

Can maize price stabilization reduce malnutrition and save lives? The case of the Zambia Food Reserve Agency

Daye Kwon, Robert J. Myers, Nicole M. Mason, and Paul Samboko

Introduction

Agriculture plays a crucial role in the Zambian economy, and maize is the most important food staple. One of the main mechanisms for implementing Zambian maize policy is the Food Reserve Agency (FRA), which manages the country's Strategic Grain Reserve (SGR). The FRA SGR is used for emergency relief purposes and as a price stabilization tool; the FRA also provides a ready market for smallholder maize sales. Because of its prominent role in Zambian maize markets, considerable research has been conducted on the economic effects of FRA policies. This research indicates that FRA policies have raised average Zambian maize prices and reduced price fluctuations over time (Mason and Myers 2013). In turn, these price effects have altered production and consumption patterns and influenced the welfare of Zambian households, with some gaining and some losing. Not surprisingly, it is the rural poor with high dietary- and income-dependence on maize who have been affected the most. These outcomes have been achieved at a considerable cost, as shown by the consistently high share of FRA activities in Zambia's agricultural sector budget (IAPRI 2017).

FRA policies also clearly have the potential to reduce malnutrition and starvation among poor Zambian households. However, the effects of FRA policies on these outcomes have received much less research attention. Part of the reason is that traditional economic analysis, based on effective supply and demand, does not explicitly account for the fact that poor maize producers and consumers may be forced out of markets and suffer severe negative welfare effects (e.g., malnutrition and death) that are not reflected in traditional market-based measures of economic welfare. Incorporating the effects of

Key Policy Implications:

- Economic research has found that FRA policies in Zambia have stabilized maize prices around higher average levels, benefiting large surplus maize producers, imposing costs on poor maize deficit households, and imposing substantial costs on the Zambian treasury.
- However, maize price fluctuations may have additional effects besides those taken into account in the traditional price stabilization welfare analysis framework — effects on malnutrition and on the survival probability of the poor. We currently know very little about these malnutrition and survival probability effects.
- We highlight the need to include these malnutrition and survival probability effects into the policy analysis framework and suggest some way to begin this task.

malnutrition and survival probability into policy analysis requires extending the traditional economic framework for evaluating the effects of SGRs.

This policy brief has three main objectives. First, it reviews the state of current knowledge on the effects of FRA policies on private sector market performance and traditional measures of household welfare. Second, it argues that there is a need to extend the existing policy evaluation frameworks to take explicit account of FRA policy effects on malnutrition and survival rates among poor Zambian households. Third, it discusses how existing analytical frameworks for economic analysis might be extended to explicitly account for the malnutrition and survival probability effects of the Zambian FRA, and of SGRs more generally.



FRA Policy Goals and Effects

The FRA maintains an SGR with the stated goal of ensuring food security and stabilizing maize prices by responding to supply shocks. Most SGR maize is purchased from smallholders, typically at above market prices, and then exported or sold domestically. When sold domestically, it is usually at below market prices to selected millers who are expected to keep maize meal prices low. As the single largest buyer of maize, FRA purchased 880,000 MT in the 2010/2011 marketing year, which accounted for more than 80 percent of smallholder maize sales (Mason and Myers 2013). While the FRA's maize purchase volumes have been lower in recent years – e.g., to just above its target SGR level of 500,000 MT in 2017/2018 – some estimates suggest that a much smaller SGR of 150,000 MT to 350,000 MT would suffice given significant changes in local and regional capabilities related to logistics and production (Kuteya and Samboko 2018). Organizing and storing large grain reserves in past years is estimated to have had major adverse effects on markets and imposed considerable opportunity costs on the economy (Harman and Chapoto 2017).

Research has shown that these FRA policies have raised average maize prices in Zambia and reduced price fluctuations over time (Mason and Myers 2013). These higher prices have benefited relatively wealthy surplus maize producers but net buyers of maize, including urban consumers and the rural poor, have been adversely affected. Indeed, most Zambian smallholder farmers own and operate less than 2 hectares of land and produce little maize surplus for sale (Chapoto and Chisanga 2018). The 2015 Rural Agricultural Livelihood Survey (RALS) in Zambia indicates that roughly 40 percent of farming households are net-maize buyers (Chapoto and Zulu-Mbata 2016). If the benefits of price stabilization outweigh the costs of higher prices for these poor households, they may be better off overall. However, research suggests that any benefits to these groups from price stabilization are likely to be small (Mason and Myers 2013). Therefore, it is widely accepted that raising Zambian maize prices and stabilizing them around higher levels has hurt subsistence-oriented smallholder farmers and poor consumers of maize (Chapoto 2019), reducing their available disposable income to meet basic food needs.

There have also been second round reallocation effects from the price changes. Mason, Jayne, and Myers (2015) find that farmers raise their maize price expectations and produce more maize in response to the increased farmgate price due to FRA policies. However, it is again mainly the relatively better-off farmers with more resources, not the poorest, who are capable of responding to and thus benefit from the FRA's maize purchase policies. Higher maize prices also change purchasing and consumption patterns, influencing poverty, nutrition, and starvation. It has been found that poverty outcomes of households who sell maize to the FRA improved, mainly as a result of higher maize income (Fung et al. 2019). Such gains, however, were not universal since only a fraction of smallholders are maize net-sellers and of those, not all sell their maize to the FRA.

One study that has focused on nutrition outcomes is Fung et al. (2019) who consider household calorie availability as one of the smallholder welfare indicators for FRA policy effects. During the early years of FRA operations (until 2008) they find that higher maize income from maize sales to FRA did *not* significantly improve smallholder households' calories retained from own production of crops, milk, and eggs, and purchase of staple foods. In addition, more intense FRA activities in a district were found to be adversely related to calorie availability among households in the district during the same period. Unfortunately, data are not currently available to extend this study beyond 2008.

The Importance of Incorporating Malnutrition and Survival Probabilities into Policy Evaluation

Given the significant concentration of Zambian smallholder agriculture on maize production, and heavy reliance on maize in most diets, FRA policies directly influence the nutrition and survival rates of the poor. Since the the 2007/2008 season, Zambia has consistently recorded a surplus in maize production, and even exported maize and maize products to its neighboring countries in some years (Chapoto, Chisanga, and Kabisa 2018). In most years the FRA has had to purchase a significant amount of maize to hold the SGR at desired levels. Hunger and malnutrition levels in Zambia, however, remain high (Mofya-Mukuka and Mofu 2016). The Food and Agriculture Organization (FAO) reports that 40 to 50 percent of the total population in Zambia was

undernourished over 2000-2014. While malnutrition and starvation are multi-dimensional issues, it is of great importance to gain a better understanding of how FRA policies affect malnutrition rates and the survival probabilities of the poor. Only when these effects are taken into account explicitly will a more comprehensive picture of the full economic and societal effects of such policies begin to emerge.

Extending the Policy Evaluation Framework

Considering the FRA's significant involvement in maize markets, with more than 17 percent of the total agriculture budget allocated to the FRA in 2018 (Ministry of Finance, Zambia), it is important to understand *all* of the effects of FRA operations, including effects on malnutrition and survival rates of the poor. The standard economic framework for evaluating optimal public stockholding programs assumes an objective of maximizing net social welfare, which aggregates the welfare of consumers and producers, as well as accounting for program costs. As discussed earlier, however, these studies are based on effective supply and demand and do not explicitly account for the welfare of poor households forced out of the market who may then be subject to malnutrition and death.

In the case of very poor households at or near maize subsistence level, maize price fluctuations may further impose additional costs (Smith 1997; Myers 2006). When food, especially a starchy staple like maize, accounts for a significant proportion of household income and expenditure, variations in its price largely change the amount of food that the very poor can buy. In times when the maize price is high, the poorest consumers are forced out of the market or can only afford a small amount of food, which is insufficient to meet their basic nutrition or even survival requirements. The conventional way of evaluating and considering optimal storage policy, however, does not explicitly consider this outcome nor incorporate the resulting costs of malnutrition and death in the policy evaluation. This would not be a major issue if the poor could protect themselves through credit and/or insurance markets. However, such markets typically either do not exist or do not work efficiently in rural areas of developing countries like Zambia. In this situation, it is possible that if well designed and implemented, FRA SGR behavior could constitute a second-best policy that improves social welfare, once

imperfect or missing credit and insurance markets and the effects on malnutrition and survival probability are taken into account. However, we currently know very little about what an optimal second-best policy would look like in this context, nor how close or far away current FRA policies are from that optimal policy.

The concept of survival probability has been suggested for analyzing the welfare effects of price stabilization (Myers 2006) and can be used to rethink the full effects of SGR policies. While malnutrition and death are typically ignored in conventional economic welfare analyses of SGR policies, many poor households in the developing world are subject to food insecurity and confront a threat of malnutrition and death. This may distort their consumption and production decisions, especially if they cannot insure or otherwise manage the resulting risks. When intertemporal decision making is considered, changes in current behavior can affect survival probability to the next period (Sattinger 2013). In this framework, reducing price variations could possibly have greater welfare effects on the poor than what conventional studies have suggested. This is because price stabilization can potentially raise the chance that poor households survive by being able to continue to afford adequate food consumption. An increase in survival probability thus results from improved food security, and this effect needs to be incorporated into policy analysis.

Incorporating malnutrition and survival probabilities explicitly into SGR policy evaluation, assuming imperfect or missing credit and insurance markets, may also change the nature of optimal storage rules for SGRs. If households do not survive when food consumption falls below a minimum threshold, and they have no way to insure against this risk, their optimal consumption behavior over time may change in order to enhance current and future survival probability (Sattinger 2013). FRA policies could then act as a second-best policy, but little is known currently about what form such an optimal second-best policy should take. Further research is needed to incorporate these issues into economic analysis of FRA policies and of SGRs more broadly.

Conclusion

Existing research has found that FRA policies have raised and stabilized average maize prices which, in turn, has induced production and consumption responses from Zambian households. Using standard economic welfare analysis, these changes have benefited relatively wealthy surplus maize producers at the expense of poor net buyers of maize. However, it is possible that, if reformed, FRA policies may be able to prevent very high maize prices and make more maize available in times of critical production shortfalls; this, in turn, should reduce malnutrition and increase survival rates among the poor. We currently have very little knowledge of how and to what extent malnutrition and survival rates have been influenced by FRA policies, nor do we currently have a framework for including these effects into a comprehensive evaluation of the full economic welfare effects of SGR policies. This policy brief emphasizes the need for such analysis and suggests some possible approaches to operationalizing this research agenda.

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About the authors

Daye Kwon is PhD student, Department of Agricultural, Food, and Resource Economics, Michigan State University, East Lansing,

Robert J. Myers is University Distinguished Professor, Department of Agricultural, Food, and Resource Economics, Michigan State University, East Lansing,

Nicole M. Mason is Associate Professor, Department of Agricultural, Food, and Resource Economics, Michigan State University, East Lansing,

Paul Samboko is Master’s student, Department of Agricultural, Food, and Resource Economics, Michigan State University, East Lansing, MI.

This work was made possible by the generous support of the American People provided to the Feed the Future Innovation Lab for Food Security Policy (FSP) through the United States Agency for International Development (USAID) under Cooperative Agreement No. AID-OAA-L-13-00001 (Zambia Buy-In). This work was also supported by the US Department of Agriculture (USDA), the National Institute of Food and Agriculture, and Michigan AgBioResearch [project number MICL02501]. The contents are the sole responsibility of the authors and do not necessarily reflect the views of FSP, USAID, USDA, the United States Government, Michigan AgBioResearch, or MSU.

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Published by the Department of Agricultural, Food, and Resource Economics, Michigan State University, Justin S. Morrill Hall of Agriculture, 446 West Circle Dr., Room 202, East Lansing, Michigan 48824.