the SGR and commit to regular reviews:** This paper proposes a mechanism for calculating the optimum size of the SGR to ensure food security in the country. This calculation accounts for consumption patterns for the first time, as well as vulnerable population and lead-in time for mobilizing additional supplies for the first time. Using this mechanism, the optimal size of the SGR is in the range of 150,000 MT and 350,000 MT; we propose that under present conditions the SGR should be 250,000 MT, which would allow for a lead time of five months to mobilize reserves. We recommend that government adopt this mechanism for calculating the size of the SGR and hold it under review with the aim of reducing the size of the SGR as improved private sector capacity increases producing, trading, and storage capacity.

2) **Reform the structure of the SGR to include a ‘virtual’ reserve:** We recommend that the government promote investment by creating a virtual reserve by procuring grain from the private sector through the Zambian Agricultural Commodity Exchange (ZAMACE). To ensure that these reserves can be accessed in times of shortage, the FRA could contribute a percentage of the value of purchases and establish a first right of refusal on sales. In this way, the virtual reserve would reduce government spending on the SGR and promote private sector growth in the sector without compromising the primary objective of the reserve to ensure food security. This virtual reserve should be rolled out in areas where there is existing private sector participation, leaving the FRA to service remote areas without competition. From extensive interviews with stakeholders, this paper recommends that the virtual reserve be rolled out incrementally and proposes that private sector capacity allows for the FRA to procure 40% of the virtual reserve.

3) **Improve the operation of the SGR to promote private sector investment:** The operation of the SGR creates inefficiencies in the market that discourage private sector participation but could be reformed to crowd-in investment. As well as rolling out a virtual reserve, it is recommended that the government:

   - Create an enabling environment in the storage market by scaling back government investment in silos and instead, using public-private partnerships or facilitating loans for creation and management of storage facilities.
   - Develop the process for stock releases by committing to rotating stock before the harvest to avoid undercutting producers and creating a roadmap for regular stock releases to provide investors with certainty. The FRA could begin exporting stock to overseas market, and use private sector traders to do so, which would deliver high foreign currency reserves while promoting investment. Provide off-take agreements to producers to enable them to better access commercial loans to invest in their businesses.
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ACRONYMS AND ABBREVIATIONS

CFS          Crop Forecast Survey
CSO          Central Statistical Office
DMMU         Disaster Management and Mitigation Unit
FISP         Farmer Input Support Programme
FRA          Food Reserve Agency
GTAZ         Grain Traders Association of Zambia
Ha           Hectare
Kg           Kilogram
IAPRI        Indaba Agricultural Policy Research Institute
MACO         Ministry of Agriculture and Cooperatives
MoA          Ministry of Agriculture
MT           Metric Ton
ODNRI        Overseas Development Natural Resources Institute
RALS         Rural Agricultural Livelihoods Survey
SAGIS        South African Grain Information Service
SGR          Strategic Grain Reserve
USAID        United States Agency for International Development
ZAMACE       Zambia Agricultural Commodity Exchange
1. INTRODUCTION

The idea of holding strategic food reserves is an age-old practice that seeks to ensure food availability in a country. This decision is primarily driven by uncertainty in harvest, inelastic consumption, and local populations’ inability to move land. In eastern and southern Africa, several national marketing boards were responsible for performing this function, e.g. the grain marketing boards in Zimbabwe and Zambia. Since the 2007/08 world food crisis, there has been a resurgence of strategic grain reserves, with increased government involvement in grain markets (Rashid and Lemma 2011; Jayne et al. 2007). Adverse weather shocks such as the 2015/16 El Niño weather phenomenon, and the subsequent La Niña that significantly reduced food production in most eastern and southern African countries have also triggered policy responses that seek to ensure local food availability.

In all countries, (Strategic Grain Reserves) SGRs were introduced to serve three main objectives. *First* was to facilitate emergency relief that provides assistance during transitory food shortages and crises, which are caused by sudden supply shocks such as natural disasters including floods, drought, war, etc. *Second* was to provide a ready and accessible market for locally produced grains to reduce the price risk faced by farming households. *Third* was to provide buffer stocks in order to maintain food price stability and ensure food security. Buffer stocks are also used to induce production of strategic crops when governments offer higher prices, and/or to protect consumers from price hikes (Deuss 2014; Olajide and Oyelade 2002).

However, while SGRs provide governments with the security they need, they are not without encumbrances. They typically take up substantial amounts of scarce public resources; have become political tools and subject to political pressures; curtail private sector participation in grain markets for the strategic grains; are subject to abuse, corruption, and theft; and are prone to high wastage in storage including the build-up of Aflatoxin (e.g., see Mason, Jayne, and Myers 2015; Wright and Cafiero 2011). Moreover, there are arguments that there is little need for SGRs to ensure food security with goods available through free trade (Johnson 1976). Not only do SGRs hinder sector growth through creating inefficiencies in the market, they create an outsized burden on the treasury, which does not need to secure such large reserves.

Similar to other countries in southern Africa, the Zambian government has maintained SGRs for maize in an effort to ensure food availability, reduce farmers’ price risk, and stabilize prices. This exercise is prone to the common challenges associated with SGRs earlier alluded to. Stocks rotation is sub-optimal, the maize meal price stabilization role questionable, and the size of the SGR highly variable due to political pressure and often a drain on the treasury. Consequently, there is high fiscal exposure on the government’s part, with the programme unsustainable. High budgetary allocations to maintaining an SGR limit available public resources to competing needs within and outside agriculture. Presently, the SGR stands at 500,000 MT of maize; this was established around 2014 based on population estimates at the time, a monthly national consumption requirement of 100,000 MT, and a lead-time of up to five months for imports should need arise.

Since this value was estimated, there have been significant changes in the economy and wider global environment. There are notable changes in consumption patterns owing to rising incomes as predicted by Bennet’s law. Essentially, Chisanga and Zulu-Mbata (2017) show a declining share of starchy staples in total expenditure for Zambia, with expenditure on non-maize food items rising. Further, private sector investments in Zambia’s agriculture sector have increased substantially further enhancing local production, trading, and processing
capacity. In addition, the country’s irrigation capacity has improved since the 1990s: commercial farmers at short notice can be contracted to produce maize to fill any anticipated shortfall. Moreover, the infrastructure to procure and import grain has improved over the years. The variance between planned and actual purchases and the subsequent fiscal exposure across several years are of primary concern in Zambia. In view of these changes, 500,000 MT may no longer be an appropriate size for the SGR. Revising the size of the SGR also provides for efficient utilization of scarce public resources within and outside the agricultural sector.

Furthermore, this paper reviews the impact that the SGR has on the maize sector in light of its objective to stabilize prices and its wider objective to correct inefficiencies rather than distort the market. The SGR has not been used to stabilize maize meal prices and creates further inefficiencies in the market. The way the Food Reserve Agency (FRA) procures, stores, and releases stock has crowded out private sector investment, which has limited the productivity in the sector and the impact of the SGR’s price stabilizing function. By reforming the nature of the reserve by procuring a virtual stock through the private sector and changing its operating practices, the FRA can promote private sector-led growth in the sector, which will see a reduced burden on the Treasury without compromising the SGR’s core objective to ensure food security.

1.1 Study Objectives

The primary objectives of this study are to determine the appropriate size of the SGR in Zambia in a given year, and to set forth a process that government could use to update the SGR target on an annual basis. The specific objectives of this paper are:

i. To understand the structure and objectives of the SGR in Zambia;
ii. To determine the appropriate size of the SGR depending on the purpose of the SGR;
iii. To propose approaches that the government could use in determining the size of the SGR;
iv. To analyze the impact of the SGR on the market and propose reforms to how the FRA operates it in order to promote private sector-led growth in the sector; and
v. To contribute evidence-based options towards the Food Strategic Reforms.

The rest of the paper is organized as follows: Section 2 presents the data and methods while in Section 3 the study reviews Zambia’s current strategic grain reserve in terms of the purpose and how it is managed. Rethinking the size of the SGR in Zambia is presented in Section 4, the section that presents the main findings of the study. Finally, the conclusions and policy recommendations are presented in Section 5.
2. DATA AND METHODS

This study used both qualitative and quantitative research methods to achieve the stated objectives. This involved extensive review of relevant literature, and interviews with key informants/selected key stakeholders during the month of June 2018. Key informants included officials drawn from Ministry of Agriculture and the grain traders. The goal of this was to understand the objectives of the SGR, and if this has changed over time, provide guesstimates of the appropriate size of the SGR, and insights into how best to maintain strategic grain reserves in the country.

The quantitative analysis involved descriptive analysis of data on agricultural production drawn from various sources. With quantitative data, the study used the annual Food Balance Sheets produced by the Ministry of Agriculture (MoA) to provide estimates on national cereal requirements. Other sources of data were the annual Crop Forecast Surveys (CFS) for the 2002/03 to 2016/17 agricultural seasons; the Rural Agricultural Livelihood Survey (RALS), which covers the 2010/11 and 2013/14 agricultural seasons; and the Census of Population and Housing for 2000 and 2010. All these datasets are nationally representative. For more details on the sampling designs for RALS 2015, the reader is referred to IAPRI (2016).

Maize storage by private grain trader in Mpongwe.
Picture by: Christabel C. Chabwela - IAPRI
3. REVIEW OF ZAMBIA’S CURRENT STRATEGIC GRAIN RESERVE

3.1 The Purpose of Strategic Grain Reserves

In Zambia, the FRA buys maize grain from smallholder farmers soon after harvesting at a pan-territorial price. The Food Reserve Act (1995) sets out that the objectives of the Zambian SGR are to:

- ensure a reliable supply of maize grain and other designated agricultural commodities for the country;
- meet local shortfalls in the supply of maize grain plus other strategic crops;
- meet food emergencies caused by drought or flood or other natural disasters; and
- correct problems relating to the supply of maize grain/mealie meal which result from the manipulation of prices or monopolistic trading practices as well as stabilize grain/maize meal prices (GRZ 1995).

It should be noted that the Zambian SGR is not only limited to these objectives but rather tries to meet the broader/universal grain reserves objectives as outlined in the introduction. In general, SGR stocks should provide for the basic needs of the affected population during the lead-time required for arranging the availability of alternative supplies. SGR functions may also be social or humanitarian in nature; therefore, operations of the SGR are not expected to be commercial. It should as well be noted that SGR often has political connotations especially in the manner they are managed and on the use of the stock (Lynton-Evans 1997).

While the FRA was established under the Food Reserve Act (1995), revisions to the Act in 2005 expanded its role. Until 2005, the agency’s role was strictly that of maintaining a sustainable national strategic food reserves to ensure national food security by providing complementary safe/quality grains for consumption. However, following the review of the FRA Act in 2005, the role of the agency expanded to include crop-marketing activities. This resulted in increased maize purchases from smallholder farmers by the FRA. In fact, during the period between 2010/11 and 2012/13 marketing years, the agency bought about 80% of the total anticipated maize sales from both commercial and smallholder farmers. If we only consider smallholder anticipated maize sales during this period, the agency bought nearly 93%. This is despite increased private sector investments in grain markets in most parts of the country. The increased grain purchases by the FRA has in some years placed unnecessary stress on the national treasury as the agency ended up buying beyond the target quantity (Figure 1).
Another reason for this trend of exceeding the targeted SGR side, particularly in the lead-up to elections, relates to the perception that buying large quantities of maize translates to more voters. Again, based on revelations from field interviews with key stakeholders, the agency is judged by how much maize it buys from the small-scale farmers. This activity goes beyond the objectives of the SGR but falls under the Food Reserve Act that was revised in 2005 and does not stop FRA from participating in markets over and above the strategic reserves.

Continued variations on planned versus actual purchases of strategic grain contribute to fiscal exposure on the government’s part. For instance, during the 2011/12 marketing season, the FRA, which had only budgeted to buy 500,000 MT of maize, ended up buying about 1.75 million MT (Sitko and Kuteya 2013). Because this was not budgeted for, the agency had to obtain government secured loans from commercial banks and ultimately such loans had to be paid back from the national treasury.

Generally, the FRA was buying beyond the set targets during the period between 2010/11 and 2014/15 marketing seasons, making it the dominant single buyer of smallholders’ maize (Mason, Jayne, and Myers 2015; Figure 1). The purchased maize far exceeded the agency’s storage capacity and this resulted in grain storage losses as well as theft. In 2013, about 32% of the total maize grain stored by the FRA went to waste (MAL 2013). This was a huge loss relative to only about 5% loss under the private grain storage sector in the country (Kuteya and Sitko 2014). Thus, maize deterioration and losses during storage was partly due to over procurement of the grain beyond what the agency could adequately handle. This situation has since improved with better management of SGR stocks.

Furthermore, increased procurement of maize grain during the 2010/11 to 2014/15 marketing seasons made the FRA’s actual expenditure very high and this came at the expense of financing other important programs. During this period, supplementary funding was allocated towards the operations of the Agency each year to finance many other hidden costs involved to keep the maize grain safe. Such costs include fumigation, handling (loading and offloading), insurance, transport, security, rentals, etc.

Besides quantity, many farmers and farmer associations also judge the performance of the agency based on the level of the price it pays farmers for their maize. In most cases, the
purchase price of maize is above market price, crowding out private sector participation in maize markets. For instance, between the 2010/11 and 2013/14 marketing years the FRA buying price was pegged at ZMW 65 per 50Kg bag, this was roughly ZMW 20 above the prevailing market price (Figure 2). Such pressures are driven by different stakeholders including politicians and farmer organizations or advocacy groups. However, during the 2017/18 marketing season, the Republican president ensured the FRA buying price was dictated by market forces.

The SGR must strike a difficult balance in ensuring food security without being an excessive burden on the Treasury and must intervene in the market in a way that corrects failures rather than creating distortions. The Government has managed the SGR more effectively in recent years, as its price has not exceeded the market rate and its size is the targeted amount in the last two years. This review makes a wider assessment on how the SGR has performed in providing an adequate level of food security and intervening effectively in the market.

**Figure 2. The Relationship between FRA Purchase Price and Nominal Maize Grain Prices in Zambia**

![Graph showing the relationship between FRA purchase price and maize market prices.](image)


### 3.2 Food Security in Zambia

We next consider the maize surplus/deficit situation in Zambia for the 1999/2000 to 2016/17 maize marketing years. The bars of Figure 3 that fall above the zero line show surplus years while those that fall below the zero line indicate deficit years. These were determined using data from Zambia’s food balance sheets. The food balance sheets estimate food required for human consumption and industrial uses that include stock feed and breweries. Others are grain retained for uses such as losses and structural cross-border trade. Therefore, surplus/deficit was calculated by subtracting total grain requirements from total available food. Figure 3 shows that the country had significant food deficits from 1999/2000-2002/03.
However, since the 2003/04 farming season, with the exception of 2005/06, Zambia has been self-sufficient in maize supply from its own production. Over the period of consideration, the highest maize surplus recorded was in the 2011/12 marketing season at 1.7 million MT (Figure 3). It should be noted that these surpluses include carryover stocks from previous seasons. The country’s maize production in 11 of the 13 years from 2003/03 through 2016/17 has been sufficient to meet national consumption requirements.

Increased capacity in the maize market has significantly reduced the risk of shortfalls. While it is prudent for the FRA to continue to hold stocks in case of a shortfall, it is clear that government can afford to hold lower levels of stock and reduce the burden of the SGR on the treasury. Owing to austerity measures the country is trying to put in place, this becomes very important.

Furthermore, as “the main function of a strategic grain reserve is social/humanitarian in nature,” Lynton-Evans outlines that the management of the SGR needs to align with this objective. The government needs to be able to access and manage the release of reserves during food shortages. It is the Disaster Management and Mitigation Unit (DMMU), which falls under the Office of the Vice-President that has the responsibility for releasing grain for the purposes of humanitarian relief. Therefore, the government could not only reduce the size of the SGR to reflect changing maize productivity and consumption, it must streamline how reserves are released so that they can be used to effectively to address humanitarian issues when required.

### 3.3 The Impact of the SGR on the Maize Market

Although Zambia’s productivity has increased—reducing the risk of the deficits—it remains below global averages, signaling that the sector is operating below its potential (Figure 4). Between the 2002/03 and 2015/16 farming seasons, the mean yields in Zambia increased by 26.5% (from 1.66 MT per hectare to 2.1 MT per hectare). Over the same period, the average yields for the world increased by a similar percentage (from 4.46 MT per hectare to 5.64 MT per hectare, also 26.5%).

![Figure 3. Maize Surplus/Deficit over Time](image-url)
Though the percentage increase in average yields between Zambia and the world was the same between the 2002/03 and 2015/16 farming seasons, maize yields in Zambia are substantially lower than the average maize yields in the world. Zambia’s maize production between 2002/03 and 2016/17 farming seasons averaged 1,974,804 MT with the highest production of 3,606,549 MT during the 2016/17 harvest.

As maize yields in Zambia remain below international averages, there is substantial room for improving productivity in the sector. It is critical that the SGR should achieve its objective for ensuring food security in line with its broader objective to correct, rather than create, distortions in the market. Successfully implemented, the SGR should show growth in the sector, which will in turn raise farmers’ incomes and support GDP growth without compromising the country’s food security. The section explores the impact of the SGR on maize price stabilization and private sector investment by reviewing the effect of the SGR on the market.

### 3.3.1 Price Stabilization

Price stability is key in maintaining the purchasing power of the domestic currency by preserving stable inflation rates. It avoids protracted inflation or deflation. It should, however, be understood that price stability does not mean that prices do not change, rather it assumes moderate change. When inflation is high, it implies reduced household incomes and high expenditures on production and this impacts economic growth negatively and discourages private investments.

The SGR seeks to stabilize prices by releasing subsidized maize to millers in order to reduce consumer prices. However, there is no significant relationship between the Zambian SGR and maize grain prices. Moreover, past research by Kuteya and Jayne (2012) shows that contrary to popular belief, subsidized maize grain does not influence retail maize meal prices in
Zambia. This poses a serious policy question around the maize meal price stabilization role of the FRA. In 2011, the Zambian Government heavily subsidized the price of maize sold by the FRA to maize millers with the hope of reducing consumer retail maize meal prices. However, these benefits were not passed along to consumers as maize meal prices failed to come down, mainly because of the FRA supported a subsector of large-scale millers with subsidies, reducing competition.

While the release of grain in this way has been shown not to stabilize prices, it has further implications by discouraging private sector investment. Many mills including informal markets were not able to access the maize at the subsidized price or in sufficient quantities to satisfy market demand. Eventually, this discouraged many private players to participate effectively in grain marketing to service the smallholder farmers. Increased private sector participation is essential for both producers and consumers; as it reduces reliance on the FRA, it will offer new markets for farmers and increase competition among millers, driving down prices. (Kuteya and Jayne 2012; Kuteya and Sitko 2015).

To encourage a level playing field for all private players in grain marketing government should be very transparent in the management of the reserve and avoid taking actions that disadvantage some players. Lack of competition in grain marketing is likely to exacerbate price instability rather than achieve stability as intended by the SGR, and further discourage private sector investment, which will better reduce prices.

3.3.2 Maize Marketing and Sales to the Food Reserve Agency

The role of the SGR dominates maize marketing in a way that fails to achieve its objectives, creates pressure on the Treasury, and crowds out investment. When the FRA purchases maize above market prices, it promotes informal imports and reduces incentives for private sector investment, often leaving the government with the high storage costs of storing surpluses. Moreover, the role of the government in the market has increased as the SGR has gone beyond its original intent to restrict purchases to remote areas poorly serviced by private sector marketers and is used ineffectively alongside the Farmer Input Support Programme (FISP) and export bans.

The Zambian Government influences the size of the SGR held by the FRA by declaring the amount to be purchased in a year, and by imposing trade restrictions in times of local and regional stress in grain markets (Takavarasha 2006). These periodical bans of maize exports by the Government impede full participation of the private sector in grain trade (Takavarasha 2006; Tschirley et al. 2004). Moreover, their efficacy in ensuring local availability is questionable given the impracticality of policing the export bans on vast borders.

Similar findings were also reported by Kuteya and Sitko (2015). Note that the country during the 2010/11-2012/13 period was having large amounts of maize coming in informally from other neighboring countries, especially Mozambique and Tanzania. This informal maize grain inflow was due to the high FRA prices that were being offered at that time. This helps explain why the FRA during the 2011/12 marketing year ended up buying more than the total maize sales anticipated from Zambian farmers (Figure 5).
Upon its establishment, one of the proposals for the FRA was to restrict its maize purchases to far-flung areas where it is difficult for the private sector to reach due to poor road networks. This proposal was intended to benefit and encourage farmers in very remote areas. Currently the situation, however, is that the FRA is competing with the private sector to buy maize in urban and peri-urban areas that are highly accessible. As a result, there is a concentration of public and private grain storage and trading activities in urban and peri-urban areas, to the detriment of remote rural areas. This could have a negative impact on the incentives for crop production by smallholder farmers in remote areas.

Figure 5. FRA Domestic Maize Purchases and Anticipated Sales over Time


Also, on realization that there are two government subsidy programs towards smallholder farmers—an input subsidy program (FISP) and a maize price support and marketing program (FRA)—stakeholders interviewed expressed concern that the two programs need to be synchronized because they are two sides of the same coin. Stakeholders suggested that the FRA should buy grains only from FISP beneficiaries; in contrast, at present, the agency buys from FISP beneficiaries and non-beneficiaries alike.

In trying to ensure national food security and stabilize food prices, the agency’s focus has been almost exclusively on maize. The maize grain purchased by the FRA is either exported or sold on the domestic market (mainly to millers and traders) at prices determined after consultation with local stakeholders. However, our consultations with stakeholders revealed that final decision for the price at which the FRA buys and sells maize locally is made at ministerial level. If such decisions fail to take into account market forces, they become detrimental to the growth of the sector, especially participation of the private sector. When there is a deficit in maize production, though this has not happened in the recent past, the agency under the directive from the government often imports maize, which is later sold mainly to selected large-scale millers with the hope that this would lower mealie meal prices (Mason and Myers 2013). Maize sales to a few selected large millers undermine competition in the sector. Consequently, the objective of reducing consumer prices for mealie meal is usually not achieved.
3.3.3 Operational Inefficiencies

The way the FRA handles the SGR during procurement, storage, and stock releases can either crowd in or crowd out private sector participation in grain marketing. Kuteya and Sitko (2015) found that FRA’s activities on grain reserve have different implications on the private sector. The authors found that when the agency procures the bulk of the available maize surplus and later sells it to a few selected commercial millers, it negatively affects the informal market, including private grain traders, retailers, and hammer mills.

Procurement and Storage: The government through the FRA has been incurring high costs in grain procurement, transportation, handling, fumigation, storage and other operational costs. Every year the agency purchases grain it needs and engages large transporters, who charge exceedingly large fees to transport the grain to main depots. These transporters end up being the ones who benefit the most from public resources under the FRA. Procuring part of the grain through grain traders can help reduce the agency’s budget as the private players cover some of the operational costs.

Storage is also costly for the government. However, despite the current target quantity for maize grain that the FRA is supposed to procure is 500,000 MT, the agency currently has grain storage capacity of about 870,000 MT and is even planning to increase grain stores to 2 million MT by 2018. For the 2018/19 marketing season, the agency plans to purchase about 390,000 MT of maize; when added the 600,000 MT already in stock, it implies the agency will have nearly 1 million MT, which is above its current storage capacity of 870,000 MT. This increase will increase the risk of losses, which the FRA Executive Director revealed to have been reduced to only 1% for the 2015/16 season when the FRA procured up to the target quantity of 500,000 MT (Mbewe 2017). Moreover, storage is expensive and the government can ill afford to incur such costs in a time of fiscal consolidation, with ZMW 75 million allocated towards FRA storage in the 2018 budget (Chisanga, Chapoto, and Subakanya 2017).

Figure 6. Grain Storage Facilities Operated by GTAZ Members by 2018

Source: GTAZ 2018.
Given an enabling environment or supportive policies, the private sector has great potential to invest in grain storage, promoting growth in the sector and providing relief to government finances. According to the Grain Traders Association of Zambia (GTAZ), already there are roughly 23 potentially certifiable storage sites in 18 districts with a total storage capacity of about 947,000 MT in the hands of private grain traders, worth over ZMW 300 million in investments with plans to invest in further grain storage countrywide (Figure 6). However, inconsistencies in government policies can easily discourage such investments. With these potential investments in storage facilities from the private sector, the allocation of ZMW 75,000,000 in the 2018 budget towards construction of silos by government remains questionable.

To reduce procurement and storage costs, the FRA could hold a virtual stock using registered grain traders to encourage private sector involvement in grain trade and/or work with the commodity exchange. As the Zambia Agricultural Commodity Exchange (ZAMACE) is already providing warehouse receipt system, this can be a good starting point for the FRA to procure virtual stocks. This can also help to reduce FRA’s operating costs, especially when it comes to transport, handling, and storage costs. Every year the agency needs to train satellite depot managers; procuring a portion of the required SGR through grain traders can help reduce the cost of hiring and training these managers. Interviewed grain traders indicated that in the event that the grain procured for the FRA is not needed, it could then be liquidated on the local market. Since this has not been tried before, it can start as a pilot in order to ensure everything is done accordingly, with our interviews with stakeholders suggesting that the FRA could consider procuring 40% of the SGR as a virtual stock as a starting point.

**Stock Releases:** Improving practice in stock releases provides another opportunity to reduce market inefficiencies and promote private sector investment. It is important to rotate the SGR stock on a regular basis to avoid quality deterioration of the grain. Stock rotation can be done say in April/May when the next harvest is starting to come in. Grain releases help to reduce storage costs incurred by the agency. However, grain releases by the FRA should be done cautiously in such a manner that there is no disruption of the local market competition. One way to achieve this is when the actions of the agency are predictable, not ad-hoc, as this may enable the private sector to be more prepared and as a result, grain releases by the FRA are less likely to negatively affect their operations. A clear roadmap for stock releases by the agency is one way to develop and encourage private sector participation in grain marketing, which is one of the objectives of the FRA.

Sometimes the SGR stock in Zambia is released at a wrong time. The first reason behind such releases is under-reporting of stocks from grain traders and other institutions that hold stocks. As a result, the government is led to conclude that there is less maize available in the country than really is available and thus, they release some of their stocks. To curb false stock declarations from the members of the Stock Monitoring Committee, there is a need to enact the Agricultural Marketing Act. Under this, a body like the South African Grain Information Service (SAGIS) can be formed to help establish accurate estimates of the stocks available in the country. The main goal of SAGIS is the gathering, processing, analyzing, and timely distribution of reliable agricultural price, supply, and demand information to all role players.
The second reason for ad-hoc stock releases is due to the strong lobbying from millers whose business is built around FRA maize such that they rarely secure maize directly from farmers. According to interviews with key informants, mis-timing of stock release has also negatively affected the production of winter maize because harvesting of winter maize was coinciding with the release of the SGR by the FRA. SGR stock releases should not only be made to satisfy short-term political objectives, there is also a need to take into account long-term effects those decisions leave on food security.

When there is a need for the FRA to rotate the SGR stock amidst plenty of maize on the local market, stakeholders interviewed said the agency can sell on the regional/foreign market. However, this should be done through grain traders in order to realize revenue through export tax for the national treasury. Government-to-government transactions do not benefit the economy in terms of raising revenue through an export tax. Rotation of the SGR needs to be done in parts e.g., half of the total target in one year and the other half the following year.

Grain being cleaned in readiness for storage by private grain trader in Mkushi.

Picture by: Christabel C. Chawela - IAPRI
4. RETHINKING THE SIZE OF THE SGR IN ZAMBIA

4.1 Global Best Practices

Establishment of food reserves should be done in ways that facilitate the development of agriculture and agricultural trade, and in the long run, reduce a country’s dependence on donors. To realize the objectives of an SGR, it is important to maintain a small physical food reserve as well as an innovative virtual reserve. In Zambia, the FRA can procure virtual stock for its SGR through the ZAMACE platform. ZAMACE is the authorized agency in the implementation of the warehouse receipt system (WRS). Virtual stock helps to prevent market price spikes and to keep prices closer to levels suggested by long-run market fundamentals (Lines 2011). Lines (2011) noted that according to the Pre-Positioning for Predictable Access and Resilience feasibility study presented at the Economic Commission for West African States’ Dakar conference in 2011, it recommended holding a physical reserve to cover 30 days of food needs, supplemented by virtual reserve for another 60 days. This indicates a period of three months that the SGR should cover in the event of a need to import food. The three months period suggested at the Dakar Conference seems to be in line with what stakeholders in Zambia suggested. The various grains usually considered under SGRs are maize, wheat, rice, sorghum, millet, and pulses. Currently, Zambia concentrates on maize grain, as it is the main staple food in the country.

4.2 Determinants of the Size of the SGR

Determining the size of the SGR depends on the roles and objectives of that SGR. In general, when there are several roles to be performed by the SGR that would mean having a large size of the reserve. On the other hand, the fewer the roles of the reserve the smaller the size of the SGR (Lynton-Evans 1997). What should be noted however is that the larger the size of the reserve, the costlier it becomes to maintain. The factors that are used in determining the optimal size of an SGR include consumption patterns in the country, the size of the population, and the time taken to import food in the country.

4.2.1 Changing Consumption Patterns

According to Chisanga and Zulu-Mbata (2017), a study on changing food expenditure patterns in Zambia revealed that there have been major declines in the shares of food expenditure on maize both among rural and urban households over years. The authors showed that there was a significant increase in wheat expenditure shares while rural households reduced the share of other coarse grains and tubers. Maize has become less responsive to income shifts (elasticity equal to 0.2), while wheat and rice now exhibit income elasticities of expenditure that are almost equal to 0.6 (Table 1).

These results are in line with Bennet’s law that hypothesizes declining shares of expenditure on starchy staples as income rises, with other foods becoming more important. Given these findings, the government policy focus on maize is misplaced as it fails to recognize the changing consumption patterns both in urban and rural areas. Despite the changing patterns in consumption, the government through the FRA has maintained the 500,000 MT of maize reserve over the past five years.
Table 1. Income Elasticities of Expenditure for Selected Starchy Foods (1996-2015)

<table>
<thead>
<tr>
<th>Product</th>
<th>Elasticity</th>
<th>1996</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>0.48</td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td>Maize</td>
<td>0.82</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>1.40</td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td>Other cereals</td>
<td>-0.19</td>
<td>-0.08</td>
<td></td>
</tr>
<tr>
<td>Cassava</td>
<td>-0.13</td>
<td>-0.13</td>
<td></td>
</tr>
<tr>
<td>Potatoes</td>
<td>0.68</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td>Other tubers</td>
<td>0.20</td>
<td>0.14</td>
<td></td>
</tr>
</tbody>
</table>

Source: Adapted from Chisanga and Zulu-Mbata 2017.

The size of the population plays a key role in determining the optimal size of an SGR. This implies that as the size of the population changes there is need to adjust the size of the SGR also. The population of Zambia as captured during the 2010 Census of Population and Housing increased from 9,885,591 in 2000 to 13,092,666 in 2010. This represented an increase of 32.4%. Between the two censuses, the population in urban areas increased more than the population in rural areas. In urban areas it increased by 51% while in rural areas by 23% (Zambia’s Central Statistical Office 2012). These changes in the size of the population have an implication on the size of the SGR.

Based on projections for years 2011-2035, Zambia’s total population is expected to grow from 13.7 million in 2011 to 17.9 million in 2020, and to 26.9 million by 2035 (Zambia’s Central Statistical Office 2013). This expected population growth suggests that the size of the SGR cannot remain the same over a long period. With changing population, the SGR must be periodically revised. In our analysis, therefore, we give scenarios that can be considered.

4.3 Private Sector Participation in Grain Marketing

According to personal interviews with Grain Traders Association of Zambia (GTAZ), the presence of the private sector in grain trade in the last decade has continued to expand such that currently their grain storage capacity is around 900,000 MT. A number of private players are involved in warehousing and aggregation including NWK Agri-services, Export Trading group, and AFGRI Corporation. These players do not only have financial resources but also the requisite expertise in storing grain.

In an attempt to understand the private sector’s perspectives on what the size of the strategic grain reserve should be, and how this should be administered, selected grain traders were interviewed. Essentially, it would take about three months to import non-genetically modified organisms (GMO) maize from South America, which is a stable producer of maize grain. If we consider our nearest neighbor, South Africa, which is also a stable producer of non-GMO grain though at a premium price, it would take less than three months to land such maize in the country.

Ideally, the SGR should be purchased via the commodity exchange to foster private sector participation in maize markets. However, given the emphasis by the government to have physical stocks held by themselves, and the sensitivities around maize marketing, it was
suggested that the FRA could purchase 60% of the maize directly from farmers in far-flung areas where the private sector has no presence. The other 40% of the recommended SGR size could be virtual stock purchased through the private sector. This can then be released to the government in times of stress such as droughts between January and April, which coincides with the announcement of the food production estimates from the annual crop forecast surveys. However, for this to work there is a need for a government off-take guarantee to facilitate access to finances from commercial sources among grain traders. There is also need for predictability on when FRA recycles its stock. It was suggested that the FRA should do this preferably between January and April.

4.4 Establishment and Size of the Grain Reserve

Among the factors that led to the establishment of the SGR current size of 500,000 MT in Zambia were increased maize production coupled with policy direction, as well as political decisions. This size has been maintained year after year without taking into consideration all parameters that should be used in determining the optimal size of an SGR. Computation of the Food Balance Sheet in Zambia has been using the inherited 500,000 MT since the 2013/14 marketing year. The inherited 500,000 MT size of the SGR is used as a benchmark for budgeting purposes by MoA and MoF. Though the Zambian SGR is composed of maize alone, currently there are discussions to consider including other grains.

According to Lynton-Evans (1997), Zambia determines the target size of its reserve based on an estimated three months' market demand. Other countries like Ethiopia, Mozambique, and Tanzania use a traditional approach where the target size of a food reserve is determined on the basis of the cereal requirements of the vulnerable population for the time required following the recognition of an imminent food emergency until additional supplies could be made available for distribution. The author pointed out that for the purposes of calculation it was assumed that the cereal requirement was equivalent to some 160-175 kg per person per year and that a lead-time of three months would be required to organize and receive additional supplies. On the other hand, the Food and Agriculture Organization of the United Nations (FAO) estimates a range of requirements for maize for the Southern African Development Community (SADC) member countries. The range is between 88 and 98 kg per capita per year, yielding an average of 93 kg per person per year.

Before we can apply the above approach, certain assumptions have to be made. The so-called vulnerable population or the number of people that would need assistance has to be determined annually. In addition, the lead-time required also has to be determined. Another assumption is about the cereal consumption requirements coupled with consumption patterns of the population that would need assistance in the case of food shortages. It should as well be known that, usually, the affected population tends to switch to alternative available foods when faced with food shortages; and therefore, there is need to take into account available alternative food and cross-price elasticities of demand when determining an optimal size for the reserve. In Zambia, rice, wheat, and millet as well as cassava are substitutes for maize. The SGR should aim to provide protection to at least 95% of the target vulnerable population (ODNRI 1987).
It is also important to know how much grain is in the hands of the private sector and for this to work there is a need to have a good and effective stock monitoring committee that is availed with factual information regarding stocks held by all the players in the country. This applies to both committed and uncommitted stocks. By committed stock, we mean the stock that is reserved because of commitments made either through sales order and reserved invoices. The committed stock through sales order is the stock that has orders placed on it via purchase orders. Such information is very important for government to know the quantity of grain stocks available. These assumptions may be relaxed depending on the objective the SGRs is trying to address.

In view of variability in assumptions and other factors depending on the intended objective of the SGR at that particular time, the size of the reserve can be adjusted according to the perceived requirements and past experience. Adjusting the size of the reserve implies reviewing the SGR size every year as opposed to maintaining a fixed size of the strategic grain reserve irrespective of the prevailing circumstances. FRA can review the size of the strategic grain reserve with the Early Warning Unit (EWU) and the DMMU. The EWU is in the department of the Policy and Planning Department in the Ministry of Agriculture. The EWU and DMMU are well positioned in helping the FRA conduct an annual review of the size of the SGR.

The collaboration of DMMU with Ministry of Community Development and Social Services can help in identifying vulnerable communities/households. On the other hand, the EWU spearheads the implementation of the Zambia’s Crop Forecast Survey (CFS) through the Central Statistical Office and the Ministry of Agriculture. The CFS is conducted every year around April (about two months before harvesting) to estimate crop production that will be available for consumption during the upcoming marketing year. Information generated from the CFS is key for government to know whether there is likely to be a food surplus or deficit during the upcoming marketing year. This allows government to make informed decision on the size of the SGR required for that year.

When the objective of the SGR is to meet food deficit, it means the size of the reserve would be reduced during the year of surplus or adjusted upward when it is a poor crop production year. It should be noted that adjustment of the reserve size can be done at any time of the year as new information is received. CFS-based results enable government to have ample time to put any necessary measures in place for food imports when faced with food deficit. With the different purposes that SGRs are intended to serve each year, one-size-fits-all models will not work.

The assumptions used in Table 2 to calculate the size of the SGR were based on Lynton-Evans (1997), FAO, and Central Statistical Office (CSO) literature, as well as interviews with key informants. According to the 2017 Global Hunger Index (GHI) scores by rank, Zambia, at 38.2% of its population suffering from hunger, is among the countries with alarming levels of hunger. Using this percentage, we find that about 6.5 million (38.2% of 17 million estimated Zambian population for 2018) of the Zambian population is affected with hunger. For our calculations, we also use the FAO estimated average maize requirements for SADC member countries at 93 kg per person per year, equivalent to 255g per capita per day. Using three different lead times to mobilize additional grain supplies at three, four, and five months in our calculations we obtain suggested optimal SGR size as shown in Table 2.
Table 2. Calculations to Determine the Size of the SGR by Objective

<table>
<thead>
<tr>
<th>SGR major objective</th>
<th>Assumptions</th>
<th>Calculations</th>
<th>Suggested optimal SGR size (MT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>To meet local shortfalls in the supply of maize grain for human consumption</td>
<td>• Vulnerable population estimated at 6.5 million.</td>
<td>6.5\times10^6 \times 90 \text{ days} \times 255\text{g}</td>
<td>149,175</td>
</tr>
<tr>
<td></td>
<td>• Lead time required for food imports to reach the country at three months (90 days).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Maize consumption requirements at 255g per capita nutritional level per day.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Protection at 95% of the target vulnerable population.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lead time to mobilize additional grain supplies at four months (120 days).</td>
<td>6.5\times10^6 \times 120 \text{ days} \times 255\text{g}</td>
<td></td>
<td>198,900</td>
</tr>
<tr>
<td>lead time at five months (150 days).</td>
<td>6.5\times10^6 \times 150 \text{ days} \times 255\text{g}</td>
<td></td>
<td>248,625</td>
</tr>
<tr>
<td>To meet maize grain deficit for human consumption plus industrial requirements</td>
<td>• Vulnerable population estimated at 6.5 million.</td>
<td>6.5\times10^6 \times 90 \text{ days} \times 255\text{g} x 1.4\text{g}</td>
<td>208,845</td>
</tr>
<tr>
<td>(stock feed and breweries)</td>
<td>• Lead time required for food imports to reach the country at three months.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Cereal consumption requirements at 255g per capita nutritional level per day.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Industrial requirements at 1.4g per day.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lead time to mobilize additional grain supplies at four months.</td>
<td>6.5\times10^6 \times 120 \text{ days} \times 255\text{g} x 1.4\text{g}</td>
<td></td>
<td>278,460</td>
</tr>
<tr>
<td>lead time at five months.</td>
<td>6.5\times10^6 \times 150 \text{ days} \times 255\text{g} x 1.4\text{g}</td>
<td></td>
<td>348,075</td>
</tr>
</tbody>
</table>

Source: Authors’ own calculations.
5. CONCLUSION AND RECOMMENDATIONS

Strategic grain reserves provide governments with some security in terms of food availability to protect the population and more importantly vulnerable groups. They are also crucial for price stabilization. Yet they are faced with many challenges. Often times, they are subject to abuse, corruption, political pressure, waste and losses, and mostly adversely impact private sector participation in grain markets. The size of the reserve requires periodic review in view of these factors and in consideration of changing population dynamics, vulnerability, and consumption patterns in the country, as well as capacity to deal with shocks. This study sought to establish what the appropriate size of Zambia’s maize grain reserve should be in view of these factors and other criteria vis-à-vis the objectives of the SGR, and the need to save the scarce public resources amid budget deficits in the country.

We estimate that the SGR should range between 150,000 and 350,000 metric tons. This implies that the current size of the SGR at 500,000 MT is outside the recommended range. It is also important to note that the country is now better placed to deal with any shocks without the need to hold such huge stock levels (Chapoto and Ramadhan 2015). An ideal estimate and based on consumption requirements is just about 250,000 metric tons for a lead time of five months while at three months lead time it is roughly 150,000 MT.

First and foremost, we recommend that the government reduce the size of the SGR and commit to periodic reviews of the SGR to reflect the continuous and rapidly changing parameters that include consumption patterns, size of the population, and the time taken to import food. FRA can review the size of the strategic grain reserve in collaboration with the Early Warning Unit and the Disaster Management and Mitigation Unit as these Units are well positioned for that task. This will allow the government to make all-important reductions to fiscal spending, while ensuring that the SGR meets its core objective of ensuring food security.

In view of the FRA inefficiencies causing waste and discouraging private sector involvement in the market, the following options were recommended to create an enabling environment for growth in the sector:

i. Procurement of the strategic grain reserve should involve the private sector to an extent acceptable to government. Owing to storage costs involved when holding physical stocks, procuring the grain through the Zambia Agricultural Commodity Exchange (ZAMACE) as opposed to holding physical strategic grain reserves in the FRA’s storage facilities could provide a cheaper way of holding the SGR. This is on the assumption that costs such as fumigation, handling (loading and offloading), insurance, and transport including security would no longer be absorbed by the agency but passed onto ZAMACE or grain traders. On the basis of our field interviews, we have established that the registered grain traders are capable of providing 40% of the SGR.

ii. Government should consider reducing its direct involvement in grain storage, which will reduce maize losses, increase coverage of storage facilities across the country, and minimize the burden on the Treasury. FRA storage facilities can be managed under a public-private partnership agreement to stimulate the development of a private sector-led storage industry. The other option is where the government incentivizes private sector by facilitating loans to private sector led storage facilities.
iii. Government should provide investors with certainty through regular and transparent stock rotation and grain releases, which are often ad-hoc and disrupt the market. The government should commit to rotating stock during the optimal period before harvest, ideally around April to May and publish a road map that sets out the timings for stock releases.

iv. Government should provide producers with off-take agreements for their stock so that they can secure commercial loans for investment.

The maize sector offers great potential for Zambia’s development. Although productivity has increased due to investment across the value chain, yields are considerably lower than in the rest of the world. By resizing, restructuring and reforming the operation of the SGR, the government has an opportunity to move from crowding-out to crowding-in investment in the sector. These changes would allow the government to reap twin benefits of private sector-led growth and reduced spending, an important opportunity in a period of fiscal consolidation, especially when applied within wider reforms to promote growth in the sector such as reform to FISP and lessening of export bans. Reducing spending and promoting investment are undoubtedly good for the economy but are also good for the SGR. Reforms will improve performance against the SGRs’ objectives to serve producers and consumers as growth will improve market access for farmers and better stabilize prices for consumers, all without compromising the core function to ensure food security.
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