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Strategic Grain Reserves in Ethiopia

Institutional Design and Operational Performance

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INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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ABSTRACT

Holding strategic grain reserves to address food price hikes has received renewed attentions in recent years. This paper examines such a program in Ethiopia that has been successful in addressing several emergencies since the 1990s. The analysis suggests that the key ingredients behind the success are a unique institutional design, coordination during emergencies with food-based safety net programs, and keeping the grain stocks to a minimum. Institutional design is unique because, unlike similar agencies in other countries, Ethiopia's Emergency Food Security Reserve Administration (EFSRA) is independent of price stabilization and hence is not engaged in buying and selling of grain. The paper also demonstrates that scaling up school feeding programs will generate additional food demand and an effective outlet for stock rotation; and that increasing the stock level for price stabilization will adversely affect both grain markets and the performance of the EFSRA.

Keywords: Ethiopia, strategic grain reserves, agricultural price policies, safety net programs

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ABBREVIATIONS AND ACRONYMS

CFSAM	Crop and Food Security Assessment Mission
DRMFSS	Disaster Risk Management and Food Security Section
EFSRA	Emergency Food Security Reserve Administration
EGTE	Ethiopian Grain Trading Enterprise
ETB	Ethiopian Birr
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GMB	Grain Marketing Board
GoE	Government of Ethiopia
ITSH	Internal Transport, Shipping, and Handling
MPC	Marginal Propensity to Consume
MoA	Ministry of Agriculture
MoFED	Ministry of Finance and Economic Development
MoT	Ministry of Trade
NEPAD	New Partnership for Africa's Development
NGO	Nongovernmental Organization
ODA	Overseas Development Administration
PSNP	Productive Safety Net Program
SGR	Strategic Grain Reserve
WFP	World Food Programme

1. INTRODUCTION

Maintaining grain reserves was, and in many countries still is, an integral part of agricultural price policies—interchangeably termed as food price stabilization, buffer stock policies, or dual pricing policies—in developing countries for several decades. In Ethiopia, such policies date back to the early 1950s when Emperor Haile Selassie instituted the Grain Marketing Board (GMB). However, real control over food markets began when the socialist government came to power in 1974. Consistent with its ideology, the socialist government of Ethiopia instituted a wide range of controls over grain production and marketing. These included determination of annual quotas, restrictions on private grain trade and interregional grain movement, determination of days on which the local markets had to be held, and rationing of grain to urban consumers.[1] Wholesale prices of cereals were administratively set for many provincial markets and changed little between 1976 and the late 1980s (Webb and von Braun 1994, 48). In other words, the government's marketing board was in control of almost all aspects of markets.

Yet, the government decided to establish strategic grain reserves in the early 1980s and continues to maintain it, despite changes in governments and substantial market liberalization since 1991. This background gives rise to three important questions:

1. Why did Ethiopia institute a separate grain reserve agency, even though its marketing board had total control over agricultural markets?
2. How compatible is the strategic grain reserve with overall market-oriented policies?
3. How has the strategic reserve system performed in terms of operational and institutional efficiency?

Answers to these questions not only are important for Ethiopia but also have relevance for regional initiatives, such as the one endorsed by the New Economic Partnership for Africa's Development (NEPAD),[2] and the ongoing debate triggered by the 2007–2008 food crisis over various proposals for holding grain reserves at regional and global levels.[3]

The rest of the paper is organized as follows: Section 2 describes how the strategic grain reserve agency, now called the Emergency Food Security Reserve Administration (EFSRA), has evolved over time, and this is followed by a discussion on the organizational structure and management of EFSRA in Section 3. Section 4 presents the results of the analysis on the operational performance with respect to optimal stock, efficiency of stock management, and operational costs. The linkages of EFSRA with emergencies and other food security programs are analyzed in Section 5. The report concludes with a summary and implications of the results.

[1] For details, see Franzel, Colburn, and Degu (1989), Lirenso (1994), and Lemma (1996).

[2] The rationales and modalities for regional strategic reserves are discussed in FAO (2004) study conducted the NEPAD.

[3] The proposals include virtual reserves (von Braun and Torero 2009), rice reserve for Asia (Timmer 2009), as well as suggestions for financial reserves. For a detailed discussion on merits and demerits of various proposals, see Wright (2009).

2. RATIONALE AND EVOLUTION OF STRATEGIC GRAIN RESERVES

In Ethiopia, agricultural price control began in the mid-1970s when the socialist government, in line with its ideology, instituted a wide range of controls over grain production and marketing. Among other things, the public controls involved administratively fixing grain prices, setting up annual quotas, restricting private grain trade and interregional grain movement, and supplying grain ration to urban consumers. In other words, the government was in charge of almost all aspects of grain marketing in the country, including maintaining a large grain stock.[4] However, the drought of 1973–1974 and subsequent famine, which claimed about 200,000 lives, made it clear that the grain stocks accumulated as part of agricultural price policies were not enough to address the country's food emergencies.

Therefore, the government of Ethiopia (GoE) requested the Food and Agriculture Organization of the United Nations (FAO) to undertake a study to analyze possible options for addressing vulnerability to shocks and food insecurities. The idea of setting up a strategic reserve was an outcome of that study. The underlying logic was that since the country was structurally deficit, production shocks were recurrent, and the infrastructure and institutions were weak, the government had to be prepared to protect the poor and vulnerable at times of scarcity. Given the level of infrastructure, institutions, and other constraints, having an emergency stock was considered critical for national food security. This was the rationale for instituting strategic grain reserves in early 1980s and appears to remain valid even today. The frequency of shocks continues to be high, and the country has consistently needed food aid assistance to deal with the emergencies. During 1996–2008, food aid inflow to the country has ranged from roughly a quarter of a million tons in 1996 to about two million tons following drought in 2003 (Table 1). In recent years, EFSRA has played important roles in managing the aftermath of droughts and emergencies. EFSRA was the only immediate source of food supplies in the 1999–2000 and 2002–2003 drought years, and both government and relief agencies heavily relied on the reserves to combat the unusually sharp increase in food prices during 2008–2009. In September of 2008, the EFSRA stock declined from more than 200,000 tons to only about 17,000 tons. Clearly, things would have been worse if the country did not have the emergency reserve.

Table 1. Production and food aid in Ethiopia, 1996-2008

Year	Total Grain Production	Total Food Aid Deliveries	Food Aid as % of Production	Production per Capita
	('000 Metric tons)	('000 Metric tons)		
1996	10,327.9	244	2.4	0.18
1997	10,436.8	228	2.2	0.18
1998	8,102.7	444	5.5	0.14
1999	8,866.9	473	5.3	0.15
2000	9,233.6	1,231	13.3	0.15
2001	11,039.2	980	8.9	0.17
2002	10,371.4	266	2.6	0.16
2003	11,536.3	1,887	16.4	0.17
2004	10,626.9	732	6.9	0.15
2005	12,573.9	1,004	8.0	0.17
2006	14,411.6	552	3.8	0.19
2007	15,572.5	285	1.8	0.20
2008	16,871.9	626	3.7	0.22

Source: Authors' calculations from GoE data.

[4] For details, see Webb and von Braun (1994) and Lirenso (1994).

Although it recommended setting up emergency reserves, the first FAO study did not present an implementation plan. Therefore, a second study was conducted in 1979, which recommended building a stock of 60,000 metric tons within one year and 180,000 metric tons within four years. Following this recommendation, the GoE established EFSRA in 1982 as an additional unit of the Relief and Rehabilitation Commission. Subsequently, a joint study conducted by the World Food Programme (WFP) and the Overseas Development Administration (ODA) of the United Kingdom recommended revising stock levels to 204,600 metric tons in 1987. The study came to this conclusion based on the assumption that at least 95 percent of the food-insecure populations need to be protected by providing a ration of 400 grams of cereal per capita per day for a period of four months, which is considered to be the necessary lead time to import and distribute the food to beneficiaries. Food or cash aid involve two lead times: one represents the time between flash appeal to actual pledge by the donors and the other is time between the pledge and actual imports.

Institutionally, EFSRA went through a significant change in October 1992, when the prime minister, in his capacity as the chairman of the council of ministers, issued a legal directive establishing EFSRA as an autonomous agency with significant changes in its operational procedures. The primary mechanism to respond to emergencies was now the provision of inventory loans to well-established relief and rehabilitation agencies working in the country. The objective was to facilitate relief agencies' operations in case of temporary shortages in their working stocks if there was a guarantee of repayment within an agreed-upon time. However, the new operational manual did not rule out the possibility of free drawdown, as was the case earlier, if the scale of emergency was larger and the primary mechanism failed. In other words, the new operational guideline kept the provision for other food security programs, such as safety nets and price stabilization programs, to withdraw from the reserve in case of large-scale emergencies.

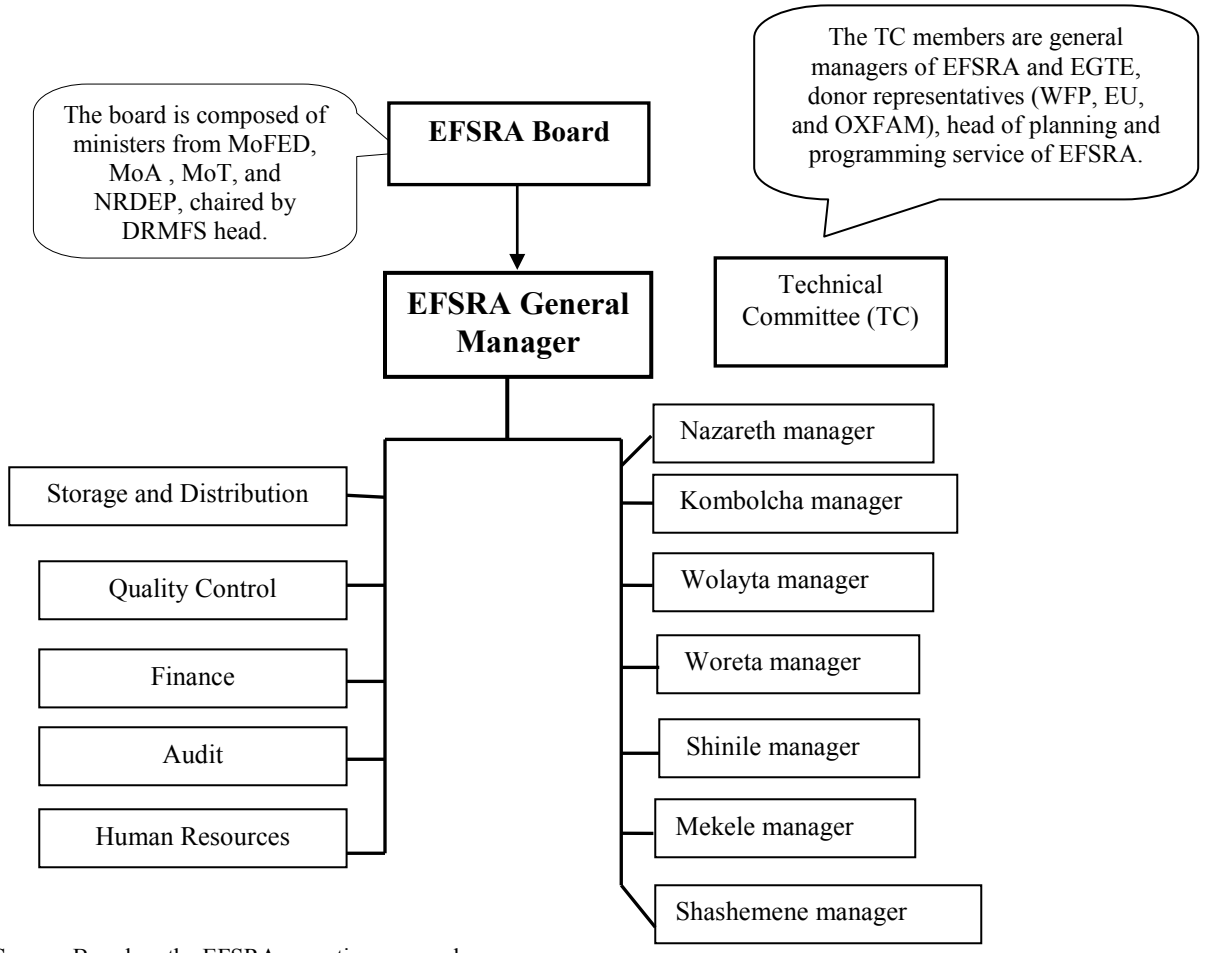
Following the droughts of 2002–2003, the reserve level was re-examined and a new stock level was established at 407,000 metric tons in 2004. The increase in stock was largely dictated by the increase in the number of food-insecure people in the country and the old assumption that it would take four months to reach the beneficiaries with a new shipment of food to the country. Before launching this study, IFPRI organized a stakeholders' consultation that was attended by the representatives from EFSRA, Disaster Risk Management and Food Security Section (DRMFSS), nongovernmental organizations (NGOs), and national research organizations. At the meeting, it was unofficially mentioned that a policy discussion was underway to increase strategic grain reserves to 1.5 million metric tons and to establish an enhanced mandate for EFSRA, which includes the agency's larger contribution to price stabilization activities. As the subsequent sections will demonstrate, given current institutional setting and logistics, such a move can lead to a substantial loss of efficiency and an increase in subsidy bills, along with potential disruptive impacts on the grain markets.

3. ORGANIZATIONAL STRUCTURE AND OPERATIONAL GUIDELINES

Organization and Management

From the conceptualization phase, there was a deliberate attempt to keep the organizational structure of EFSRA thin, simple, and flexible to be able to respond to emergency needs. The agency is managed by a director general, who is in charge of overseeing five departments, namely, storage and distribution, quality control, finance, and audit and human resources departments (Figure 1). Under these departments are the major warehouses, which have their own manager, quality control officer, and storage and distribution officers—all overseen by the five central departments. The director general is also responsible for overseeing seven warehouse branch managers, located in different parts of the country. Each warehouse has its own quality control office, administration and finance, and storage and distribution officers and clerks.

Figure 1. Organizational structure of EFSRA



Source: Based on the EFSRA operations manual.

EFSRA's major policy guidance and decision making are guided by the board, which is chaired by the head of the DRMFSS, and the members include the general manager of EFSRA and the Ministry of Finance and Economic Development (MoFED), Ministry of Agriculture (MoA), and the Ministry of Trade (MoT) High-level representation of public officials in the EFSRA board is a reflection of the government commitment toward effectively managing the agency. To be responsive to emergencies, the

general manager of EFSRA is given the authority to release up to 5,000 tons of grain at a time, with a total of up to 25,000 tons if requested by any recognized relief agency. For larger amounts, the general manager is required to receive approval from a technical committee composed of the general manager of EFRSA, representatives from Ethiopian Grain Trading Enterprise (EGTE), the WFP, and a representative on behalf of the NGOs engaged in emergency operations. The technical committee has the authority to approve 5,000–25,000 metric tons, provided that the total outstanding grain loan approved by the committee does not exceed 100,000 metric tons.

If reserve levels drop to or below 25 percent of the targeted total stock of 407,000 metric tons, neither the EFSRA manager nor the technical committee can make any decision regarding stock release. At that point, stock release can only be approved by the EFSRA board. If emergencies are acute, the relief agencies can call for an emergency meeting with the board for faster action; the board can then decide on the size of stock release. Although this has been rare, the board has indeed made such interventions during the acute crisis of 2008. In summation, the organizational structure and the management of EFSRA reflect the high level of GoE commitment; at the same time, they are flexible enough to promptly respond to emergency needs of varying degrees.

Operational Guidelines and Capacity Utilization

A key distinction between EFSRA of Ethiopia and the reserves of many other countries is that EFSRA it does not engage itself with buying, selling, transporting, and distribution of grain. Instead, the agency serves as the custodian of the stock, built through donor and government contributions. More specifically, when the target stock level of 407,000 tons was determined, government and donors made pledges to build up that stock, mainly through food aid and imports. This is a one-time procurement exercise. Once the stock level is reached, the national and international agencies can borrow from the EFSRA with a guarantee that they will replenish the stock within an agreed-upon time period. The main responsibility of EFSRA is to manage the lending and replenishment of stock according to its operational guideline. All transactions have to follow strict procedures set by the EFSRA executive board. To that end, the operation manual of the EFSRA states, “The organization requesting the loan should be legally recognized, engaged in relief activities, enter into obligation to cover all transactions costs (for example, loading, unloading, and weighing) both at the time of procurement and at the time of repayments.” In addition, borrowing from EFSRA requires that (1) the relief agency does not have previous record of default in repaying the grain and (2) any request for borrowing has to come from the heads of the respective agency and needs to be backed by a letter of guarantee from an additional donor or government agency.

Although the EFSRA’s target stock level is 407,000 metric tons, it has only seven warehouses with an effective capacity of 285,000 metric tons (Table 2). Monthly stock data by storage site indicate that, on average, EFSRA held a stock of 179,000 tons during 2004–2009, which is about 63 percent of the effective capacity, 46 percent of total capacity, and 44 percent of the target stock level of 407,000 metric tons. At the warehouse level, capacity utilization rates have varied from only 25 percent in Shinile to roughly 80 percent in Nazareth and Woreta.

Table 2. Capacity and utilization rate of warehouse, 2004-2009

Warehouse	Warehouse Capacity		Average Stock Level (2004–2009)	Capacity Utilization
	Rated	Effective		
	(metric tons)		*(metric tons)*	*(percent)*
Nazareth	67,690	45,000	35,956	79.90
Kombolcha	97,340	65,000	40,299	62.00
Mekele	67,300	45,000	23,658	52.57
Shashemene	37,440	25,000	17,947	71.79
Shinile	39,440	25,000	6,437	25.75
Wolayta Soddo	41,200	41,200	25,454	61.78
Woreta	38,000	38,000	29,722	78.21
National	**388,410**	**284,200**	**179,472**	**63.15**

Source: Authors' calculations based on EFSRA data.

4. OPERATIONAL PERFORMANCE

Maintaining food reserves is expensive. If the grain stocks are not managed efficiently, there are at least three potential adverse consequences: (1) large subsidies may be required to pay for the storage costs, (2) grain quality may deteriorate and can pose health risks to the poor households who receive these grains (or the children who are fed in school), and (3) when stock gets older, generally following good harvests, governments have to sell the grain to open markets, which can distort markets and adversely affect private sector incentives. Once a policy decision to hold a strategic grain stock is made, it is important to devise measures to minimize fiscal costs, ensure food safety, and reduce distortive impacts of stock policies on grain markets. A set of analyses have been carried to out to assess how EFSRA has performed with respect to these indicators. Assessing the optimality of stock is an obvious starting point because it greatly influences all performance indicators. Then we analyze three key aspects of stock management: (i) stock age, (ii) costs of holding stocks, and (iii) impacts of markets. Results are presented below.

Determination of Stock Level

Determination of optimal stock is complicated. Given the political sensitivity and the involvement of stakeholders with conflicting interests, it is difficult to generate an optimal stock estimate that is agreeable to all. As a result, the optimal grain stock has generally been determined either on an ad hoc basis or based on a very simple formula.5 In Ethiopia, it has been the latter. When the country instituted EFSRA in 1982, the objective was to feed 3.7 million food-insecure people by providing them with 400 grams of grain a day for a period of four months. A minor change was made in 1987 following the WFP and Overseas Development Administration (ODA) study that proposed to cover 95 percent instead of 100 percent of the food-insecure population.

Using the DRMFSS estimates of the food-insecure population, and assuming that at least 95 percent of the food-insecure population needs to be covered in case of emergency, we have calculated the size of necessary grain reserves since the 1970s. The results, presented in Table 3, show that at optimal stock, estimates for the 1970s and 1980s (157,300 tons and 179,564 tons, respectively) are very similar to the respective official targets of 160,000 and 180,000 tons. However, the estimates start changing in early 2000. For instance, the estimate for 2000–2004 is 362,322 tons, which is about 12 percent lower than the official target of 407,000 tons. The difference between these estimates and official estimates becomes more striking following the introduction of the Productive Safety Net Program (PSNP) in 2005. The number of people in need of food assistance declined significantly, primarily because a portion of the food-insecure population is now covered by the PSNP. During 2005–2009, maximum stock requirement, according to our calculation, would have been 287,000–302,000 tons, depending on what proportion of population in need of food assistance is expected to be covered in an emergency. Thus, we conclude that the current target level of 407,000 tons of strategic grain reserves is on the higher side and needs to be revised unless new programs are expected to be covered by EFSRA.

[5] See Goletti, Ahmed, and Chowdhury (1991) for Bangladesh, and Krishna and Chibber (1983) for India.

Table 3. Food-insecure population and grain reserves for Ethiopia, 1970-2009

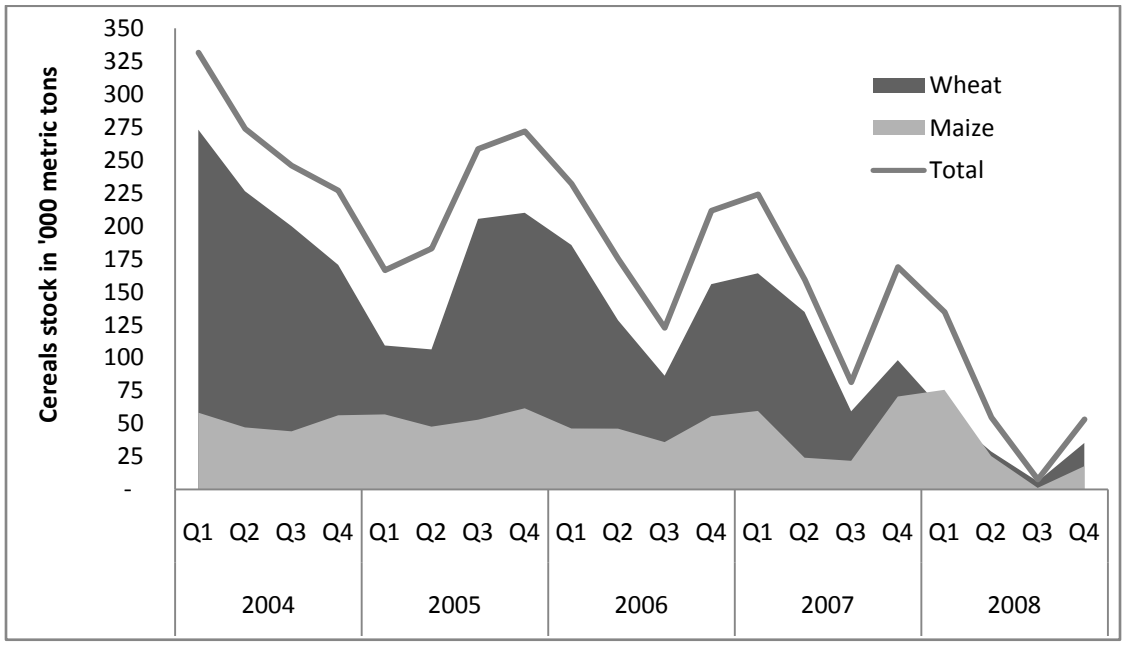
Year	Population Needing Emergency Assistance (in millions)	Total Stock Requirement (in metric tons)	
		Covering All of the Food-Insecure Population	Covering 95% of the Food-Insecure Population
1970s	3.25	157,300	149,435
1980s	3.71	179,564	170,586
1990s	4.61	223,124	211,968
2000–2004	7.88	381,392	362,322
Average (1970–2004)	**4.86**	**235,345**	**223,578**
2005	2.72	131,648	125,066
2006	2.58	124,848	118,606
2007	3.36	162,624	154,493
2008	4.60	222,640	211,508
2009	6.24	302,127	287,020
Average (2005–2009)	**3.9**	**188,777**	**179,339**

Source: Authors' calculations using DRMFSS data.

There are at least three reasons why a stock revision may be justified. First, the assumption that it will take four months for food import to arrive might have changed over the years. The road infrastructure in Ethiopia has improved since early 2000 (Mogues, Ayele, and Paulos 2008), resulting in significant reduction in domestic transportation time and costs (Rashid and Negassa 2009). Second, the introduction of PSNP has substantially reduced the number of people in need of food assistance compared with earlier years. Therefore, unless PSNP and other safety net programs are scaled up and linked with EFSRA, the stock requirement will be smaller. Finally, Ethiopia has successfully addressed a series of emergencies (in 1994, 1997, 1999, and 2003), with an average stock of about 200,000 tons in spite of the fact that the country did not have a large program like PSNP in those years. That is, although the target was 407,000 tons, effective stock was much smaller in most of the months. Thus, unless EFSRA is linked with other justifiable food security programs, a stock level of 302,127 tons—that is, the upper bound of the estimates in Table 3 since 2005—should be optimal.

Given the experiences of 2008–2009 emergencies, a proposal for revision in strategic reserve may not be appealing unless there is a clear understanding about the causes behind a sharp increase in prices. One of the key reasons for sharp price hikes in 2008–2009 was an inaccurate crop forecast and an interlinked estimate for the size of the food-insecure population, which is estimated through joint efforts of the early warning systems, relevant GoE agencies, and the Crop and Food Security Assessment Mission (CFSAM) of the FAO and WFP. Although this assessment has generally performed well, its forecasts were wrong for those years. This is clear from the fact that despite official projection of a double-digit growth in cereal production in the country, cereal prices increased sharply. This resulted not only in an increase of the food-insecure population but also in strong political pressure to stabilize food prices in the major urban centers through reintroduction of the rationing system. The end result was alarming depletion of strategic food reserves to only about 7,600 tons (Figure 2).

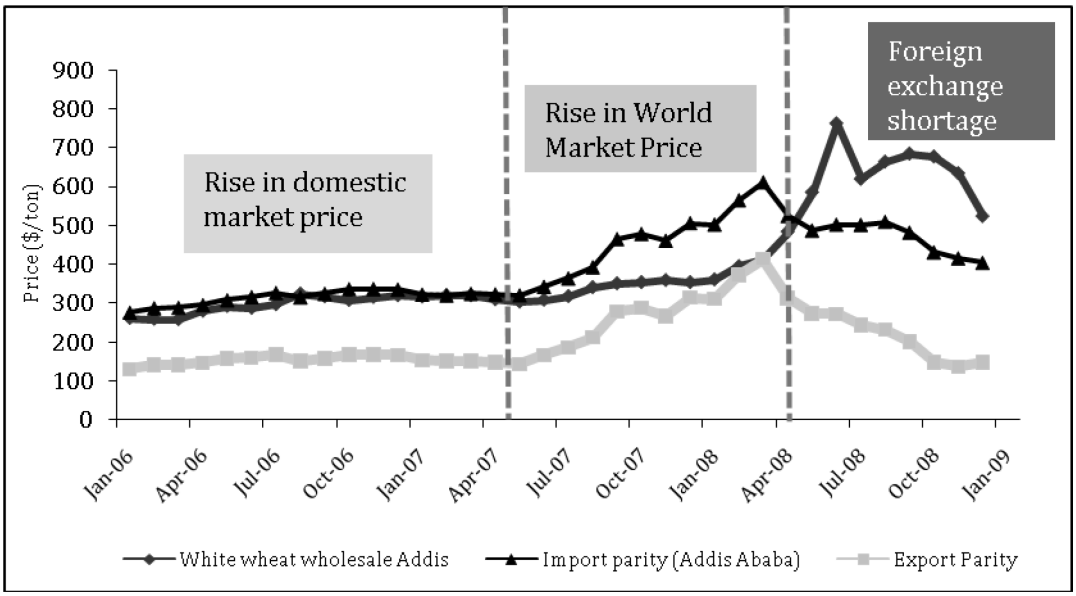
Figure 2. Quarterly EFSRA stocks by grain types, 2004–2008



Source: Author's compilation on EFSRA data

Two macroeconomic policies further exacerbated the food price situations. During 2005–2007, money supply outpaced overall growth, resulting in overall nominal inflation (World Bank 2007). Given that the currency was overvalued, this brought domestic prices closer to the import parity. In early 2008, due to a sharp increase in fuel subsidy bills, the government encountered a balance of payment shortage. To combat this problem, Ethiopia's central bank started rationing foreign exchange, which prevented the private sector from importing. As a result, domestic prices went way above the import parity. Figure 3, which presents export and import parity prices of wheat, illustrates how these played out in domestic markets at different time periods. It is interesting to note that domestic prices started increasing before the global food crisis, did not follow world prices during the global food crisis, and started increasing sharply long after world prices took a nosedive. Once there is a clear understanding that the 2008–2009 situations was an unusual one fueled by inaccurate forecasts and macroeconomic instability, it becomes easier to make the case for revision of stocks.

Figure 3. Export and import parity prices of wheat in Ethiopia, 2006–2009



Source: Authors' calculation based on EGTE data.

Stock Management

Efficient management of stock is very important in reducing costs of operation, ensuring food safety, and minimizing market distortions. These aspects are assessed by carrying out two sets of analyses: (1) an assessment of stock age and (2) an analysis of the relationships among market supply, EFSRA stock release, and grain prices. Assessment of the stock age is guided by the hypothesis that the older the stock, the higher the costs and higher the likelihood of quality deterioration and contamination. Thus, this assessment not only provides costs of holding stock but gives some indication of the quality of grains that are distributed. On the other hand, the analysis of the relationship among stocks, market size, and prices gives us an idea about whether public stocks have any significant impacts of markets.

Stock Age Analysis

An ideal way to decompose grain stock by age would be to collect data from each warehouse by origin, arrival date, and date of distribution. Carrying out such surveys is very difficult and time-consuming; more importantly, in many instances, such surveys may not be able generate all the relevant information. In this study, we adopted an alternative method, as presented in Dorosh and Farid (2003) and Ahmed et al. (2004). According to this method, the amount of n-month-old stock in a given time, say t, can be calculated as closing stock at time t–n minus total distribution from period t–n + 1 through period t. For example, the amount of stock that is at least three months old at the end of April of a given year is calculated as the closing stock of January minus total distribution from February to April of that year. Note that this calculation is based on two strict assumptions: (1) that EFSRA stocks are rotated on a first-in, first-out basis, which can be violated if there is a need for disposing of deteriorating stock or under unusual emergency situations, and (2) that stock received by any storage at any given time is at least one month old. The second assumption is also restrictive, especially for the transoceanic food aid shipments, which might be months old before they arrive at a specific EFSRA warehouse.

The results of our analysis are presented in Table 4. The stock age calculations are done for all EFSRA warehouses for two separate periods, 2005–2006 and 2007–2008, by warehouse locations. For each warehouse, the first row presents the volume, the second row presents the volume of stock of a given

age as a percentage of the total, and the third row presents the costs of holding the stock. The estimates of volume of stock by age suggest that EFSRA's stock rotation has been quite efficient during these time periods. On average, none of the seven warehouses appear to have held stocks older than nine months. At the national level, about 62 percent of the stocks were less than or equal to three months old in 2007–2008; this number was about 70 percent in 2005–2006. This is quite remarkable compared with countries in both Africa and Asia. For instance, using the same method of calculations, Kenyan warehouses appear to hold 33 percent of the stock for longer than nine months. In Bangladesh, where public food stocking has a long history, more than 10 percent of stocks were older than six months (Ahmed et al. 2004).

Table 4. Analyses of EFSRA stock age and storage costs, 2005-2006 and 2007-2008

Warehouses	Indicators	2005 to 2006			2007 to 2008		
		≤3 Months	3–6 Months	6–9 Months	≤3 Months	3–6 Months	6–9 Months
Kombolcha	Quantity (MT*)	46,406	17,731	1,072	24,689	5,881	2,740
	Percentage	71.2	27.2	1.6	74.1	17.7	8.2
	Storage cost**	**382**	**292**	**26**	**337**	**161**	**112**
Mekele	Quantity (MT)	19,108	5,624	—	7,430	5,435	3,063
	Percentage	65.1	33.1	1.8	46.7	34.1	19.2
	Storage cost	**157**	**93**		**101**	**148**	**125**
Nazareth	Quantity (MT)	26,233	13,350	741	11,414	2,488	—
	Percentage	65.1	33.1	1.8	82.1	17.9	0.00
	Storage cost	**216**	**220**	**18**	**156**	**68**	**—**
Shashemene	Quantity (MT)	10,462	6,308	—	4,121	1,349	—
	Percentage	62.4	37.6	0.00	75.3	24.7	0.00
	Storage cost	86	104	—	56	37	—
Shinile (Dire Dawa)	Quantity (MT)	10,797	798	—	2,788	1,781	134
	Percentage	59.3	37.9	2.8	59.3	37.9	2.8
	Storage cost	**89**	**13**	**—**	**38**	**49**	**5**
Wolayta-Soddo	Quantity (MT)	18,025	8,752	—	8,544	1,452	—
	Percentage	85.5	14.5	0.00	85.5	14.5	0.00
	Storage cost	**148**	**144**	**—**	**117**	**40**	**—**
Woreta	Quantity (MT)	16,746	16,889	6,495	8,455	7,797	2,058
	Percentage	85.5	14.5	0.00	85.5	14.5	0.00
	Storage cost	**138**	**278**	**160**	**115**	**213**	**84**
National Average	Quantity (MT)	147,778	69,452	8,308	67,440	26,184	7,996
	Percentage	70.1	29.1	0.8	62.2	18.3	5.8
	Storage cost	**1,216**	**1,143**	**205**	**921**	**715**	**327**

Source: Authors' calculations based on EFSRA data.
Notes: *MT = metric tons.
**Storage costs at all warehouse locations are in thousand U.S. dollars.

At the warehouse level, there are some variations in the composition of stocks by age from period to period. The only exception is Kombolcha, where more than 70 percent of the stocks have been less than or equal to three months old in both time periods. Except for Mekele in 2007–2008, stocks older than three months have never exceeded more than 50 percent of the total. Three out of seven warehouses did not have any stock older than six months. Among other warehouses, only Mekele and Kombolcha had roughly 3,000 tons of stock each that were older than six months. Thus, we conclude that EFSRA has

been successful not only in addressing the emergencies but also in managing the stocks efficiently, which in turn has contributed to reducing food safety risks.

Costs of Stock Holding

The third row with each warehouse shows the costs of holding the stock of various ages. The costs reported in this table include (a) a finance charge that is calculated on the basis of the value of stock at the going market price and average lending rate of the National Bank of Ethiopia (12.5 percent), (b) EFSRA-reported costs of fumigations, sorting, and other maintenance costs, and (c) the value of loss and waste due to moisture and infestations. Note that this calculation does not include rental costs of the warehouses, staff salaries, and the costs of internal transport, shipping, and handling (ITSH), which is estimated to be US$21 per metric tons in Bangladesh (Ahmed et al. 2004).6 Therefore, if data were available on these costs and added to our analyses, per-unit storage costs would have gone up by a fixed percentage.

Given the calculations in Table 4 and an assumed ITSH cost of US$21 per ton, per-unit costs of EFSRA grain stock can be calculated by warehouse and stock age. For example, during 2005–2006, the average quantity of stock that was less than three months old was 147,778 tons, and associated costs were US$1.22 million. That is, the per-ton cost of three-month-old stock in 2005–2006 was about US$8.25. If an ITSH of US$21 is added to each ton, the average cost becomes US$29.25. Similarly, the average cost of six-month-old and nine-month-old stock is estimated to be US$37.50 and US$45.70, respectively. At the national level, with ITSH included, weighted average costs of holding stocks are estimated to be US$32.40 per ton for 2005–2006 and US$40.32 per ton for 2007–2008, with a two-year weighted average of US$34.84 per ton. Note that this number depends on the stock rotation and can go up in years when a larger proportion of stocks are held for a longer period.

Not many estimates are available on the cost of holding stocks. However, although the estimates are not strictly comparable, some comparisons can be made based on the data compiled for India (Chand 2002) and Bangladesh (Dorosh 2009). For India, the average cost of wheat storage in 2000–2001 was Rs 2410 per metric ton, which is equivalent to about US$60 per ton at 2000–2001 exchange rates. However, this includes labor costs and other administrative costs that are not included in our analysis for Ethiopia. If these labor and administrative costs are subtracted (a total of Rs 990) from the total, the estimated cost of storage becomes US$35.40 per ton. For Bangladesh, the total storage cost of rice is estimated to be US$44.30 per ton. However, this estimate includes administrative costs and the costs of quality deterioration, which are not available for Ethiopia. Assuming that quality deterioration and administrative costs accounted for 20 percent of the total, a comparable amount for Bangladesh would be US$35.44 per ton. Thus, we conclude that EFSRA has been as efficient in managing stocks as the South Asian countries with similar programs.

Strategic Reserves and Grain Markets

While any grain reserve program will involve subsidies and crowd out private trade, actual impacts of stock on market price depend on the purpose of a grain reserve program. In fact, it is possible for a grain reserve program not to have any price-depressing effects when governments hold the stock only to stabilize prices at a time of production shortfalls or other supply disruptions. In this case, the government replaces the private imports that would have occurred in the absence of government control, *ceteris paribus*. The logic is that since there is no change in net supply, there should not be any change in price. What if there were no shortages for a few years in a row? In such a situation, the government would have to rotate the stocks, and the only option to do so would be to sell the old stock and buy an equal amount of new stock so as to leave the net supply of grain, and market prices, unchanged. Even though this is theoretically possible, such a situation would be an operational nightmare and financially expensive. To illustrate, consider Ethiopia's decision to increase their stock level to 1.5 million metric tons. Now

[6] This is what WFP pays to the Government of Bangladesh as ITSH costs.

suppose the government sells its old stock to private traders in exchange for an equal amount of new stock at a prevailing trade margin, which is about 12 percent according to recent surveys.[7] Assuming an average price of US$200 a ton, this would imply a total direct cost of US$36 million just to rotate the stock, leaving aside the indirect costs of crowding out and other distortive effects of the program on markets.

In contrast, if the government holds large stocks to support public works, emergencies, and safety net programs, there will clearly be price-depressing effects. The magnitude of these effects will depend on (a) size of stock, (b) timing of distribution, and (c) targeting of beneficiaries. If the stock is too small, it will fail to achieve the emergency response objective. On the other hand, if it is too large, not only will the program be too expensive, but it will also crowd out private stocks and depress market prices. Crowding out private storage can also have harmful impacts on the private sector because releasing of the stock creates uncertainties and destroys arbitrage and storage incentives of the private traders. The timing of the distribution is also important. If stock is distributed equally every month to a group of beneficiaries, price-depressing impacts on markets will be much smaller compared with a situation where a large volume of grain is released to the markets in a short period of time. Finally, targeting efficiency is an important determinant of how market prices will change in response to public distribution through safety net programs. One extreme possibility is that targeting is perfect and hence there is no impact on the market prices. In other words, the program targeted the beneficiaries who were not buying any cereals from markets, and they would have starved had the government not included them in the program. Clearly, this is a very unlikely scenario.

A more likely scenario is one where beneficiaries increase their consumption after becoming program participants. One way to measure such changes is to estimate the marginal propensity to consume (MPC). We have not come across such estimates for Ethiopia, but del Ninno and Dorosh (2003) present MPC estimates for a number of targeted programs in Bangladesh. Their results suggest that these estimates range from zero for a self-targeted Food for Works program, to 0.50 for a Food for Education program, with an estimate of 0.32 for all programs. These numbers have important implications in understanding the impact of Strategic Grain Reserve (SGR) stocks on market prices. For an illustration, consider a poor household that buys and consumes 10 kgs of wheat before becoming a program beneficiary. An MPC of 0.32 implies that this household will increase consumption by 32 percent of its original consumption. Therefore, if the household receives 15 kgs of wheat from the program, it will consume 13.2 kgs (a 32 percent increase from original consumption of 10 kgs) and sell the remaining 1.8 kgs. Since this household will no longer have to buy from the market, net supply will increase by 11.8 kgs due to its program participation.

Using these MPC estimates, along with assumptions about elasticities and timing of distribution, we have carried out some simulations to examine the impacts of various stock holding on market prices; the results are presented in Table 5. The first two rows show the results for the case where MPC = 0, and the last two rows shows the results where MPC = 0.32. Consider the results in the first two rows. If the EFSRA stock remains at the current level, and an equal amount of grain is distributed every month, market prices will be depressed only by 2.18 percent if prices are considered relatively elastic (0.6), and by 3.27 percent if prices are relatively inelastic (0.4). In contrast, if the stock is distributed equally during the six-month lean period, the prices will be depressed by larger magnitudes of 4.36 to 6.55 percent. The price-depressing effects become more striking if the stock level is raised to 1.5 million tons, as is being currently discussed by the government. The estimated reduction in market price will be 18 to 28 percent if the stock is distributed in an equal amount every month, and 37 to 55 percent if distributed during the six lean months. When the MPC is assumed to be 0.32, the price-depressing effects become smaller. However, notice that impacts of raising the stock level can still be high.

[7] This is estimated from two rounds of traders' survey data collected by IFPRI in 2002 and 2008, respectively.

Table 5. Stocks and market prices under different scenarios

MPC Estimates	Stock Levels	Price-Depressing Effects if Prices Relatively Elastic (E_p=0.6)		Price-Depressing Effects if Prices Relatively Inelastic (E_p=0.4)	
		Distributed equal amount every month	Distributed equal amount in six lean months	Distributed equal amount every month	Distributed equal amount in six lean months
		(Percent)			
MPC = 0.0	SGR stock = 407, 000 tons	2.18	4.36	3.27	6.55
	SGR stock = 1.5 million tons	18.42	36.84	27.69	55.26
MPC= 0.32	SGR stock = 407, 000 tons	1.48	2.97	2.23	4.45
	SGR stock = 1.5 million tons	12.53	25.05	18.79	37.58

Source: Authors' estimates.

5. LINKS BETWEEN STRATEGIC RESERVE AND OTHER FOOD SECURITY PROGRAMS

Coordination between strategic reserves and other food security programs is important not only for the efficiency of grain reserves but also for the overall functioning of all food security programs of a country. In Ethiopia, the efficiency of stock rotation and the associated cost reductions have been high primarily because most of the food-based intervention programs in the country are well-coordinated with EFSRA. In this section, we provide some empirics on how EFSRA serves various food security programs and how its roles are changing, as well as a discussion on the current status and future potential for linking with school feeding programs.

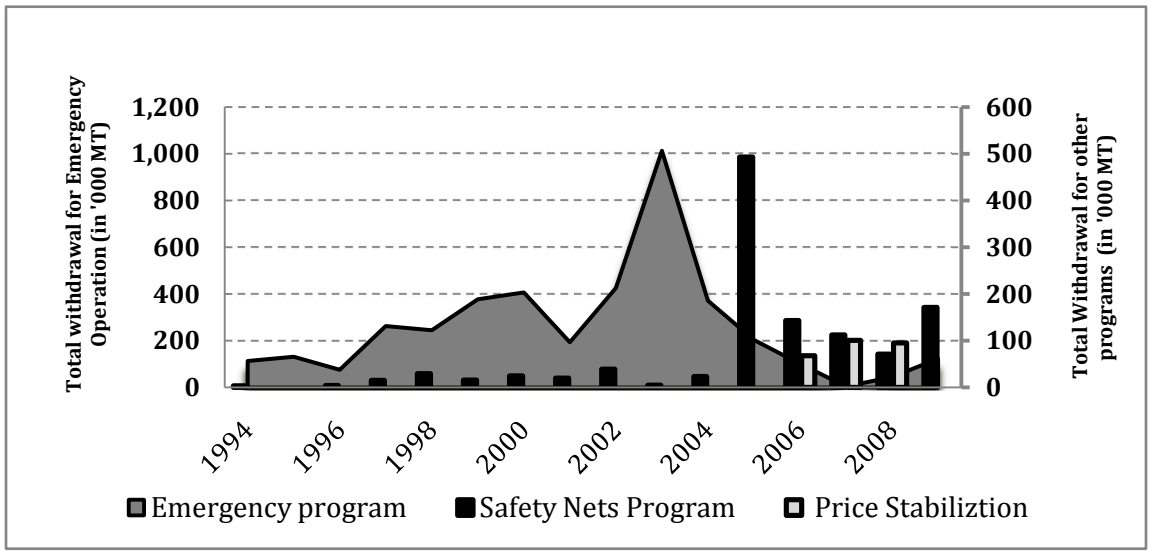
Emergency Programs

Consistent with its mandates, EFSRA has proved to be successful in addressing emergencies in several instances since the 1990s. During the food security crisis of 1994, the agency responded in timely manner by releasing about 94,000 tons of grain on loan to NGOs and 52,000 tons in free drawdowns to the government relief agencies. These interventions helped mitigate food shortages in the northern and southern parts of the country, prevented migration toward urban centers, and protected smallholders' livelihoods (FAO 2004). Following the belg crop failure in 1997 was an unexpectedly acute need for emergency relief operation; the government, WFP, and many NGOs went to EFSRA to borrow grain for immediate emergency distributions. EFSRA was also the immediate source of food relief during the drought of 1999–2000; it came to the rescue again in 2003, when a food security crisis after two consecutive years of bumper harvests caught everyone off guard.

Things started changing with the introduction of PSNP in 2005, which coincided with rising food prices in the country. During 1994–2009, the share of emergency distribution in total withdrawal from EFSRA was 74 percent, followed by 21 percent for safety net programs[8] and about 5 percent for price stabilization. However, these numbers change quite substantially if the period is divided into pre- and post-PSNP—that is, 1994–2004 and 2005–2009. Since 2005, while withdrawals for safety net programs and price stabilization have jumped to 57 and 15 percent of the total withdrawal, respectively, the emergency operations share has dropped drastically to an average of only 28 percent. Figure 4 shows how drastically withdrawal for emergency relief operations has declined in the past few years, including during the acute emergencies of 2008–2009.

[8] Safety net programs include PNSP, Food for Work, and school feeding programs.

Figure 4. Trends in the withdrawal from EFSRA by program type, 1994-2009



Source: Authors' creation.

Note that in 2008; only 45,000 out of a total distribution of 212,000 tons went to emergency operation, which was less than half the amount withdrawn for price stabilization in major urban centers (95,000 tons). This drastic decline in withdrawal for emergencies does not imply that the scale of emergencies in 2008 was smaller than previous emergencies; it only reflects a shift in the priorities toward price stabilization. This was also the case for the safety net programs, especially for the PSNP, which dropped drastically after 2005. In fact, even the cash beneficiaries of PSNP demanded food instead of cash because cash could not buy as much food due to high cereal price inflation.

PSNP and Food Reserve Needs

Providing access to food to the poor through social safety net programs is a valid policy intervention, irrespective of economic ideology, functioning of markets, or even the level of development of a given country. However, there is a long-standing debate as to whether these transfers should be in kind or in cash (Coate 1989; Dreze and Sen 1990; Basu 1996). There is a consensus in the literature that cash transfers are more efficient if market locations are spatially integrated and financial institutions are well developed. On the other hand, food-based interventions are justified where markets are disintegrated. The assumption (in many cases, the reality) that markets are not efficient is perhaps the reason why safety nets and emergency programs in many countries continue to be food based.[9]

However, apart from situations of extreme civil conflict or war, it is unlikely that market locations in all parts of a given country would be isolated from major central markets. This implies that in most cases, it should be possible to implement a mix of food- and cash-based safety net or emergency assistance programs. Cash transfer programs could be implemented in more developed geographic locations, where transaction costs are low and cash injection is likely to create demand for local products yet not raise food prices excessively. Food transfer programs could be implemented in more remote places where markets are thin (not integrated with locations in surplus regions), so as to avoid possible surges in food prices in local markets from cash transfers that would adversely affect not only the households receiving social transfers but also poor non-beneficiaries (Basu, 1996).

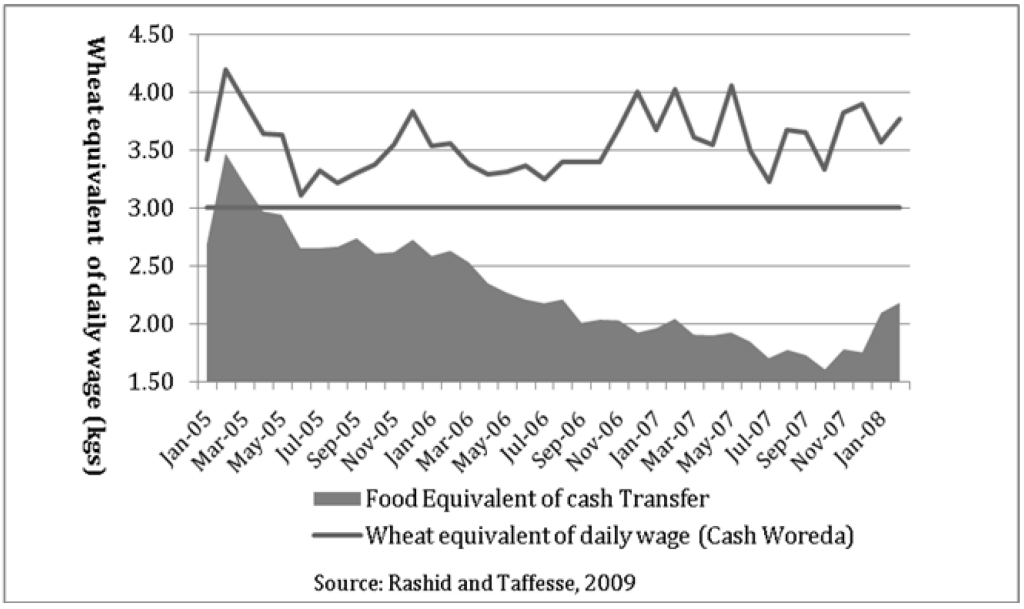
[9] Food aid donors' desire to support their own domestic farmers and shippers is another major reason for preference for transfers in kind. See Barrett and Maxwell (2005).

This was the underlying rationale behind introducing PSNP in Ethiopia in 2005. It was a strategic move on the part of the Ethiopian government toward reducing food aid dependence and integrating food security programs with an overall growth and poverty alleviation agenda. It was a bold undertaking on the part of Ethiopian government in terms of both size, the largest of its kind in sub-Saharan Africa, and institutional design that combined both cash and food transfers. The program targets transfers to poor households through public works and direct support, with public works accounting for the larger share of the total program budgets. Beneficiaries in the locations with good market access were paid 6 Ethiopian birr (ETB) per day (about US$0.75 at 2005 exchange rate) for their labor on labor-intensive public projects. On the other hand, the beneficiaries in the remote areas were paid 3 kgs of wheat or maize.[10]

Despite honest intention and innovative program design, the PSNP faced an immediate challenge when cereal price inflation started skyrocketing. A critical challenge in implementing cash-based safety net programs is ensuring that the values of transfers remain the same over time. Doing so becomes particularly difficult in a high-inflation macroeconomic environment, because frequently adjusting for inflation is extremely difficult, if not impossible. When PSNP was launched, the Ethiopian economy was largely characterized by low inflation, which started changing in 2006. The food component of the national consumer price index increased from about 8 percent in 2003 to 19 percent in 2006, with an average annual increase of about 13 percent (World Bank 2007). Inflation continued at approximately 20 percent in 2007, but since has further accelerated, with total inflation approaching 100 percent for calendar year 2008.

In spite of this high inflation rate, however, the amount of the cash transfer (ETB 6, or US$0.70) remained the same until December 2007, causing severe erosion of benefits to the households receiving cash transfers. Figure 5, constructed with PSNP woreda-level data, illustrate this fact. It plots the wheat equivalent of cash transfers (meaning the amount of wheat ETB 6 could buy), the wheat equivalent of daily agriculture wage, and the size of food transfers (3 kgs of wheat per day) represented by the horizontal line. To examine how cash transfers fared with food transfers, compare the shaded area showing the wheat equivalent of cash transfers with of the solid line of the wheat at 3 kgs per day that remained constant.

Figure 5. Rural real wage (wheat equivalent) and PSNP transfer



Source: Rashid and Taffesse, 2009.

[10]For detailed program description and household-level impacts, see Gilligan, Hoddinott, and Taffasse (2008).

Clearly, recipients of cash transfers fared better than those of food transfers only during the first few months, when the cash (ETB 6) could buy more than 3 kgs of wheat. The real benefits of cash started eroding in May 2005 but continued deteriorating until daily cash transfer was increased from ETB 6 to ETB 8 in late 2007. Even after increasing cash transfers from ETB 6 to ETB 8, the real value of cash in February 2008 was about 60 percent of the value of transfers in January–May 2005. Given this level of erosion, it is obvious that all cash recipients would have switched to food if they had a choice. The key lesson from this experience is that cash-based safety net programs have their share of problems. Unless these kinds of programs have the flexibility to quickly adjust the size of cash transfers or to switch from cash to food, there will be inequality in benefits, which perhaps will defeat the purpose of the program. Such risks can be mitigated if there is an efficient and responsive strategic reserve system in place.

School Feeding

Although the global development community has a growing interest in school feeding programs, the size of these programs remains very small in Ethiopia. According to available data, WFP covers about 451,797 students between the ages of 7 and 14 under its current school feeding program. Each student covered by this program receives 120 grams of blended food, 3 grams of vegetable oil, and 6 grams of salt per day for a total of 120 days per year. Table 6 presents the summary of the program in terms of geographic coverage, total food distribution, and per capita food distribution. Notice that although size of the program has increased slightly, total food distribution in the school feeding program has been only 4,986 metric tons in 2008 and 8,194 in 2009, with a two-year average of 6,590 tons.

Table 6. School feeding program in Ethiopia, 2008-2009

Region	Total Beneficiaries (7–14)			Total Food Distributed			Per Capita Distribution		
	2008	2009	Total	2008	2009	Average	2008	2009	Average
				metric tons			*kg/student/year*		
Tigray	83,865	83,865	83,865	1,403	1,924	1,663	16.725	22.944	19.835
Afar	32,711	48,697	40,704	521	951	736	15.942	19.529	18.088
Amhara	127,954	145,533	136,744	1,353	2,536	1,945	10.574	17.426	14.220
Oromiya	95,063	113,892	104,478	485	1,006	745	5.105	8.829	7.134
Somali	43,705	42,330	43,018	644	769	707	14.739	18.177	16.430
SNNPR	38,504	47,474	42,989	580	1,008	794	15.050	21.233	18.464
National	**421,802**	**481,791**	**451,797**	**4,986.0**	**8,194.2**	**6,590.1**	**11.821**	**17.008**	**14.586**

Source: Compiled from WFP-Ethiopia data.
Note: SNNPR = Southern Nations, Nationalities, and People's Region.

This is simply too small in terms of both the magnitude of the problem and the overall size of the grain markets in Ethiopia. According to Ministry of Education statistics, presented in Table 7, total enrollment of students ages 7–14 is roughly 14.5 million. That is, the program coverage (451,797 students) was only 3 percent of the total enrollment. If only the children of the poor families are considered, total enrollment in 2009 was 4.25 million, which is almost 10 times more than the current coverage of 451,797 students. These are the students who go to school hungry and often drop out after falling behind because of the pressing need to support their families. In addition to limited coverage, the size of rations also appears to be very small. To illustrate, let us consider a child between the ages of 10 and 14 who can work in an agricultural field and earn ETB 6 a day, which can buy 2 kgs of wheat at the market price. This implies that a ration of 120 grams of blended food in a school feeding program will be much smaller than what this child could earn as an agricultural worker. Given the family's pressing needs, parents will mostly decide to take their children out of school under such circumstances because the opportunity cost of keeping their children in school (short term) would be high.

Table 7. Enrollment of students, ages 7 -14, by region, 2009

Region	Ownership			Location			Poor Children
	NGOs	Government	Total	Urban	Rural	Total	
Tigray	37,865	943,319	981,184	170,216	810,968	981,184	287,487
Afar	4,100	52,624	56,724	14,427	42,297	56,724	16,620
Amhara	55,427	3,702,117	3,757,544	559,023	3,198,521	3,757,544	1,100,960
Oromiya	111,433	5,230,928	5,342,361	1,050,127	4,292,234	5,342,361	1,565,312
Somali	13,008	315,212	328,220	115,962	212,258	328,220	96,168
Benishangul	2,229	140,909	143,138	39,005	104,133	143,138	41,939
SNNPR	132,135	3,190,491	3,322,626	518,308	2,804,318	3,322,626	973,529
Gambela	2,048	68,469	70,517	18,484	52,033	70,517	20,661
Harari	1,969	33,626	35,595	18,752	16,843	35,595	10,429
A. Ababa	208,258	181,848	390,106	388,658	1,448	390,106	114,301
Dire Dawa	9,747	43,816	53,563	31,586	21,977	53,563	15,694
Total	**578,219**	**13,903,359**	**14,481,578**	**2,924,548**	**11,557,030**	**14,481,57**	**4,243,102**

Source: Ministry of Education, GoE.
Note: SNNPR = Southern Nations, Nationalities, and People's Region.

A plausible range of food requirements can be calculated based on the regional poverty estimates and various levels of coverage. For example, consider a program that tries to bring all poor children between the ages of 7 and 14 under the school feeding program. Given that there are 4.25 million poor children in the country within that age cohort, it will require roughly 62,000 tons of blended food at the current level of ration (120 grams for 120 days). If the coverage for poor children is increased from 120 days to 200 days, the requirement goes up to 101,834 tons. If the girls are given a take-home ration of 12.5 kgs per month for 10 months, as is the case in the new Malawi program, the estimated additional requirement will be roughly 348,000 tons (Table 8).

There will be an additional requirement if children over age 12 are provided a take-home ration to prevent them from dropping out of school. If we assume the number of students each year from ages 7 to 14 to be the same, the total number of poor students between the ages of 12 and 14 would be roughly 1.8 million. If we further assume that their opportunity costs of staying at school are ETB 6 per day during the three peak months, equivalent to 2 kgs of wheat, the total additional requirement would be 218,216 tons. Thus, to feed the poor children in Ethiopian schools would require a total of 568,216 metric tons. This represents a substantial latent demand of food in the country; meeting this demand not only will help keep children in school and improve labor productivity in the future, but also has the potential to contribute to market development.

Table 8. Food requirement for school feeding programs

Region	Total Food Requirement under Various Scenarios			
	All primary school children	Government primary schools	Rural primary schools	Poor children
	(quantities in metric tons per year)			
Tigray	84,059	80,815	69,477	24,629
Afar	3,936	3,651	2,935	1,153
Amhara	317,855	313,166	270,566	93,131
Oromiya	430,140	421,168	345,589	126,031
Somali	23,692	22,753	15,321	6,942
Benishangul	11,090	10,917	8,068	3,249
SNNPR	268,447	257,771	226,571	78,655
Gambela	5,452	5,294	4,023	1,597
Harari	2,844	2,687	1,346	833
Addis Ababa	36,372	16,955	135	10,657
Dire Dawa	4,359	3,566	1,788	1,277
Total	**1,188,244**	**1,138,742**	**945,819**	**348,156**

Source: Authors' calculations.
Note: SNNPR = Southern Nations, Nationalities, and People's Region.

6. SUMMARY AND POLICY IMPLICATIONS

Strategic grain reserves have received considerable policy attention following the 2007–2008 global food crisis. This paper has examined the institutional design and operational performance of such a program using the case study of Ethiopia. Overall, the study concludes that EFSRA has performed well in terms of addressing emergencies and managing the stocks efficiently. It has proved effective in addressing emergencies in several occasions since mid-1990s and has effectively managed the grain stocks. The study finds that about 62–70 percent of the EFSRA stocks were less than three months old during 2005–2006 and 2007–2008, with associated holding costs of US$34.84 per metric ton. This shows a level of stock management efficiency that is better than that in several countries in Africa and Asia for which similar analyses were carried out.

The success of EFSRA has resulted from three key features of the program design. The first important feature is the organizational structure and management of EFSRA, which reflects a high level of government commitment, participation of key stakeholders, and clearly defined rules of procurement and distribution. Second, unlike similar programs in many other countries, EFSRA does not engage in buying and selling of cereals. Instead, it serves as a custodian of the grain, with the key responsibility of lending grain to relevant government and nongovernmental agencies following well-defined official guidelines. Finally, EFSRA has been successful because it has maintained a reasonably smaller stock with very little impact on the market prices. This will change if the stock level is increased significantly. In particular, the results suggest that increasing stock for price stabilization purposes will depress domestic prices, increase the costs, and adversely affect the evolving private sector in the cereal value chain, where millions of people make their living.

The paper argues that there is still room for improvement with respect to EFSRA's linkages with safety net programs and stock optimality. The school feeding program is very small in the country. During 2008–2009, total food distribution under school feeding programs averaged only 6,590 tons. This is miniscule compared with Ethiopia's needs, given that the country has almost 14.5 million children between the ages of 7 and 14 enrolled in school. Even if only poor children are covered under the school feeding programs, the additional demand for food could be as high as 568,000 tons per year. This is a large demand for a justifiable intervention, which not only will keep children in school and increase the nation's future labor productivity but also can contribute to generating local demand and boosting food processing sectors. Given stable prices and the right policy environment, this will also trigger a supply response that can potentially generate benefits for the smallholders in the country.

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