The Effects of the Food Reserve Agency on Maize Market Prices in Zambia

Nicole M. Mason and Robert J. Myers

Key Points:

1. The Food Reserve Agency's (FRA's) presence in the domestic maize market increased considerably over the last decade. The FRA is currently the dominant buyer of smallholder maize in Zambia. For example, during the 2010/11 marketing year, the FRA purchased 83% of smallholders' marketed maize.

2. Since 2002/03, the FRA pan-territorial maize buy price has consistently exceeded average wholesale prices, particularly in major maize-producing areas such as Choma, Kabwe, Chipata, and Kasama. The above-market buy price makes it difficult for the FRA to export maize unless treasury funds are available to subsidize exports. For example, FRA exports in 2007/08 and 2010/11 generated a trading loss.

3. Estimation results suggest that between July 2003 and December 2008 the FRA's activities raised mean maize market prices by 19% in Choma (which represents a major maize production area) and 17% in Lusaka (which represents a major maize consumption area).

4. FRA activities stabilized maize market prices throughout the July 1996-December 2008 study period. For example, between July 2003 and December 2008, the Agency's activities are estimated to have reduced the coefficient of variation of maize market prices by 34-36%.

5. The maize market price raising and stabilizing effects of FRA policies are regressive. Higher maize prices harm urban consumers and the nearly 50% of smallholders that are net buyers of maize. Higher maize prices help large-scale farmers and a small number of relatively better off smallholders. The more stable maize prices brought about by FRA activities also disproportionately benefit relatively wealthy households.

INTRODUCTION: This policy synthesis estimates the effects of the Zambia Food Reserve Agency's (FRA) activities on maize market prices in the country. The FRA, a government parastatal strategic food reserve/maize marketing board, buys maize at a pan-territorial price that typically exceeds wholesale market prices in major maize-producing areas. It then exports the maize or sells it domestically at prices determined by tender, at auction, or administratively. In deficit production years, the Agency often imports maize and sells it to select large-scale millers at below-market prices. The FRA is a major player in the Zambian maize market and substantial public sector resources are devoted to its activities. For example, the FRA purchased 30% to 86% of the maize marketed by smallholders in six of seven years between 2004/05 and 2010/11, and government spending on the FRA exceeded 25% of total agricultural sector expenditures in several years during this period. Despite these large expenditures on the FRA, relatively little is known about how its activities are affecting maize prices in the private sector.

The general perception in Zambia is that the FRA's activities have raised the level of maize prices and one of the FRA's goals is to stabilize

market prices (Govereh, Jayne, and Chapoto, 2008; FRA n.d.). This study provides empirical evidence on the impacts of FRA policies. Given the importance of maize in domestic production and consumption in Zambia and the high level of government resources devoted to the FRA, a better understanding of the effects of the Agency's activities is needed (Govereh et al. 2009). This study contributes to such an enhanced understanding, which could, in turn, aid in improving the effectiveness of Government of the Republic of Zambia (GRZ) expenditures in the agricultural sector.

OBJECTIVES: The objectives of this policy synthesis are: (1) to use monthly data from July 1996 through December 2008 and an econometric approach similar to Jayne, Myers, and Nyoro (2008) to estimate the impacts of the FRA's pricing decisions and net maize purchases on the level and variability of wholesale maize prices in Zambia; and (2) to identify the policy implications of the empirical findings.

METHODS: We use a vector autoregression (VAR) approach similar to Jayne, Myers, and Nyoro (2008) and monthly data from July 1996 through December 2008 to estimate the effects of FRA activities on maize market prices in Zambia. A VAR is a system of equations in which all variables are treated as endogenous and each variable is regressed on past values of itself as well as current and past values of the other variables in the system. Two groups of endogenous variables are used in this study: maize market prices and FRA policy variables.

The **maize market prices** included in the model are wholesale maize prices in Lusaka and Choma in Zambia and on the South African Futures Exchange (SAFEX) as well as retail maize prices in Mchinji, Malawi. Lusaka is the national capital and largest city in the country, and represents a major maize consumption area in the model. Choma in Southern Province represents a major maize production area. Over the 1993/94 to 2009/10 agricultural seasons, Southern Province accounted for 21% of national smallholder maize production and 18% of smallholder maize sales. Among Zambia's nine provinces, only Eastern Province had a larger share of smallholder maize

production (26%) and only Central Province had a larger share of smallholder maize sales (25%). Maize prices on SAFEX are included in the model because South Africa is the major source of formal maize imports for Zambia, accounting for 72% of such imports between 1999 and 2006 (FAOSTAT 2010). Maize prices in Mchinji, Malawi are included in the model because Malawi is a major source of informal maize trade with Zambia, with much of this maize crossing the Eastern Province border near Mchinji (FEWSNET 2010). Retail prices are used for Mchinji because wholesale price data are not available.

The **FRA policy variables** included in the model are (i) the FRA buy price premium (the FRA buy price minus the wholesale price in the major maize production area, Choma); and (ii) the FRA sell price premium (the weighted average FRA sell price minus the wholesale price in the major maize consumption area, Lusaka). Net FRA maize purchases (FRA domestic purchases minus domestic sales) were initially included in the model as well but the variable was ultimately dropped because sensitivity analysis shows that its inclusion has no substantive impact on the estimated effects of FRA policies on maize market prices in Zambia. The FRA buy and sell price premiums capture most of the FRA effects.

The VAR model is estimated via ordinary least squares. The estimation results are then used to simulate the maize market prices that would have prevailed in Zambia in the absence of the FRA. We refer to these as the *no FRA* market prices. For more details on the methods used in this policy synthesis, please refer to the forthcoming FSRP Working Paper of the same title which will be available at
http://aec.msu.edu/fs2/zambia/research.htm.

DATA: This study uses monthly data from July 1996 through December 2008. The FRA first became active in the Zambian maize market in July 1996 and the most recently available data on FRA maize sales are for December 2008. (The FRA has not released sales data for January 2009 to present.) Data on FRA purchase and sales quantities and prices are from the FRA. Lusaka and Choma maize market prices are into-mill wholesale prices from the Agriculture Market

Information Center (AMIC) of the Zambia Ministry of Agriculture and Cooperatives (now the Ministry of Agriculture and Livestock). Other monthly data series used in the model are: (i) wholesale maize spot prices near Johannesburg, South Africa, from SAFEX; (ii) retail maize prices in Mchinji, Malawi from the Malawi Ministry of Agriculture and Food Security; (iii) South African Rand-US dollar exchange rates from SAFEX; (iv) Malawian Kwacha-US dollar exchange rates from the Reserve Bank of Malawi; (v) Zambian Kwacha-US dollar exchange rates from the Bank of Zambia; and (vi) import tariff rates from the Zambia Revenue Authority.

FINDINGS: This study highlights four key findings. First, as shown in Figure 1, the FRA's presence in the domestic maize market increased considerably over the last decade. The FRA is currently the dominant buyer of smallholder maize in Zambia. For example, during the 2010/11 marketing year, the FRA purchased 83% of smallholders' marketed maize.

Second, as shown in Table 1, since 2002/03, the FRA buy price has consistently exceeded average wholesale prices, particularly in major maize-producing areas such as Choma, Kabwe, Chipata, and Kasama. The above-market buy price makes it difficult for the FRA to export maize unless treasury funds are available to subsidize exports. For example, FRA exports in 2007/08 and 2010/11 generated a trading loss (Govereh, Jayne, and Chapoto 2008; Nkonde et al. 2011).

Figure 1. FRA Smallholder Maize Market Share (FRA Purchases as Share of Expected and Actual Smallholder Maize Sales), 1996/97-2010/11 Marketing Years
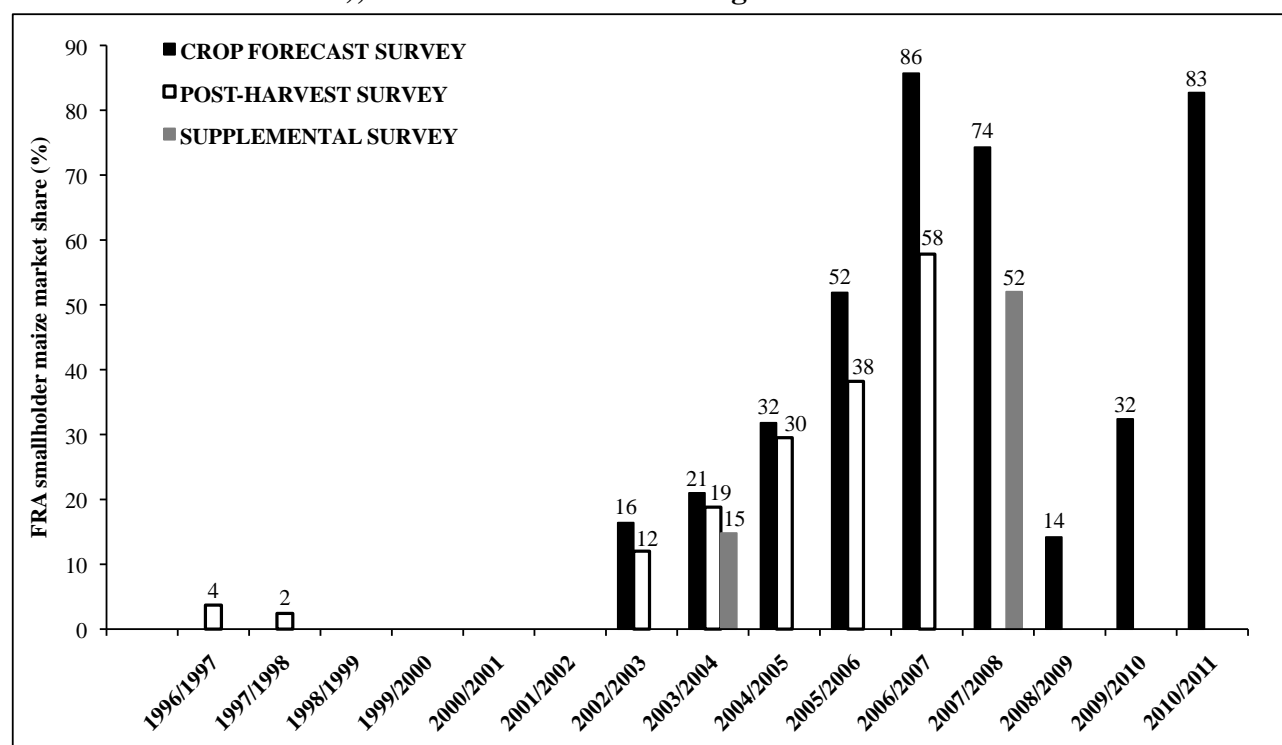
Sources: FRA; CSO/MACO Crop Forecast Surveys; CSO/MACO Post-Harvest Surveys; CSO/MACO/FSRP Supplemental Surveys.
Notes: Crop Forecast Survey estimates of smallholder maize sales are based on farmers' expected sales prior to harvest. Post-Harvest and Supplemental Survey estimates are based on recall data of smallholders' actual maize sales during the previous marketing year.

Table 1. FRA Buy Price and Average Market Wholesale Prices (ZMK/50-Kg), 1996/97-2009/10 Marketing Years

Marketing year	FRA buy price	Wholesale price					
		Lusaka	Ndola	Choma	Kabwe	Chipata	Kasama
1996/1997	11,800	6,815	7,672	4,601	5,944	5,504	6,718
1997/1998	7,880	10,718	11,262	8,506	11,339	11,634	10,782
1998/1999	N/A	16,014	18,902	14,617	14,974	16,028	17,161
1999/2000	N/A	14,768	16,175	12,583	12,166	11,392	11,116
2000/2001	N/A	15,973	17,304	14,518	13,001	11,922	13,786
2001/2002	N/A	31,900	26,667	30,344	32,520	24,933	27,975
2002/2003	40,000[a]	48,290	36,575	40,017	39,193	32,903	34,276
2003/2004	30,000	31,525	27,757	23,096	26,455	20,543	28,716
2004/2005	36,000	30,480	26,642	25,859	25,400	25,121	26,863
2005/2006	36,000	39,113	40,749	39,363	36,801	36,544	37,339
2006/2007	38,000	29,877	31,062	23,839	26,746	22,737	30,167
2007/2008	38,000	34,962	37,655	30,673	31,699	26,576	37,474
2008/2009	55,000[b]	58,877	57,266	51,554	49,175	45,681	48,958
2009/2010	65,000	60,879	58,722	55,518	48,160	48,801	54,599

Sources: FRA; AMIC.
Notes: Prices are in ZMK/50-kg. [a]Initial FRA price of K30,000 was raised to K40,000 in August 2002.
[b]Initial FRA price of K45,000 was increased to K55,000 in September 2008. N/A = not applicable.
The FRA did not buy maize in Zambia in 1998/99-2001/02 hence there was no FRA buy price in those years.

Third, estimation results suggest that between July 2003 and December 2008 the FRA's activities raised mean maize market prices by 19% in Choma and 17% in Lusaka. Figures 2 and 3 show historical and simulated no FRA maize prices in Choma and Lusaka, respectively. The two sets of results are summarized in Table 2. With the exception of 1996/97 (the FRA's first marketing year in operation), there is little difference between the levels of historical and simulated prices prior to mid-2003. From October 1996 through June 2003, mean historical prices exceed mean no FRA prices by less than 1% in both Choma and Lusaka (Table 2). The FRA began buying maize directly from smallholders throughout Zambia at a pan-territorial price in July 2003. Since then with the exception of the 2005/06 marketing year, maize market prices in Zambia have been substantially higher than they would have been in the absence of the FRA (Figures 2 and 3).[1]

Fourth, FRA activities stabilized maize market prices throughout the study period. Although FRA activities had little effect on mean maize market prices prior to July 2003, these activities reduced the standard deviations (SD) of Choma and Lusaka wholesale prices by 13%, resulting in 14% reductions in the coefficients of variation (CV).[2] The market price stabilizing effects of the FRA's involvement in domestic maize marketing are even greater in the July 2003 through December 2008 period; the Agency's activities are estimated to have reduced the CV of maize market prices in Choma and Lusaka by 34% and 36%, respectively.

CONCLUSIONS AND POLICY IMPLICATIONS: The results in this policy synthesis suggest that two of the major outcomes of the FRA's activities since mid-2003 have been an increase in the average level of and a reduction in the variability of maize market prices in Zambia. Who are the likely winners and losers? In general, higher average maize market prices are beneficial for net sellers and detrimental for net buyers of maize (Weber et al. 1988). In Kenya, for example, Mghenyi, Myers, and Jayne (2011) find that a discrete 25% maize price increase is associated with significant welfare losses in areas where most households are net buyers. In Zambia, nationally-representative household survey data
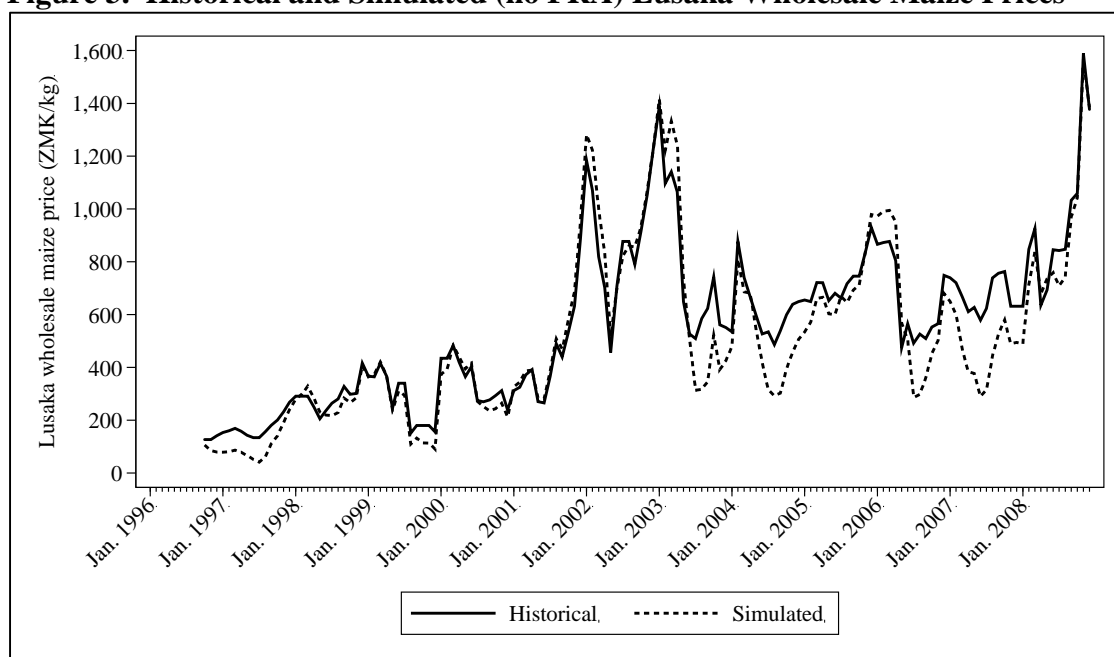
---

[1] The 2005 smallholder maize harvest was by far the smallest of the 2003 to 2008 period, and FRA maize purchases in 2005/06 were relatively small.

[2] CV = SD / |mean|

4

Figure 2. Historical and Simulated (no FRA) Choma Wholesale Maize Prices
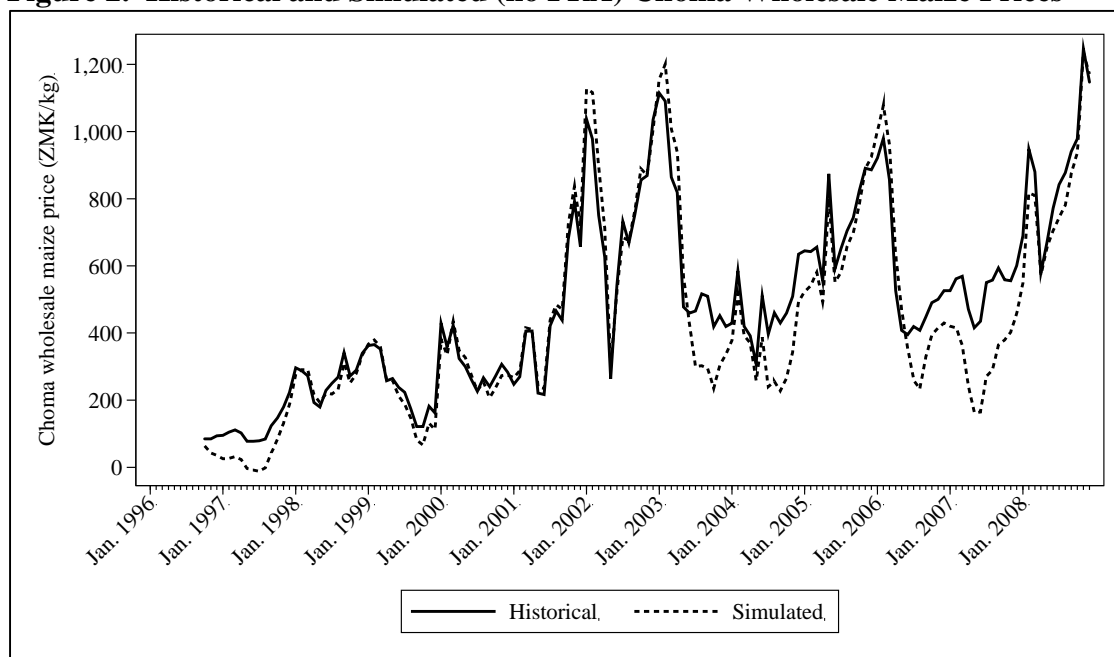
Figure 3. Historical and Simulated (no FRA) Lusaka Wholesale Maize Prices

collected by the government Central Statistical Office and Ministry of Agriculture and Cooperatives indicate that only approximately 28% of smallholder farm households sell more maize than they buy; the remaining 72% either buy more maize than they sell (49%) or neither buy nor sell maize (23%) (2008 CSO/MACO/ FSRP Supplemental Survey). Thus higher maize prices hurt urban consumers and the nearly 50% of smallholders that are net buyers of maize. Large-scale farmers and the 28% of smallholders

that are net-maize sellers benefit from higher average maize prices. (The 23% of smallholders that neither buy nor sell maize are not directly affected by higher maize market prices.)

Among smallholder net-maize sellers, gains from higher maize market prices would be highly concentrated in the hands of the 3% to 5% of maize-growing smallholders that account for 50% of all smallholder marketed maize (Kuteya et al.

5

Table 2. Summary of FRA Effects on Choma and Lusaka Wholesale Maize Prices

Period, statistic	Choma price (ZMK/kg)			Lusaka price (ZMK/kg)		
	Historical	Simulated	% difference	Historical	Simulated	% difference
(i) Full sample period (October 1996-December 2008):						
Mean	486	439	10.5%	559	512	9.2%
SD	271	298	-9.1%	296	326	-9.0%
CV	0.559	0.679	-17.7%	0.530	0.636	-16.7%
(ii) October 1996-June 2003:						
Mean	377	374	0.8%	435	433	0.4%
SD	272	312	-12.9%	309	356	-13.1%
CV	0.721	0.835	-13.6%	0.710	0.821	-13.5%
(iii) July 2003-December 2008:						
Mean	618	519	19.1%	711	609	16.8%
SD	204	261	-21.7%	192	256	-24.8%
CV	0.331	0.503	-34.2%	0.270	0.420	-35.6%

Notes: SD=standard deviation. CV=coefficient of variation.

2011). This group tends to have more land and non-land assets than other smallholders do. Therefore, to the extent that they raise average maize market prices in Zambia, the FRA's policies are regressive: higher maize prices harm urban consumers and a large proportion of rural households, and help large-scale farmers and a small number of relatively better off smallholders.

There may be additional welfare impacts associated with the market price stabilizing effects of FRA policies. However, the welfare effects of FRA-induced increases in the average *level* of maize market prices are likely to dwarf any welfare effects that result from price *stabilization* (Newbery and Stiglitz 1981). Furthermore, just as in the case of higher mean maize prices, relatively better off producers are likely to be the principal beneficiaries of more stable maize prices (Naylor and Falcon 2010). For example, simulations in Myers (2006) suggest that a large reduction in food price variability (i.e., from a CV of 0.3 to 0) results in a welfare increase equivalent to nearly 9% of income among affluent producers. The same degree of price stabilization results in the equivalent of income increases of only 2.7% and 1.4% among poor producers and poor consumers, respectively.

Similarly, empirical evidence from rural Ethiopia indicates that the benefits from food price stabilization are concentrated in the hands of the wealthiest 40% of households (Bellemare, Barrett, and Just 2011). Moreover, Bellemare, Barrett, and Just find that many poor rural households are actually hurt by more stable food prices.

If similar results hold in Zambia, it would indicate that both the mean maize price raising and the price stabilizing effects of FRA policies are regressive: they disproportionately benefit relatively better off households and have negative net effects on relatively poor households.

REFERENCES

AMIC. Various Years. Wholesale Maize Price Database. Lusaka: AMIC.

Bellemare, M.F., C.B. Barrett, and D.R. Just. 2011. The Welfare Impacts of Commodity Price Volatility: Evidence from Rural Ethiopia. Ithaca, NY: Cornell University. Available at http://dyson.cornell.edu/faculty_sites/cbb2/Papers/BellemareBarrettJustPriceVolatilityJDESubmission.pdf.

CSO/MACO. Various Years. Crop Forecast Surveys. Lusaka: CSO.

CSO/MACO. Various Years. Post-Harvest Survey Data. Lusaka: CSO.

CSO/MACO/FSRP. Various Years. Supplemental Survey Data. Lusaka: FSRP.

Food and Agriculture Organization Statistical Databases (FAOSTAT). 2010. TradeStat Database. Rome: FAO. Retrieved from http://faostat.fao.org/site/406/default.aspx, December 15, 2011.

FEWSNET. 2010. Southern Africa Informal Cross Border Food Trade Dataset. Provided by Phumzile Mdladla, Regional Representative. Washington, D.C.: FEWSNET.

Food Reserve Agency (FRA), n.d. FRA website. Retrieved from http://www.fra.org.zm/, December 15, 2011.

Govereh, J., T.S. Jayne, and A. Chapoto. 2008. *Assessment of Alternative Maize Trade and Market Policy Interventions in Zambia*. Food Security Research Project Working Paper No. 33. Lusaka: FSRP. Available at http://www.aec.msu.edu/fs2/zambia/wp_33.pdf.

Govereh, J., E. Malawo, T. Lungu, T.S. Jayne, K. Chinyama, P. Chilonda. 2009. *Trends and Spatial Distribution of Public Agricultural Spending in Zambia: Implications for Agricultural Productivity and Growth*. Food Security Research Project Working Paper No. 36. Lusaka: FSRP. Available at http://www.aec.msu.edu/fs2/zambia/wp_36.pdf.

Jayne, T.S., R.J. Myers, J.K. Nyoro. 2008. The Effects of NCPB Marketing Policies on Maize Market Prices in Kenya. *Agricultural Economics* 38: 313-25.

Kuteya, A., S. Kabwe, M. Beaver, A. Chapoto, W.J. Burke, N.M. Mason, M.T. Weber. 2011. *Statistical Report on Categorization of Rural Cropping Households in Zambia*. Food Security Research Project Working Paper No. 51. Lusaka: FSRP. Available at http://www.aec.msu.edu/fs2/zambia/wp51/index.htm.

Mghenyi, E., R.J. Myers, T.S. Jayne. 2011. The Effects of a Large Discrete Maize Price Increase on the Distribution of Household Welfare and Poverty in Rural Kenya. *Agricultural Economics* 42: 343-56.

Myers, R. J. 2006. On the Costs of Food Price Fluctuations in Low-income Countries. *Food Policy* 31: 288-301.

Naylor, R.L. and W.P. Falcon. 2010. Food Security in an Era of Economic Volatility. *Population and Development Review* 36: 693-723.

Newbery, D.M.G. and J.E. Stiglitz. 1981. *The Theory of Commodity Price Stabilization*. New York, NY: Oxford University Press.

Nkonde, C., N.M. Mason, N.J. Sitko, and T.S. Jayne. 2011. *Who Gained and Who Lost from Zambia's 2010 Maize Marketing Policies?* Food Security Research Project Working Paper No. 49. Lusaka: FSRP. Available at http://www.aec.msu.edu/fs2/zambia/wp49.pdf.

Weber, M.T., J.M. Staatz, J.S. Holtzman, E.W. Crawford, and R.H. Bernsten. 1988. Informing Food Security Decisions in Africa: Empirical Analysis and Policy Dialogue. *American Journal of Agricultural Economics* 70: 1044-52.

Nicole M. Mason is assistant professor, International Development, in the Department of Agricultural, Food, and Resource Economics at Michigan State University (AFRE/MSU) and is currently on long-term assignment with FSRP in Lusaka, Zambia. Robert J. Myers is university distinguished professor, Commodity Market Analysis and Policy, in AFRE/MSU.