

# Tanzania National Food Reserve Agency's Role in Assuring Food Security

## Final Report ████████

### 1. Introduction

#### 1.1 History of NFRA and Its Mission

During 1973-75, Tanzania was subject to a severe food shortage and had to depend on commercial food imports and food aid. This was also a time when food prices on the world market were at record levels, increasing the cost of food imports. To prevent a recurrence of such a stressful situation in the future, the Food and Agricultural Organization (FAO) of the United Nations, at the request of the Government, conducted in 1976 a review of the food security situation in Tanzania. The result was the recommendation for the establishment of a Crop Performance Surveillance System (CPSS), under the Ministry of Agriculture and Cooperatives, and a Strategic Grain Reserve (SGR), under the National Milling Corporation (NMC). In 2002, 10 years after the NMC had been placed in divestiture, the SGR became an independent unit.<sup>1</sup>

The objectives of the SGR were:

1. Procurement and storage of 150,000 MT of emergency maize sufficient to address a food shortage for a three-month period, during which it was expected that food imports could be ordered and secured.
2. Annual release of maize stocks to address disasters.
3. Stock recycling and release to stabilize food prices in the market.

Because of budget constraints and decontrol of the food market, the third of these objectives was never achieved

As part of a series of Public Service Reforms, the SGR was in 2008 transformed into an executive agency, the National Food Reserve Agency (NFRA), under the Ministry of Agriculture, Food Security, and Cooperatives. The role of the Agency was to procure reserve food stocks and to respond to food shortages in the country. In particular, the objectives were:

1. To maintain an optimal level of national food reserves to address local food shortages and to respond to immediate emergency food requirements.
2. To have a well-managed, business-like agency.

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<sup>1</sup> This background material is taken from The United Republic of Tanzania, *The Executive Agency (The National Food Reserve Agency) (Establishment) Order, 2008*, Government Notice No. 81 published on 13/06/2008.

Omitted was any reference to stabilizing food prices in the market, given the difficulties experienced by the SGR.

Despite this clear mandate, the NFRA has from time to time been under pressure to support prices at which it buys grain (mostly maize, but also some sorghum) and to sell grain at prices lower than those on the free market. This has disrupted the market, created uncertainty regarding the Agency's ability to buy and sell all the grain necessary to clear the market at these prices, and decreased the Agency's profitability. In addition, the NFRA has occasionally been barred from buying grain at market prices when these have exceeded a prescribed maximum. This has hindered its ability to constitute an adequate level of reserve stocks.

The NFRA currently has warehouse capacity for about 241,000 MT of grain. Much of this capacity remains underutilized, at least partly because of the pricing and financial constraints under which the Agency has been required to operate. Furthermore, there has not been any clear analysis of the level of stocks that the NFRA should retain to fulfill its mandate. This level depends on (1) the level and growth of desired food consumption, (2) the level, growth, and variability in food production and availability over time, (3) the extent to which imports and exports of grain and other foods can be used to compensate for shortages, (3) the cost of holding grain versus using trade to compensate for variations in production, and (4) the amount of risk that the government is willing to tolerate regarding food security. It is the purpose of this study to undertake such an analysis.

## 1.2 Issues to Resolve

In the process of conducting this analysis, there are number of important issues that need to be explored.

1. What are the sources of food insecurity? The most important of these is a shortfall in domestic food production relative to food consumption needs. This not only decreases the availability of food, which may cause food prices to rise, but also reduces farm income and the capacity of farm-households to purchase food even in the absence of a price rise. Second in importance is the effect of a rise in food prices in neighboring countries, and more generally on the world market. To the extent that Tanzania is connected to these markets via trade, these price movements will at least partially be transmitted to Tanzanian markets, which may have an adverse effect on consumers. The degree to which this happens, and the resulting impact on these markets and on consumers, is related not only to external price movements but also very much to trade policy. For example, during the sharp rise in prices on the world market for grain in 2007-08, Tanzania dampened some of the effects on the local market by suspending taxes on grain imports. It is also related to the degree of dependence on imports. This is especially important for rice, particularly in Zanzibar, which imports about 85% of its rice consumption needs from Asia and therefore is very dependent on price levels for rice on the world market.

2. What have been the sources of food insecurity in the past, and especially during the past five years when world market prices have fluctuated widely? Has food insecurity been due largely to shortfalls in domestic production or to increases in international or regional prices? How has the government responded to these disturbances, and with what degree of success?
3. What has been the regional pattern of food insecurity within Rwanda? To what extent have food surplus regions been able to supply food deficit regions, through either market flows or food assistance? Have these flows been fairly consistent from year to year or have they varied substantially?
4. What is the best way to assure food security in response to each of these disturbances? In particular, how can food storage and trade be used in an optimal way to assure maximum food security at minimum cost, including their impact on markets and their consequences for trade, growth, and employment?
5. What is the best way to link the delivery of emergency assistance to access by the most vulnerable members of the population to food? Is this best done through food deliveries? Cash transfers? What are the relative advantages and disadvantages of each, and under what conditions?
6. Who should store food (NFRA, farmers, private traders) and to what degree? What are relative storage costs, delivery costs, financial needs, and other advantages or disadvantages?
7. To what extent can a regional (across countries) approach to storage and trade be used to replace reliance on national storage and international trade?
8. How can Tanzania assure food security in the face of an unlikely coincidence of a food production shortfall at home and a spike in food prices on the world market?
9. What reforms in the consistency, transparency, and predictability of market interventions by NFRA would be necessary to assure minimum adverse impact of those interventions on private grain markets?

### **1.3 Organization of Report**

The second section of this report deals with the underlying definition and sources of food insecurity in order to gain some understanding of how it can best be alleviated. This is followed by a discussion of alternative approaches to improving food security, as well as their costs and limitations. We then move on to examining the historical evidence regarding sources of food insecurity in Tanzania, their impact, and attempts to counter them. The fifth section contains most of the analysis of the various issues outlined above. Following this there is a summary of the principal findings, followed by the recommendations of the report.

## 2 Food Insecurity, Its Sources, and What Can Be Done

In this section, we first look at the definition of food security in terms of availability, access, and utilization, and the factors that influence them. This is followed by a discussion of the different sources of food insecurity and what can be done to minimize their impact.

### 2.1 Definition

The World Food Summit of 1996 defined food security as existing “when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life”.<sup>2</sup> Commonly, the concept of food security is defined as including both physical and economic access to food that meets people's dietary needs as well as their food preferences. Food security is customarily built on three pillars:

1. Food availability: sufficient quantities of food available on a consistent basis.
2. Food access: having sufficient resources to obtain appropriate foods for a nutritious diet.
3. Food utilization: appropriate utilization based on knowledge of basic nutrition and care, as well as adequate water and sanitation. This may be related to how food is distributed within the household and whether that food fulfills the nutritional needs of all members of the household, which may be closely linked with the health conditions of various household members.

Agriculture remains the largest employment sector in Tanzania and most other developing countries. Uncertainty concerning the quantity of food and other agricultural products produced in any given year, or in a succession of years, is a major element of food insecurity. This is because of both the impact of production on food availability and its effect on income and therefore access to food.

Food availability is also influenced by internal and external trade. Not every locality has to produce all the food that it requires. Income earned from production of goods and services other than food may be used to generate demand for food from other sources within and outside the country. When this demand is insufficient because of low incomes, food assistance may be used to increase local food availability. Alternatively, cash transfers may be used to generate purchasing power over food, which could stimulate inflows of food through the private market.

Access to food depends on entitlement to that food through either the generation of income or entitlement accorded by some type of assistance program. This normally requires either a rise in local prices to induce inflows of food via food markets or an extra-market food distribution program. Shortfalls in food production in a particular locality do not generate an automatic market response because the shortfalls also result in a loss of real income, which may prevent local prices from rising sufficiently to trigger such a response.

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<sup>2</sup> World Health Organization, <http://www.who.int/trade/glossary/story028/en/>.

Improving food utilization faces multiple challenges, including limited knowledge of basic nutritional practices, insufficiently diverse diets, and inappropriate infant feeding. Lines of action include supporting households in nutritious garden practices, diversifying food production, improving nutrition-related knowledge and practices, developing a program of bio-fortified food, and other measures largely outside of the scope of this study

## **2.2 Household Income, Wealth, and Livelihoods**

It is well recognized that the ability of a household to respond to food security adversity depends not only on the availability of food – whether from its own production, the market, or extra-market supplies -- but also on its capacity to access that food. This depends, first and foremost on its income, whether cash or in kind. Subsistence rural households depend very much on the food they grow themselves, and if this crop fails, they have a difficult time coping, especially if they have little wealth upon which to draw. Frequently their only source of wealth is the land upon which they depend for sustained subsistence and possibly a few livestock.

If farmers have a more diversified range of crops, some of which they sell for cash, their wealth may be greater, enabling them to cope more effectively, at least in the short run. But even here this wealth may soon be exhausted unless they have invested in additional land, animals, and equipment. Selling these assets off to pay for food, however, will soon reduce them to poverty once again.

Perhaps the best protection against adversity lies in the diversification of livelihoods so that if one activity fails, the income associated with other activities may be drawn upon in time of need. This is typically the situation in urban and semi-urban areas, where any income earned from farming is likely to be supplemented with income from other activities. This suggests the need to take a livelihoods approach to assessing vulnerability, which emphasizes food access via sources other than crop production and the importance of purchasing power over food resources. It also requires taking a multi-sectorial approach.

The ability to compensate for not producing enough food to satisfy the household's needs by buying food also depends on the degree to which markets can provide that food at relatively low cost. Essentially, markets have three functions. First, they provide for movements of food from food-deficit to food-surplus areas. Second, they encourage the storage of food over time in order to allow consumption to be evened out over the year in which production is very seasonal in nature. Third, they allow for increased value added in processing, packaging, and other means of meeting consumer needs.

There are a number of reasons why markets may not be able to fulfill these functions. Over space, transport and other transactions costs may be very high, which discourages the physical movement of food. This is typically the case in many developing countries, including Tanzania, especially in more remote areas. Over time, perhaps the most important constraint on storage is lack of capital -- to build storage facilities and to buy and hold stocks of food. As a result, the

seasonal rise in prices may be quite high. As far as value added is concerned, the greatest demand in most developing countries, and Tanzania is no exception, is for relatively simple foods with minimal processing and packaging. Overall, one would expect Tanzanian markets to be able to supply relatively simple foods to more accessible locations during the first few months after harvest. Beyond that, reliance on the market may be more questionable, especially for households with low levels of income and wealth and little diversity in their livelihoods.

### **2.3 Impediments to International and Regional Trade**

International and regional (across countries) trade can act to stabilize local supplies of food, both by importing food to supplement domestic production and by exporting food in normal years so as to have a buffer in years of shortage. From a national point of view, reliance on international and regional markets may be a safer bet than relying on domestic production when there are periodic shortfalls.

In most years the world market is a very reliable source of food. The fact that there is a vast range of agro-climatic zones throughout the world for growing most food crops means that the likelihood of having a severe overall decline in production is very low. Although it takes some time to arrange for commercial imports, this is normally measured in weeks not months. The major transport and transactions delays are likely to be at the border and upcountry after the shipments clear the port of entry rather than before the shipments arrive.

Regional trade may be even faster, because of closer proximity, but this is not assured given that most of Tanzania's neighbors also experience relative high transport and transactions cost. Furthermore, there is a greater likelihood that production in different countries within the region will be positively correlated so that no country may have a significant surplus. Finally, there is no assurance that trade policy may not be used to protect domestic markets even if this injures neighboring partners. For example, the commitment of Tanzania to free trade has been notoriously unreliable, with frequent imposition of export bans. Although the world market has also suffered from export bans occasionally in the past, this has been much less frequent than within the eastern and southern Africa region.

The possibility of Tanzania developing a consistent export surplus as a buffer against shortfalls in production should not be underestimated. Tanzania's potential to become a major exporter of food crops, especially maize and rice, to the East Africa and Horn of Africa regions results from its large and relatively underutilized natural resource base and the growing import demand of bordering and neighbouring countries, many of which do not have the land resources that Tanzania has for expansion of production. However, while Tanzania has a transportation advantage for supplying the Kenyan and Horn of Africa markets, it still needs to compete with other exporters in the East Africa region, such as Uganda, and countries in Southern Africa, such as Malawi, Zambia, Zimbabwe, and South Africa. If Tanzania is to reach its export potential, it will need to focus on expanding production and pursuing policies that encourage rather than

restrict exports. Once this is done, the Government can be less concerned about food security since a substantial surpluses will generally available for export, storage, and emergency use.<sup>3</sup>

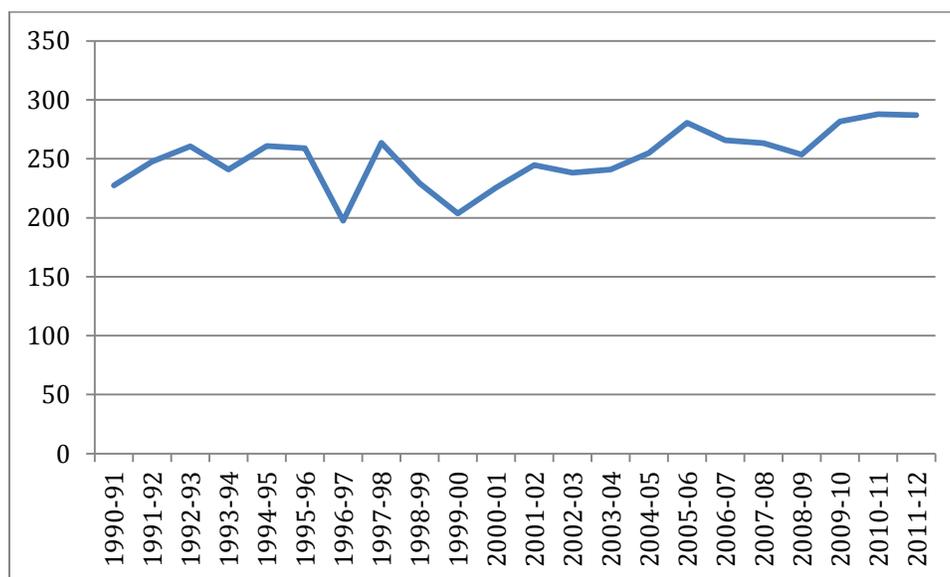
## 2.4 Sources of Instability

There are two major sources of instability that threaten the food security situation in Tanzania. The first is fluctuations in domestic production of the principal food crops, such as maize, rice, cassava, sorghum, beans, and bananas. The second is variations in prices, and occasionally availability, of foodstuffs on international and regional markets.

### 2.4.1 Fluctuations in Domestic Food Production

Graph 1 shows fluctuations in per capita food production in Tanzania from crop year 1990-91 to 2011-12. These fluctuations are on either side of the mean level of per capita production of just over 250 kg per person. The standard deviation of this production, which is a measure of the

**Graph 1: Per Capita Food Production (kg), 1990-91 to 2011-12**



Source: Ministry of Agriculture, Food Security, and Cooperatives

dispersion of annual production about the mean, equals 24.4 kg per person, which is a little less than 10% of the mean. Negative deviation of production from the mean by as much as two standard deviations, or about 50 kg per person, can be expected to occur about once every forty years.<sup>4</sup>

<sup>3</sup> NAFKA/SERA/AIRD, “Study of Policy Options for Increasing Tanzanian Exports of Maize and Rice in East Africa While Improving Its Food Security to the Year 2025,” Revised Final Report, July 26, 2012, by Dirck Stryker and Mukhtar Amin.

<sup>4</sup> This assumes that production follows a normal distribution

The data used to construct Graph 1 are for the entire country of Tanzania. Different parts of the country have different experiences regarding fluctuations in production and what this implies for food security. In general the southern regions have more abundant and reliable rainfall than do the central and northern regions. For example, Mbeya had a mean level of rainfall from 1991/92 to 2007/08 of 770 mm and a coefficient of variation (standard deviation divided by the mean) of 0.201. Arusha, on the other hand, had mean rainfall of 627 mm and a coefficient of variation of 0.346, implying more variability as well as lower average, while the mean level of rainfall in Dodoma was 493 mm and the coefficient of variation was 0.293.

<b>Table 1: Rainfall and Total Food Yields, 2000/01-2011/12</b>						
	<b>Rainfall, 1991-2008</b>		<b>Food Yield per Hectare</b>			<b>Surplus/</b>
		<b>Coefficient of</b>		<b>Coefficient</b>	<b>Mean minus</b>	<b>Neutral/</b>
<b>Region</b>	<b>Mean (mm)</b>	<b>Variation</b>	<b>Mean (MT)</b>	<b>of Variation</b>	<b>Std Dev (MT)</b>	<b>Deficit</b>
Arusha	627	0.346	1.188	0.246	0.90	Deficit
Coast/DSM	950	0.230	1.306	0.304	0.91	Deficit
Dar es Salaam	950	0.230	0.976	0.293	0.69	Deficit
Dodoma	493	0.293	0.904	0.310	0.62	Deficit
Iringa	504	0.233	1.545	0.158	1.30	Surplus
Kagera	1609	0.154	1.792	0.119	1.58	Surplus
Kigoma	772	0.106	1.776	0.142	1.52	Surplus
Kilimanjaro	672	0.276	1.553	0.248	1.17	Neutral
Lindi	861	0.247	1.287	0.208	1.02	Neutral
Manyara	627	0.346	1.170	0.218	0.91	Deficit
Mara	900	0.184	1.509	0.110	1.34	Surplus
Mbeya	770	0.201	1.795	0.117	1.59	Surplus
Morogoro	678	0.252	1.517	0.204	1.21	Surplus
Mtwara	861	0.247	1.465	0.252	1.10	Neutral
Mwanza	900	0.184	1.377	0.171	1.14	Neutral
Rukwa	770	0.201	1.644	0.134	1.42	Surplus
Ruvuma	854	0.128	1.707	0.107	1.52	Surplus
Shinyanga	617	0.351	1.097	0.285	0.78	Deficit
Singida	770	0.202	1.012	0.222	0.79	Deficit
Tabora	770	0.202	1.324	0.185	1.08	Neutral
Tanga	1035	0.333	1.482	0.274	1.08	Neutral
<b>Total Yield</b>			1.400	0.110	1.25	Surplus

Source: MAFC and Tanzania Meteorological Agency

Low levels and large fluctuations in rainfall are reflected to a considerable extent, though not perfectly, in low levels and large variations in food production yields. Although it is not possible to match the rainfall data precisely with figures on yields because of changes in the definition of regions over time, we can gain some idea of how levels and fluctuations in rainfall are related to the food security status of the different regions based on the rainfall data we have and the

production forecast reports of the MAFC.<sup>5</sup> As shown in Table 1, mean rainfall is a fairly good predictor of food production yields (correlation coefficient  $r = 0.371$ ), though some of the regions along the coast, such as Dar es Salaam, have relatively high rainfall but low food yields, primarily because they depend on activities other than agriculture for their livelihoods. The coefficient of variation for rainfall, however, is an even better predictor of the mean value of yields, with larger variations resulting in lower yields ( $r = -0.576$ ). This is at least partly because of the susceptibility of yields to shortfalls of rain during critical phases of the growing cycle. As one would expect, rainfall variation is also a very good predictor of variation in yields ( $r = 0.707$ ).

It is important to note that the coefficient of variation of food production yields shown in Table 1 is much lower for the whole country ( $CV = 0.110$ ) than it is for all but two individual regions. This shows the advantage of diversification in reducing risks across the whole country.

Rainfall variation is also a good predictor of which regions are likely to be in surplus, neutral, or deficit. The indicator used to estimate the category into which each region falls is the mean yield minus one standard deviation. This tells us that the yield within a given region will, on average, fall below the indicated value approximately 14% of the time. The correlation coefficient between this variable and the coefficient of variation of rainfall across regions is  $-0.663$ , implying that those regions with more variable rainfall tend to be those that have a more serious problem of periodic shortages. This is considerably more important than the relation between this variable and mean rainfall ( $r = 0.359$ ).

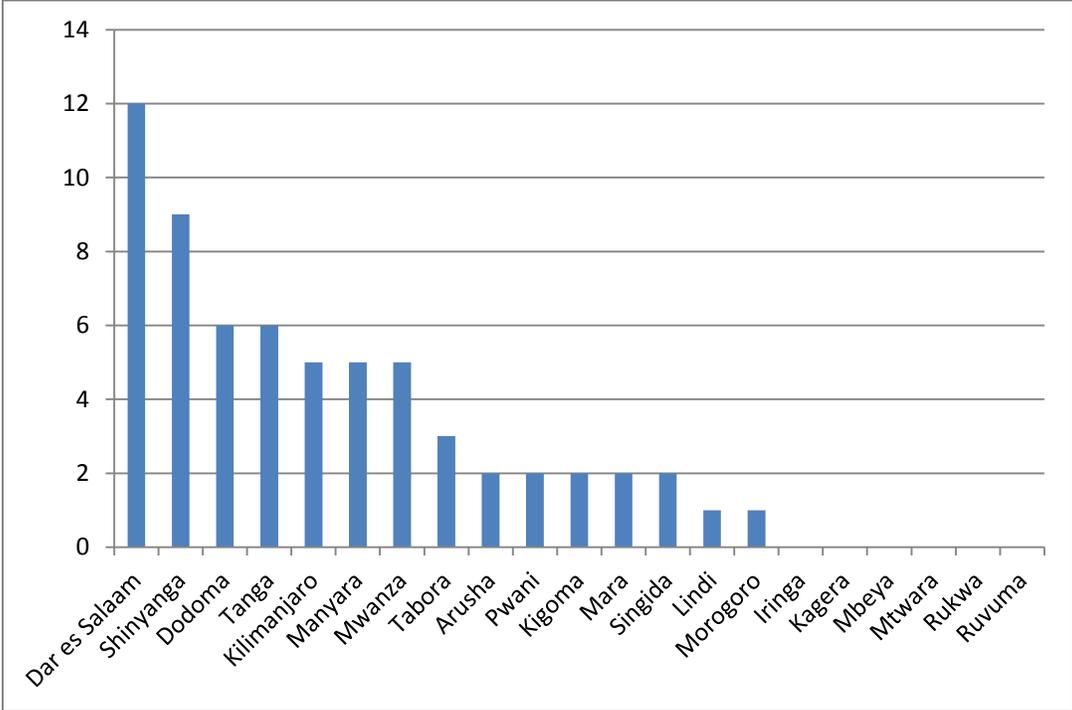
The impact of rainfall on food yields is only one element, albeit the most important one, in determining whether a given region will tend to be in surplus, neutral, or in deficit in most years. Other variables include land area under cultivation, food consumption needs, pest infestation, etc. In order to see how well rainfall and its effects on yields influences the degree to which a region tends to be in surplus or in deficit, the regions were grouped into three categories according to the value of the Mean – Standard Deviation indicator. This resulted in 8 surplus regions (1.21 – 1.59 MT/ha), 6 neutral regions (1.02 -1.17 MT/ha), and 7 deficit regions (0.62 – 0.91 MT/ha). This classification, shown in Table 1, can be compared with the MAFC forecasts showing, on the basis of projected food production and needs, what the size of the surplus or deficit is likely to be for each region. These projections are summarized in Table 2 for the period 2000/01 – 2011/12. They show the number of years during this period in which each region has been projected to be in deficit. The 7 most consistent deficit regions are Dar es Salaam, Shinyanga, Dodoma, Tanga, Kilimanjaro, Manyara, and Mwanza. All of these are classified as either deficit or neutral in Table 1. The 8 most consistent surplus countries are Ruvuma, Rukwa, Mtwara, Mbeya, Kagera, Iringa, Morogoro, and Lindi. All of these are classified in Table 1 as either surplus or neutral. Thus we see the critical importance of rainfall, and especially

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<sup>5</sup> Food yield is only one determinant of total food production, the other being area. However, yields are more likely to be related to rainfall.

fluctuations in rainfall, in influencing yields, and through this the food surplus/deficit status of each region.

**Graph 2: Number of Years a Region was in Food Deficit  
2000/01-2011/12**

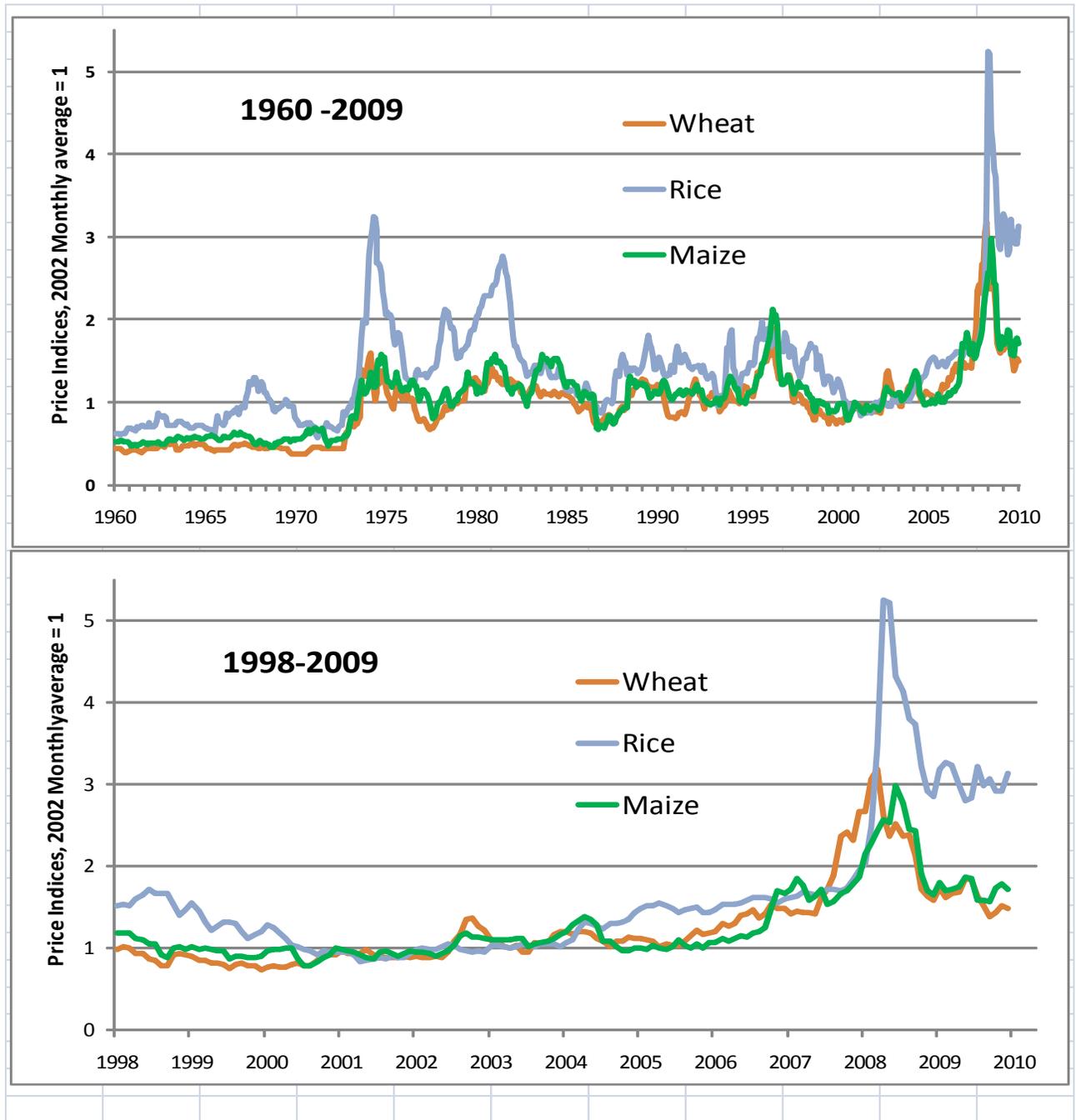


**2.4.3 Fluctuations in International and Regional Food Prices**

As shown in Graph 3, after a long period of price stability on world food markets following the tumultuous period from 1972 to 1983, international grain prices began to rise in 2007 and spiked in 2008. The steepest increase was for rice, but the price of maize rose nearly threefold until it subsided in 2009, while remaining nearly 50 % above its level prior to 2007. It is estimated that an additional 75 to 133 million people suffered from hunger and malnutrition as a result of these price movements.<sup>6</sup>

<sup>6</sup> Philip Abbot, “Stabilization Policy in Developing Countries After the 2007-08 Food Crisis,” Organization for Economic Cooperation and Development, February 2010, p. 1.

**Graph 3: International Grain Price Indices, 1960-2009**



Source: Abbott, "Stabilization Policy...,"

Several reasons have been offered as to why prices spiked in this way. One is that public holding of food stocks had decreased prior to the price rise and was only partially replaced by private stockholding, largely because of the lack of incentive for holding large carryover stocks from year to year. Another is that the demand for maize for bio-fuels had increased, which decreased

reserves for food. A third reason is that many countries took actions to mitigate the transmission of price increases to their domestic markets, such as lowering import taxes, imposing export taxes and restrictions, using subsidies to stimulate production, and releasing public stocks of food. These measures often resulted in greater stability of prices at home at the expense of larger fluctuations on the world market.

Regardless of the reasons for these price spikes, their mere existence has led governments to be fearful of depending too much on world markets even though this is often the cheapest source of food in an emergency resulting from a domestic shortfall in food production. In fact, world food prices have historically been characterized by long periods of relatively low, stable prices followed by brief periods of high prices. The long periods of low prices makes recourse to the world market attractive in comparison to costly stockpiling, as long as a strategy is developed for dealing with the price spikes that occasionally occur, albeit very infrequently.<sup>7</sup>

These movements in international market prices have only been partially transmitted to the East African regional market. This market is characterized by persistent and growing imports of food grains as a whole, and, to the extent that the international and East African markets are linked, movements in prices in the two markets should correspond. Graph 4 shows, however, that this is only partially true.

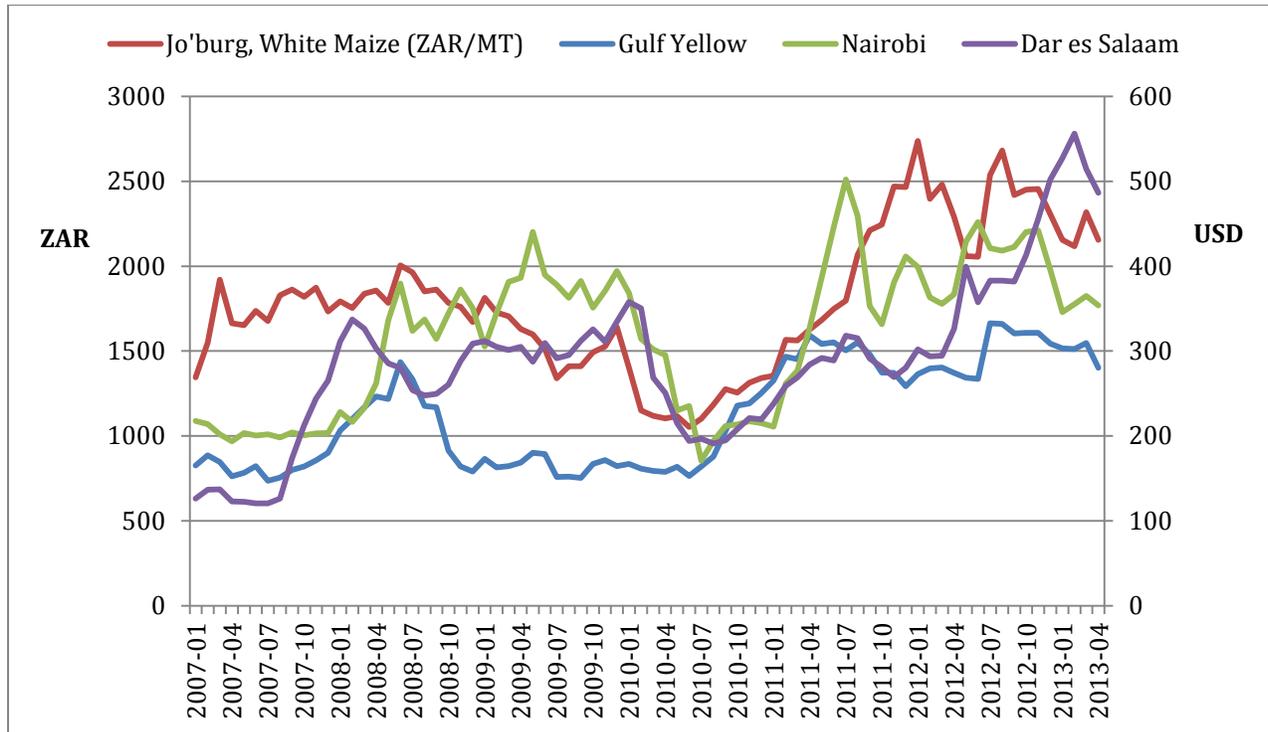
There are two major reasons for this. The first is that international maize prices are dominated by yellow maize, used primarily for livestock feed and more recently for bio-fuels. The prices in Johannesburg and East Africa, on the other hand, are for white maize, which is primarily for human consumption. Although the South African commodities exchange is well integrated with other international exchanges, the prices on the two exchanges follow each other only roughly. The same can be said for movements between prices in Johannesburg and in Nairobi and Dar es Salaam. Given the importance of imports of white maize from South Africa into Kenya, one would expect that movements of white maize prices in Nairobi would follow those in Johannesburg more closely than they do. A major reason why they do not is that Kenya and Tanzania are important producers of maize, and prices of this crop in these two countries are influenced by variations in production as well as in import prices.

The relationship between prices in Nairobi and in Dar Salaam, for example, reflects the relative size and timing of harvests in the two countries. Both Kenya and northern Tanzania have a bimodal pattern of rainfall. If the short-season harvest (*vuli*) is poor in northern Tanzania but abundant in Kenya, maize is likely to be exported from Kenya to Tanzania, even as far away as Dar es Salaam. This appeared to be the pattern that emerged in early 2013. On the other hand, once the main bi-modal harvest and single-season harvest arrive in June and July, Tanzanian production dominates and maize is exported from the major production areas in the south of Tanzania to both Kenya and Dar es Salaam.

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<sup>7</sup> Abbott, "Stabilization Policy...", p. 4.

**Graph 4: International and East African Maize Prices,  
2007-2013 (USD/MT except where indicated)**



Source:

Notes: (1) Johannesburg prices are maintained in rand, whereas the prices in East Africa are converted to USD, because the ZAR/USD rate of exchange moved substantially during this period in response to the price of gold and other factors that were unrelated to the market for maize.

The major conclusion from this analysis is that the patterns of maize marketing and trade within East Africa are complex and only moderately related to conditions on the world market. This has the advantage that price spikes on that market are not very likely to coincide with a serious overall shortage within East Africa. Furthermore, the discussion here relates chiefly to maize. Although this crop is the most important food in much of East Africa, there are many other crops that also form an important part of the diet, especially in certain localities. These include rice, cassava, beans, bananas, sweet potatoes, sorghum, and other foods. The likelihood of all these crops failing at a time of serious price spikes of the major tradable foods on the world market is very low indeed.

## **2.4 What the Government Can Do to Increase Food Security by Strengthening Private Sector Storage and Trade**

Even if serious overall shortages in Tanzania are rare, there will be regional pockets of food insecurity with which the Government must be concerned. There is also the unlikely probability, but nevertheless possibility, of an overall food shortage coupled with high prices of food on both world and regional markets. So what can the Government do in the face of these sources of food insecurity?

There are a number of actions that are examined here briefly before moving on to public stockpiling and distribution, which is the main subject this report. These include encouraging the private sector to hold reserves and relying to a greater extent on local, regional, and international trade in food.

Private sector storage and trade can and does take place at many different levels: village, market town, national, regional, and international. The most appropriate level depends on many factors, including the degree to which fluctuations in production are likely to be correlated, transportation and other costs associated with moving food, differences in taste patterns, differences in comparative advantage, and cost of storage including the economies of scale involved.

### **2.4.1 Factors Determining Levels of Private Sector Storage and Trade**

To the extent that fluctuations in production are highly correlated across regions, there are fewer gains from central storage because all localities are likely to face similar needs at the same time. On the other hand, if variations in production in different localities tend to offset one another, there may be gains from economies of scale in central storage, especially if transport costs are low. If transport costs are very high, on the other hand, it is probably better to economize on those costs by minimizing the distance food is moved. This increases the incentives for localities to store food rather than depend on acquiring it from other sources.

Differences in taste patterns also influence the incentive for local storage compared with importing food from outside the locality. Areas that consume lots of beans and bananas, for example, will not benefit greatly from supplies of maize that are stored elsewhere. Other things equal, the greater the degree of heterogeneity of consumption the fewer advantages there are to centralized storage.

Differences in taste patterns do not have to be matched by differences in patterns of production. Trade is possible between communities, suggesting that a particular locality might have a comparative advantage in producing a crop and exporting it to other areas. This comparative advantage might extend beyond differences in productivity to also include producing a crop with a higher degree of security. Thus growing a crop that requires a good deal of water, such as rice, in areas where water is abundant not only is likely to increase yields but also will result in yields that are more stable.

Grain storage is subject to economies of scale. Large amounts of grain can be stored in one place at relatively low cost per ton. For example, silo storage has low costs but requires substantial scale in order to amortize the expensive elevators and other equipment involved. Achieving these economies of scale may be difficult if transportation costs are high and the density of production on the land is relatively low, as is the case in much of Tanzania.

## **2.4.2 Application to Different Levels of Storage and Trade**

### **2.4.2.1 Village**

Most grain in Tanzania is currently stored on the farm or at the village. This has the advantage that transportation costs are low and the food stored is that which the local population favors. However, storage costs including losses are generally high, and it is difficult to achieve much in the way of economies of scale, so that the storage technology is likely to be primitive.

Furthermore, village-level storage ignores potential gains from exploitation of comparative advantage and smoothing out variations in production over a larger area of land. Furthermore, it can be extremely costly to hedge at the village level against large inter-annual fluctuations in production. Food may be imported from outside the village to meet these extraordinary needs, but this often does not take place automatically in response to a rise in local prices. As noted earlier, this is because the fall in food production is likely to be accompanied by a decline in local income, which reduces local demand for food despite the shortage. Only if the community has other sources of income that are maintained during the slump in food production will demand be sufficient to cause food prices to rise.

### **2.4.2.2 Regional (within country)**

Regional storage offers a compromise between village-level storage and national storage. There is likely to be some averaging out of production within a given region so that intra-regional trade can help to alleviate shortages, though the potential for this is likely to be limited unless there is a lot of variation in agro-climatic conditions within the region. Transportation costs within a region are also somewhat lower than between regions, though this effect is also limited because the cost of using feeder roads in Tanzania, which are highly localized, is estimated to average more than 70 percent of total transport costs (World Bank, 2009).

Furthermore, the small scale and fragmented nature of production in Tanzania makes it necessary to assemble larger volumes for wholesale from a number of different farms. This may be undertaken by farmer groups, by private individuals with access to small-scale transport facilities (ranging from bicycles to ox carts to 5-ton trucks), or by the agents of larger trading companies. Competition is intense and these small traders are able to stay in business only by cutting their relatively high costs. They have little access to the capital required to own storage facilities or even to pay for the cost of rental storage. There are larger traders who own warehouses and have better access to finance, but the high cost of doing business with many disbursed units of production and collection means that these tend to be concentrated along the market routes that

connect regions of surplus production with major urban areas and the export trade (NAFAKA/SERA/AIRD, 2012)

Some of the potential gains from inter-regional storage and trade are likely to be reduced by differences among regions in patterns of consumption. But differences in comparative advantage, including susceptibility to drought and other calamities, are sources of potential gain. So too is the potential for aggregation and exploitation of economies of scale in storage. An important issue is how much concentration is necessary to achieve this and how do these economies compare against the higher cost of transportation in moving food over longer distances.

#### **2.4.2.3 National**

Storage at the national level permits averaging out production over a much broader terrain so that the surpluses of production in some regions will offset deficits in others. This does not necessarily require that all storage take place in central facilities, but it does imply some kind of central management. Some of this already occurs among the five or six very large traders in Tanzania. The key characteristics of these large traders include the following (USAID, 2010)

1. They have integrated the various processes of the value chain into a single business operation and engage in assembly, transport, storage, and milling; some are also producers of grain themselves on commercial farms.
2. They source grain directly from farmers using their own agents.
3. They have networks of rural depots that can be used to channel grain to central warehouses.
4. They have the financial and warehouse capacity to store substantial volumes of grain in Dar and other urban centers.
5. Unlike almost any other stakeholders, they are able to take a position in the market, storing grain and releasing it when prices are most favorable. As such, their overall profitability does not depend on margins made in the course of day-to-day trading. Rather it depends upon the rapid accumulation of stocks during those periods when markets are depressed and their sale during periods of shortage.
6. The scope and scale of their operations is such that they have the capacity to influence price within the domestic market.

Despite the presence of these larger traders, most marketing is carried out by smaller operators, and this serves as a cushion against the larger traders offering farmers too low a price. Instead, they are able to cut their costs to the point that they make larger profits per unit of sale than the smaller traders.

The key question here is to what extent can the operations of these larger traders substitute for those of a public storage and trading agency such as the NFRA. Here there are at least two areas in which the private market may fail. First, the larger private traders have no incentive to deliver food to those who are in greatest need because of crop failure or a breakdown in their livelihood systems. Reduced income keeps prices from rising to signal the existence of shortage. Second, although the large traders will carry some stocks over from year to year, they have no incentive to store large quantities of food against the possibility of severe shortage in a bad year. Large

offsetting fluctuations in production within the country may not be sufficient to maintain availability from domestic sources, requiring either the drawing down of food reserves or, if these reserves are low, recourse to regional or international food markets. If there is lack of purchasing power, however, large trading firms may not go to these markets in a timely fashion. Furthermore, even if they did, there may be delays and uncertainties regarding availability and price, no matter how infrequently these occur. And in developing countries such as Tanzania, insurance and futures markets are totally inadequate to deal with such emergencies.

#### ***2.4.2.4 Regional (across countries) and International***

The advantage of regional storage across countries is that there is a greater range of agro-climatic zones that helps to mitigate widespread shortfalls for any particular crop. For example, both northern Tanzania and Kenya have bi-modal agricultural seasons. Often the harvest is good in one of these areas but not the other. It is almost always good in the surplus areas in the south of Tanzania. This gives rise to regional trade, which may reverse itself during the course of the year. Some of this trade is with current production but a good bit of it occurs because of storage in anticipation of future trade, even if just seasonal in nature.

One of the problems with depending on this source of food is that it is always subject to restrictions by national governments. Tanzania itself has a history of imposing bans on food exports. Other countries do the same. The political pressures on government to take action in the event of food shortages or high prices are powerful to resist. This is important for Tanzania not only because regional trade becomes less of a safety net in the event of domestic shortages but also because it destroys the confidence that Tanzania's neighbors have and thus the possibility of increasing food security by taking advantage of Tanzania's strong comparative advantage in producing grain for export.

Another problem in the Eastern and Southern Africa region is that the holding of stocks is not well coordinated at the regional level. The Eastern Africa Grains Council operates as a non-profit, non-political, non-denominational organization, which prepares, disseminates, and promotes the exchange of information on matters affecting the regional grain industry, but it is not actively involved in the coordination of grain reserves. SADC, of which Tanzania is a member, has had a draft proposal to create a Regional Food Reserve Facility since at least 2009, but there is lack of universal agreement that such a facility is needed. Furthermore, the private sector has thus far been excluded from this arrangement.<sup>8</sup>

Thus, at present, although regional grain trade is very important for Tanzania and is likely to become even more so in the future, it does not appear that the country's grain policy can be built on a structure of regional cooperation in the holding of grain stocks. Instead, Tanzania should work with the East African Community and the Eastern Africa Grains Council to build on the cooperation that already exists towards the dissemination of technical information on storage

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<sup>8</sup> Food, Agriculture and Natural Resource Policy Analysis Network, "The Southern Africa Experience in Regional Food Reserve."

facilities, grades and standards, collection of data, and other areas, as well as the reduction or elimination of tariff and non-tariff barriers to trade, all of which will facilitate its becoming a major supplier for the region

As noted in Section 2.3, Tanzania has an opportunity to become a major exporter of maize and other crops to the broader eastern Africa region. This will be looked at in greater detail in Section 3, but for now it is important to note that Tanzania will benefit from the type of regional cooperation discussed here not only in terms of increase income and employment but also in terms of greater food security. By creating a growing food surplus, Tanzania will be assuring its food security for years to come.

#### ***2.4.3 Government Support for Private Sector Storage and Trade***

There many ways in which the Government can support private sector storage and trade in addition to any role that it will play in public sector storage and distribution. These have been covered in numerous documents, and the purpose here is simply to summarize them.<sup>9</sup> This will serve as a backdrop for the discussion to follow of the more direct role of the public sector.

- Disseminate technical information of various levels of sophistication on storage, post-harvest technology, processing, grades and standards, etc.
- Create a viable and sustainable market information system that will respond to the needs of farmers, traders, and consumers in a timely way to provide them with prices and stocks in markets throughout the country.
- Expand on the existing MAFC Crop Forecasts and the Food Vulnerability Assessments to provide early warning and useful information to the private sector on food production and food security in Tanzania.
- Continue efforts to improve the road system, especially feeder roads and roads to secondary markets.
- Continue efforts to strengthen the rural financial system, especially as this might be used to encourage the construction and use of grain storage warehouses
- Provide a stable enabling environment for food marketing, storage, and trade. Avoid the use of quantitative restrictions on trade, such as export bans.
- Eliminate the requirement for food export and import permits.
- Encourage the use of warehouse receipts and assure that all enabling legislation is in place.

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<sup>9</sup> For example, USAID, MicroCLIR/CIBER Assessment: The Legal, Policy, Regulatory, and Institutional Constraints to the Growth of Maize and Rice in Tanzania, Agenda for Action, August 2010.

- Work within the EAC to reduce the import duty on rice and maize in order to discourage investment in unproductive technologies behind high tariff walls.
- Continue ongoing efforts to reduce or eliminate other tariff and non-tariff barriers to trade.
- Expand the current cash transfer system to act as a safety net for households by increasing their income so that they can buy the food they need.
- Engage in a wide range of activities to increase agricultural production, raise yields, and increase labor productivity, with a view to expanding Tanzania's food exports, and use the surpluses thus generated as food reserves against bad times.

## **2.5 Direct Government Involvement in Storage and Trade**

Direct government involvement in grain storage and trade currently takes place through two main channels. The first comprises the operations of the NFRA, which has sole responsibility for public storage of grain and which occasionally imports grain for this purpose. The other channel is the control exercised by the Government through its issuing of export and import permits. In addition, the Government has also attempted to control exports in the past through the use of export bans, though it currently has agreed not to engage in this policy. Finally, Government policy has influenced the cost of trade through the imposition and suppression of trade taxes.

### **2.5.1 Operations of the NFRA**

The NFRA is charged with maintaining an optimal level of national food reserves to address local food shortages and to respond to immediate emergency food requirements. It is to procure and store food stocks in an efficient and cost effective manner. Revenue sources for the Agency are Government's annual budgetary allocation, sales of foods stocks, and provision of services. The Agency aims to procure food locally from surplus areas and to move it to deficit areas where it is distributed to families with food shortages. The Agency is supposed to be a reliable market outlet for farmers in surplus areas and a reliable source of consumption in food deficit areas. The NFRA may buy and sell food from and to foreign markets where necessary to supplement its activities in the local market.

The NFRA has seven Zone offices, which are strategically located in surplus and deficit areas – three in the south and four in the central and northern parts of the country. Each zone operates several storage facilities. In total, there are 30 warehouses with an overall storage capacity of 241,000 MT.

#### **2.5.1.1 Definition of the NFRA's Role in Relation to That of the Private Sector**

It is not the NFRA's purpose to replace the private sector. Rather its role is to undertake important functions that the private sector is unlikely to fulfill. From the earlier analysis in Section 2.4, at least two of these have been identified.

- To store food for future delivery to households that have been identified as being food insecure and that do not have the means to overcome this insecurity by buying food.
- To store food against the possibility of an unforeseen emergency at the national level.

Each of these objectives is briefly summarized here, with further analysis undertaken in Section 4 of the Report

#### 2.5.1.1.1 Food Insecure Households

Section 2.1 described the reasons why Government action is necessary to deal with the problem of household food insecurity. Uncertainty concerning the quantity of food and other agricultural products produced in any given year, or in a succession of years, is a major element of this insecurity. This is both because of the impact of production on food availability and its effect on income and therefore access to food.

A major problem is that many households in Tanzania do not have well diversified sources of income. They depend very much on subsistence agriculture. When this fails, they have few resources upon which they can rely. Although they need food, their ability to buy it is severely limited. Lack of effective demand means that prices do not increase, discouraging food imports into the locality. Even if they did rise, the remoteness of some communities could mean that additional food would not flow there through the market. Furthermore, even if food were available, households might not have access to it because of lack of income. The private sector has no incentive to respond to this situation. Some type of assistance is required, either in cash or in kind. The issue of what kind of assistance will be most cost effective is examined later in the report.

#### 2.5.1.1.2 Stocks against Unforeseen Emergency

Unforeseen emergencies occur not just for households but also for nations. National disasters take place because of drought, plague, war, and a variety of events. Although the Government can store and deliver food (or cash) to households in need, it is more restricted when the crisis impacts the entire nation. As we have already seen, the two most important instruments at its disposal are storing food, especially grain because of its greater storability in comparison with most other foods, and purchasing food from outside. Storage of food is expensive and the likelihood of a serious unforeseen emergency is relatively low, which would argue for purchasing imports instead. But the possibility always exists of having to go to international food markets in the event of need and finding prices there to be high and accessibility to be low.

Inter-annual storage cannot be left to the private sector, except for limited carryover stocks maintained to facilitate transactions. Unlike seasonal storage, there is no way to predict in which way prices will move from year to year. Although farmers, as consumers as well as producers, may want to maintain some stocks as a hedge against uncertainty, their capacity to do so is often severely limited. Commercial traders, on the other hand, are interested only in profit, and

carrying large stocks is only profitable if there is a predictable rise in prices. Government, which is responsible for the public interest going beyond commercial profitability, therefore must step in.

### **2.5.1.2 Nature, Size, and Location of Stocks and Their Linkages with Trade**

There are many issues related to the holding of stocks, which will be addressed systematically in this report. These pertain to the nature, size, and location of stocks and how this relates to trade.

#### **2.5.1.2.1 Nature of Stocks**

Should stocks be held in kind or as cash? The argument has long been made that it is much cheaper to store the cash with which to buy imports, often in the form of interest-bearing securities with an appropriate degree of liquidity, than to store food.<sup>10</sup> But imports do not arrive instantaneously so timely early warning, which is not always easy, is essential if imports are to be depended on. Alternatively, stocks may be used to quell price peaks until imports arrive, and rebuilding stocks with imports can be used to minimize the dangers of two bad harvests in a row.<sup>11</sup>

Although it is cheaper to store cash rather than food, this does not necessarily mean that the cash will be available when needed. Monetary reserves tend to be spent by governments without waiting for an emergency. The same may apply to substituting cash transfers for contributions of food to households.<sup>12</sup> There is no guarantee that the money will be spent on nutritious food rather than on more frivolous items, especially if it is under the control of male members of the household. Some food insecure households are found in very remote regions, with high costs of transport into and out of the local communities, inhibiting traders from going there. Cash transfers could in these communities result in local inflation without inducing inflows of much food.

Even if storage and deliveries are restricted to food, another question is what kind of food. For the moment, most food stored by the NFRA is maize, with lesser quantities of sorghum also stored. Yet the diets of Tanzanians are much more varied, with substantial amounts of rice, wheat flour, cassava, beans, bananas, and other foods being consumed as well. Typically what happens is that when food is delivered that does not match the consumption habits of the local population, some of it is sold and converted to cash. Though this may be quite inefficient, storing crops other than coarse grains is not easy. Grading is difficult and spoilage may be significant.

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<sup>10</sup> John McIntire, "Food Security in the Sahel: Variable Import Levy, Grain Reserves, and Foreign Exchange Assistance," Research Report 26, International Food Policy Research Center (IFPRI), 1981.

<sup>11</sup> Abbott, "Stabilization Policy..." p. 9.

<sup>12</sup> Such a transfer system exists as TASAF III, targeted primarily to the bottom 30% of the population, which either is not able to meet basic food needs or is considered to be highly vulnerable. Much of this population is found in the central regions of the country rather than in the north when a livelihoods approach is used to identify them. Some of the transfers are conditional upon use of health and educational services but none are conditional on the purchase of food. During 2012-17, the program is expected to reach one million direct beneficiaries out of a total of 13.5 million people living under the basic needs poverty line.

#### 2.5.1.2.2 Size and Location of Stocks

The size and location of stocks to be held by the RFRA is determined by a number of factors. One is the magnitude of food assistance that is anticipated in a normal year in different areas of the country. This serves as a baseline from which additions or adjustments to stocks may be made in years that are not normal. Another is the tradeoff that exists between economies of scale in storage and the cost of moving grain between buying and selling stations and storage facilities. As was shown earlier in Section 2.4, economies of scale in storage are greatest if storage is highly centralized. But this maximizes the cost of transport. It also leads to delays in moving the grain to areas where it is most needed.

Dispersing storage widely throughout the country, on the other hand, inhibits the achievement of scale economies. Even more seriously, it may result in inefficient capacity utilization if storage capacity is created in different areas to handle unusually large needs. In more normal years this capacity is likely to go unutilized. Centralizing storage, on the other hand, allows for varying needs and availabilities in different parts of the country to offset each other to some extent.

The decisions regarding the holding of stocks in different localities depends not only on the location and quantities of production and consumption but also on the timing of the harvest and the need for food assistance, as well as the requirement to turn stocks over sufficiently frequently that their quality does not deteriorate. This becomes complicated in Tanzania because part of the country has a bimodal pattern of rainfall and the rest of it has a unimodal pattern so there is considerable variation in the timing of harvests. However, the complexity of this pattern also implies that there is less need for seasonal storage.

#### 2.5.1.2.3 Linkages with Trade

There are numerous ways in which the nature, size, and location of stocks may be linked with trade. One of the most obvious is that trade serves as a buffer of last resort. In the event of a severe shortfall in domestic production, local stocks may not be sufficient to supply all the needs of the population. The obvious remedy is to access the regional or international market. In part this will be done by the private sector, which will take advantage of price differentials that exist between these markets and domestic markets with enough sustained purchasing power so that prices increase sufficiently to encourage commercial imports. Purchasing power is not always sustained enough for this to occur, however, so the Government may have to step in to import food, which in turn can be distributed to those in need. In a worst case scenario, the country may have to depend on food aid, the arrival date of which may be uncertain.

The nature of the food involved could be a problem. Many domestic foods are not available on regional or international markets in sufficient quantities to satisfy local needs. There may have to be some substitution away from bananas and cassava, for example, towards maize and sorghum. Nevertheless, there should nearly always be sufficient nourishing food available at reasonable prices to bridge the gap.

Location is also an important variable in determining availability. The centers of consumption that have the quickest and lowest cost access to food imports are those located near seaports and other border points. As one goes into the interior of the country, and especially into areas with poor transport, access becomes more problematic.

### ***2.5.1.3 Potential Conflict between Public and Private Storage and Trade***

By and large the private sector can probably be counted on to undertake most seasonal storage. The incentive for commercial storage is an anticipated rise in prices, which compensates for the costs of storage. On-farm and village storage is undertaken because of the knowledge that production is not constant throughout the year and that consumption needs will have to be met during the slack season. On the other hand, Tanzania is fortunate in that the timing of its harvests tends to be somewhat diversified throughout the year, decreasing the need to match through storage all seasonal variations in production.

The problems associated with food availability are related not so much to the seasonal nature of production as to the overall deficiency of supply in relation to the food needs of the population. The problem is one of overall insufficiency rather than simply timing, even though this deficiency is most manifest during the hungry season as supplies of food begin to run out.

The NFRA' responsibility, in this case, is to procure and store adequate stocks of food to assure that food will be available when it is most needed by those who have inadequate access to food, generally during the hungry season. For those who either have enough of their own food or have the income to buy food, the private sector should be able to assure adequate availability throughout the year. To the extent that storage facilities are insufficient to stock enough food for the entire year, the private sector should be able to import the additional food that is needed.

A major problem would occur if the public sector, in this case the NFRA, were to try to reduce storage margins by buying at prices above the market at harvest time and/or selling at prices below the market later in the season. To the extent that this policy is successful, it will lead to a reduction in the margins that are necessary to encourage storage. Even if unsuccessful, buying and selling at prices other than those that prevail on the market creates uncertainty and disrupts the market. It is far better to employ policies that encourage competition in storage, such as those that facilitate access to credit for a greater range of traders.

In addition, buying at prices that are higher and selling at prices that are lower than market prices jeopardizes the financial sustainability of the NFRA. This makes it more difficult for the Agency to fulfill its role of being "well-managed and businesslike". It means that it has to rely on continuing infusions of funds from the Government, which may be insufficient or delayed, which could cause it to fail to meet its financial obligations and to introduce uncertainty to the market.

That said, the line between holding emergency food reserves and buffering price movements is not always clear, both seasonally and inter-annually. Both the peak price before the next harvest and the price after harvest are influenced by expectations regarding upcoming production. If

there has been a shortage, the public storage agency will want to assure that it has sufficient stocks to meet the needs of the coming year, especially if production forecasts are not good. Consequently, it may offer higher than market prices, not to boost those prices, but to be sure that it is able to procure its estimated needs.<sup>13</sup>

Just as attempts by the NFRA to raise purchase prices and lower sales prices may disrupt the market and discourage seasonal storage by the private sector, importation of grain by NFRA may have the same result if this results in excessive stocks that must be sold at the end of the year. The major reason for such imports should be to have adequate stocks on hand to provide for the food distribution required to maintain food security for those who are impoverished. Excessive stocks placed on the market before the next harvest will discourage private sector storage.

### **2.5.2 Trade Policy<sup>14</sup>**

In addition to the operations of the NFRA, the Government also attempts to influence trade through the use of three policy instruments: (1) import and export permits, (2) trade bans, and (3) imposition and suppression of trade taxes.

#### **2.5.2.1 Import and Export Permits**

The Ministry of Agriculture, Food and Cooperatives (MAFC) issues letters of export/import authorization, where the quantity of exports/imports of specific products, as well as the timeframe in which they are to be exported/imported, are specified. Traders are expected to meet the requirement to obtain a letter of authorization, irrespective of whether an export ban is in effect. This practice was founded in the Export Control Act, which was initially passed in 1950. It remained in effect during the period when Tanzania had a centralized, closed economy that discouraged trade with neighboring countries. This was one of the reasons why check-points were established along highways leading to border points. After the institution of trade and private sector liberalization in the 1990s, the permit system became an instrument to monitor, and even regulate, the flow of trade. One justification for issuing the letters of authorization has been to safeguard national food security. The Food Security Act of 1991, for example, specifically authorizes the Director of the Food Security Department to “recommend to the Government the level of exports and imports of major cereal staples crops annually.”

Food security in Tanzania is monitored through the Integrated Food Security and Nutrition Assessment System (IFSNAS), which is more famously known in Kiswahili as “*Mfumo wa Uchambuzi wa Uhakika wa Chakula na Lishe*” (MUCHALI). This system makes an assessment and projections of food production and requirements in all districts and for each of the two cropping seasons. The MUCHALI system, which is located in MAFC, informs the Disaster Prevention Division of the Prime Minister’s Office on the general situation of food availability,

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<sup>13</sup> Abbott, “Stabilization Policies in Developing Countries...” 2010, p. 8.

<sup>14</sup> This section is taken from NAFKA/SERA/AIRD, “Study of Policy Options for Increasing Tanzanian Exports of Maize and Rice in East Africa While Improving Its Food Security to the Year 2025,” Revised Final Report, July 26, 2012, by Dirck Stryker and Mukhtar Amin.

access, and forecast by conducting a vulnerability assessment and issuing an early warning report on food scarcity, which then triggers a national notice to increase the quantity of food imports and/or to impose a quota on food exports. It may also recommend the imposition of a total presidential food export ban. A food export quota necessitates issuance of a letter of authorization to regulate the quantity and place from which food exports are permitted. Even when there is a total presidential food export ban, letters of authorization to export a specified quantity of food are still issued.

Import permits must be obtained from the MAFC prior to importing maize or rice. To obtain the required import permits, traders must submit an application in a simple letter showing the quality, quantity, delivery time, and source of their product. Conditions required to be granted a license include: possession of a trading license and being registered with the Tanzania Revenue Authority (TRA), evidenced by a TIN number. An import permit is for a single shipment, is valid for up to six months, and can be extended

The letter of authorization to export food is initiated by the District Administrative Secretary and has to be endorsed and validated by the Regional Administrative Secretary before it is submitted to the Department of Food Security at MAFC. The role of district and regional authorities is to certify that there is a sufficient amount of food in their particular district and at that particular time that exports can be safely permitted. Given the sensitive nature of food availability, the current requirement is that the final letter of authority to export food must be issued centrally by the Department of Food Security in MAFC. In order to control against forgery, abuse and dishonesty, the same letter of authority to export food has to pass through the Regional Administrative Secretary and District Administrative Secretary to be endorsed and validated. This top-heavy process creates high transaction costs for Tanzania exporters to conduct their business of trade in foodstuffs within the EAC and SADC. The letter of authorization to export food is needed for all types of cereal staple foods such as maize, rice, sorghum, and millet, and in rare cases beans (Tanzania Exporters Association (TANEXA) 2012).

The requirement to have export permits is costly and has led to a decline in the number of businesses who are engaged in food exports.<sup>15</sup> Over 80% of respondents interviewed in a TANEXA survey of exporters said the requirement to obtain a letter of authorization has severely or highly constrained their business. A major problem is that exporters have to travel long distances to obtain their permits. The majority of cereal exporters must travel to both the regional and national capitals to obtain a letter of authorization to export food. Whereas the letter of authorization to export food is in principle only needed when rains have failed, in practice, they continue to be required by district and regional authorities through-out the year irrespective of food availability. Because the system of letters of authorization to export food has now been institutionalized in the minds of law enforcement agents, they have to be obtained or food traders will be harassed at check-points. Furthermore, at the district and

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<sup>15</sup> Much of this section is drawn from TANEXA, 2012, which reports on the results of an extensive survey of food exporters.

regional level, the authorization system creates patronage and favors from food exporters and clearing or forwarding agents. This results in loss of profit, loss of business orders due to late delivery, and loss of competitiveness of Tanzania staple cereals.

As a result of these high costs, the whole system is being extensively circumvented. First, there are clearing and forwarding agents who obtain letters of authorization to export staple cereal foodstuff even though they do not have any consignment for export. They re-cycle these permits to “pass-through” tens of thousands of tons. Second, the system encourages use of parallel trade routes which are not regulated. This is because traders prefer to use these routes rather than to go through the rigorous process of obtaining the letters of authorization. Third the system encourages corruption since food exporters find it cheaper to make under the table payments at check-points than to comply with the rigorous and cumbersome process of obtaining letters of authorization.

### 2.5.2.2 Export Bans

Tanzania is the only country in East Africa that formally restricts trade other than on an occasional ad hoc basis. Export bans have been imposed, particularly following a poor harvest (or perceived poor harvest) or when consumer prices are unusually high. As shown in Table 2,

**Table 2: Chronology of Maize Export Bans in Tanzania**

Year	Events
1983/84	GOT implements partial import liberalization by allowing individuals with own sources of foreign exchange to import incentive goods and sell them at market clearing prices.
1990	GOT abolishes import and export licenses for various goods.
2000	Export ban made permanent except when temporarily lifted.
1999/2000	Export ban lifted to allow export of maize to food deficit countries in Southern Africa.
2004	Minister of Agriculture and Food Security imposes export ban by withdrawal of all maize export permits given to traders and suspending the issuance of new permits.
Jan 2006	Export ban lifted for two months.
Mar 2006	Export ban reintroduced.
Jan 2007	Export ban lifted.
Jan 2008	Export ban reintroduced.
May 2008	Export ban lifted
Jan 2009	Export ban reintroduced
Oct 2010	Export ban lifted
March 2011	Export ban informally announced
July 2011	Export ban formally effective
Oct 2011	Export ban lifting informally announced
Jan 2012	Export ban formally lifted

Source: FAO, Global Information and Early Warning System, newspaper articles, and discussions with traders and others.

since 2000, the export ban has been a more or less permanent feature of the cereals landscape, with only a few months of formal lifting. Sometimes the export ban does not include some of the western regions, such as Ruvuma region on the border with DRC, which normally has permission to export because the infrastructure between it and the rest of Tanzania is so poor that it makes sense to export to DRC.

There is often great confusion about when a ban is or is not in place. The President may make a formal announcement, but implementing orders may not reach border posts and other agencies for some time – if at all. In the meantime customs, police, and other officials will act as if the ban is in effect. In 2011, for example, the lifting of the ban was announced on October 12, according to a news report by Reuters, but the President ordered officials to “supervise regulated grain exports to ensure the country did not deplete its own food reserves”. Given the confusion that often seems to surround when export bans are in effect and when they are not, it is highly likely that this “regulated” export was interpreted by customs officials as a continuation of the export ban. The situation remained unclear until January 2012. Soon thereafter, the President renounced the use of export bans.

### **2.5.2.3 Trade Taxes**

Trade taxes include customs duties, value added taxes, excise taxes, and some lesser taxes. These are imposed in Tanzania primarily for the purpose of raising revenue. They may also be imposed in order to protect domestic industry. Tanzania’s trade tax rates are heavily influenced by the two regional trade agreements to which it is a party: the East African Community (EAC) and the South African Development Community (SADC). The former comprises a free trade area among the member countries and a common external tariff (CET). Of the five member states, only Burundi does not yet apply the CET. The CET adopted for non-EAC countries is a three-tier tariff system: zero duty for raw materials and inputs, 10% for processed or manufactured inputs, and 25% for finished products. A selected list of sensitive items, comprising 58 tariff “lines,” has CET rates above 25%, including maize (50%) and rice (75%).<sup>16</sup> Kenya was provided with a special reduction in its customs duty on rice to 35% because of a preferential agreement it has with Pakistan, a major supplier. Furthermore, because Tanzania is a member of SADC, it assesses a preferential tariff of 15–25% on maize and 0-15% on rice imports from these member states (ESRF, 2010).

In the event of an emergency such as a food shortage, the Government of Tanzania has suppressed the application of trade taxes. The most recent example was the suppression of the EAC customs duty of 75% on imports of rice in order to exert downward pressure on rice prices. In anticipation of this, stocks of rice were placed on the market by the private sector in order to avoid getting stuck with high cost rice which would have to be sold at much lower prices. This of course brought prices down very quickly and was highly disruptive to the market.

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<sup>16</sup> USAID, *Cross-Border Trade in East African Countries*, 2009, pp. 3-5.

### **3. Tanzania's Recent Experience with Food Insecurity**

Tanzania has had a considerable history of food insecurity and Government efforts to counter its effects. As shown in Section 2, however, per capita food production has grown at a fairly rapid rate since 1999/2000 and the shortfalls have been less severe than during the 1990s. There is also every indication that Tanzania is becoming an increasingly important food exporter, especially of maize and rice, within the region. So it is useful to look at the experience of the last five years, especially, to understand what has been happening and what lessons this holds for the future.

#### **3.1 Production, Trade, and Food Insecurity from 2007/08 to 2012/13**

At the eastern and southern Africa regional level, there are several factors that affect prices of maize in Tanzania, and in return food availability and access. One is the variations in production that occur in different parts of region and with what timing. The other is the degree to which the region is linked with the international market. This section examines the 2008 to 2012 period in detail by looking at variations in production within the region and the extent to which Tanzanian maize markets are linked with markets in Kenya, South Africa, and the world market. In particular, the role of Kenya in determining prices and trade direction in Tanzania is analyzed along with the implications of these variations in production and market linkages for food security.

##### **3.1.1 Annual Variations in Production, Trade, and Prices**

Tanzania experienced good crop production during the 2007/8 crop year, with total maize production amounting to 3.6 million MT compared with 3.3 million MT in the previous year.<sup>17</sup> While overall production was good, the country had a vuli season that largely underperformed. Since the vuli harvest comes at a time of the year when food prices are high in Tanzania, performance during this season tends to have a disproportionate impact on the policies that the government implements. Hence, the vuli harvest failure led the government to announce a ban on maize exports in January of 2008, which resulted in a moderate decline in Tanzanian prices. In addition, the government offered traders permits to import 300,000 MT of maize duty free. The imports did not materialize, however, because of high import prices in neighboring countries, which was a reflection of the steep rise in prices that occurred on the world market (Graph 2). The country's food availability prospects improved, nonetheless, once the main harvest season started to come in, leading the government to lift the export ban by May.

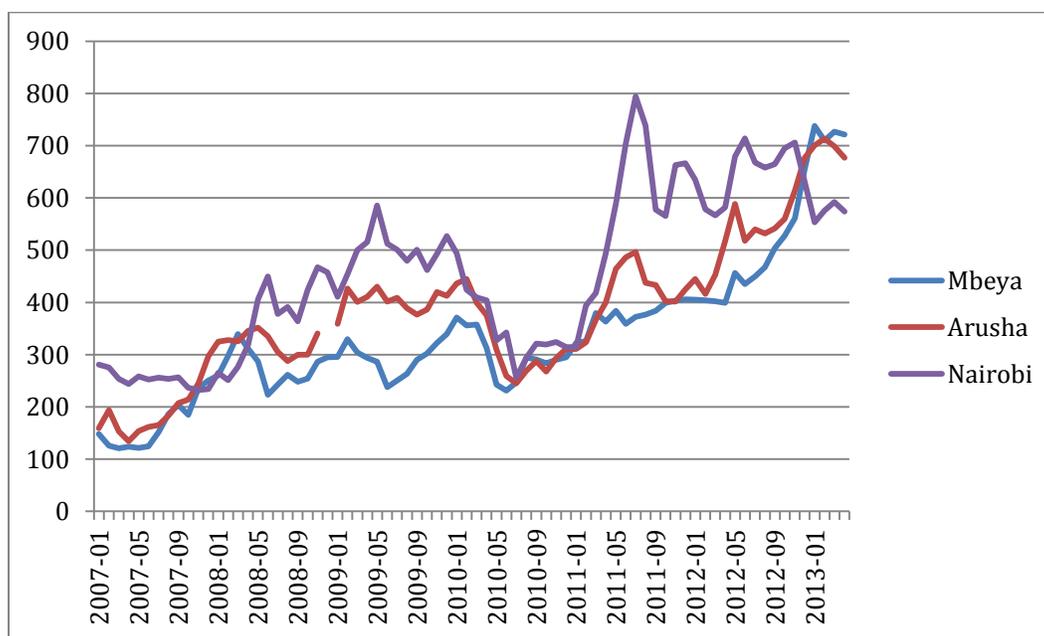
Graph 5 shows maize prices in Nairobi rising faster than those in Tanzania. This was partly because Kenya experienced lower than expected harvest during the 2007/8 crop year and partly because of increases in the price of Kenya's maize imports. By June 2008, a kg of maize in Arusha cost TZS 335 compared to TZS 450/kg in Nairobi. This differential was large enough to stimulate substantial maize exports from Tanzania to Kenya. Estimates (based on our own

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<sup>17</sup> Ministry of Agriculture, Food Security, and Cooperatives.

calculations and FEWSNET figures) show that 100,000 MT were exported from Tanzania to neighboring countries during 2008.<sup>18</sup>

**Graph 5: Maize Prices in Tanzania and Kenya, 2007–2013 (TSH/kg)**



Source: Ministry of Industry, Trade and Marketing and RATIN

The following crop year was characterized by low overall production and higher prices. The short rains in bimodal rainfall areas, which normally contribute between 20 and 25 percent of total annual food crop production, performed poorly, particularly in the northeastern highland areas of Arusha, Kilimanjaro, and Manyara regions and the eastern coastal areas including Tanga, part of Morogoro, Coast, and Dar es Salaam regions. The poor rainfall distribution and long dry spells caused significant crop losses and very poor harvests.

Overall, maize production in 2008/09 fell to 3.3 million MT, contributing to well above average prices throughout 2009, which did not decline even during the main harvest season, when prices are usually lowest. For instance, in January 2009, the price in Dar es Salaam was 420 TZS/kg, and it only declined slightly (to TZS 405/kg) during June to October. These high prices were heavily influenced by the situation in Kenya, which was experiencing a food price crisis in much of 2009. Nairobi maize prices were consistently higher than average and well above those in Arusha. From Jan to May, prices in Nairobi averaged around TZS 495/kg and remained almost unchanged for the remainder of the year, averaging TZS 490/kg from June to Oct. Arusha prices averaged around TZS 400/kg during most of 2009. The Tanzanian government was concerned

<sup>18</sup> Exports are calculated by adding FEWSNET reported exports to Kenya, mirror data from other neighboring countries, and a variable factor for unrecorded trade that ranges from 10% to 30% of additional exports depending on whether an export ban is effect or not.

about the influence of high food prices in Kenya, so it imposed an export ban in January 2009. The effect was a slight decline in Tanzanian prices, though this decline was very modest, suggesting that the ban was not fully respected.

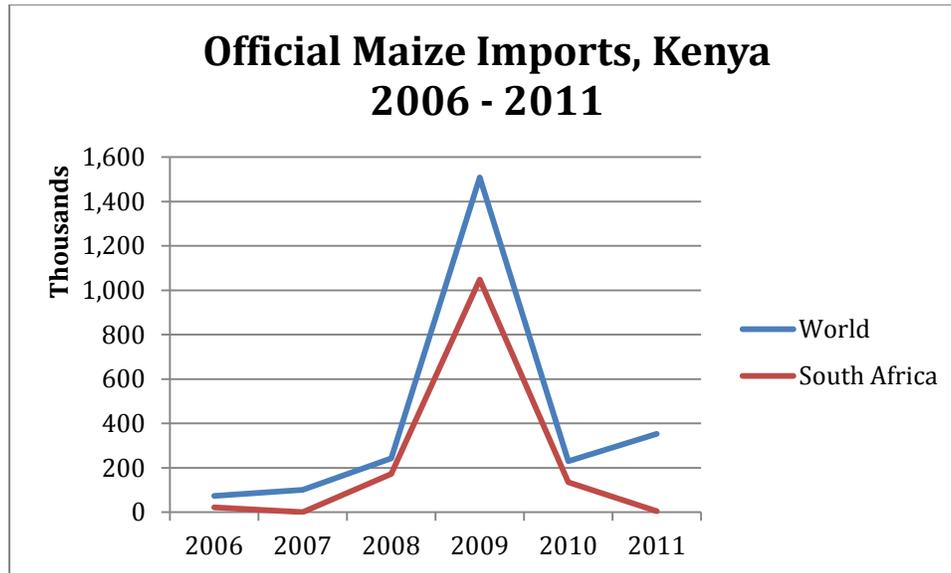
The price differential between Tanzania and Kenya was high enough for some cross border maize trade to take place even with the ban in effect. Official export figures from COMTRADE show only 1,731 MT of exports in 2009, while mirror data from Kenya show greater, but still fairly low, exports at 13,082 MT. Our own estimates, which are based largely on mirror data, show that about 17,000 MT were exported to neighboring countries.

It appears that the high prices in Kenya and in Tanzania in 2009 were largely regional in nature and did not follow international maize markets very closely. Gulf of Mexico yellow maize peaked at USD 287/MT in June 2008 and declined rapidly soon thereafter, averaging USD 166/MT throughout 2009. Nominal prices in Johannesburg were also on a downward trend during this period, declining from about ZAR 2000/MT in May-June 2008 to ZAR 1339/MT in July 2009, though they rose briefly thereafter to just over ZAR 1600/MT by the end of 2009. There is normally a lag between international prices and when they are passed through to smaller importer markets, which could explain the disparity between the downward trend in international prices and continuing high prices in the East African market until early 2010, when there was a sharp decline. But there were other factors at work as well.

While prices in Tanzania remained high during the first months of 2010, Nairobi prices showed a notable decline to about TZS 305/kg, compared with 495/kg during the same period the previous year. The decline in Kenya's prices was influenced by the lifting of tariffs on maize imports, normally 50%, and ensuring that large quantities were imported, mainly from the South African market, during 2009. As Graph 6 shows, Kenya imported a record 1.5 million MT that year, with about 1 million of these coming from South Africa. This illustrates the strong influence that Kenyan imports can have on the regional market. Although the initial price decline in Kenya undoubtedly occurred because of the large increase in maize imports into Kenya and the decline in their prices, this was reflected relatively soon in a steep fall in Tanzanian prices. In Arusha, for example, the price of maize declined from about TZS 430/MT in early 2010 to about TZS 250/MT at midpoint of that year.

This steep price drop was also affected by the excellent harvest in 2009/10, when Tanzania registered a total production of 4.5 million MT --more than a million MT increase over the previous year. This is despite the fact that the vuli harvests was poor, which is one reason why Tanzanian maize prices continued to be high in early 2010, while those in Kenya started to decline because of a better vuli harvest in Kenya and because of the large volume of Kenyan imports the previous year. After the good main harvest season in Tanzania, prices remained low, with Arusha prices averaging TZS 265/kg between June and October. Prices in Nairobi averaged about TZS 305/kg.

**Graph 6: Official Maize Imports into Kenya, 2006-2010 ('000 MT)**



Following the good harvest and declining prices, in October 2010 the government announced a temporary lifting of the export ban that it had imposed in January 2009. However, the price differential between Arusha and Nairobi was not large enough to stimulate major maize trade across the border. Official export figures from COMTRADE show only 776 MT in exports, while mirror data show 1,900 MT of exports. Our own estimates, which account for maize crossing along informal border routes, show that exports were about 2,500 MT.

One of the paradoxes about the 2009/10 production year is that the increased level of production the country experienced does not correspond well with the recorded low level of Tanzanian exports. Kenya's production was low for the year, and officially recorded imports had returned to a more normal level of about 200,000 MT. Two possible explanations for the seemingly low exports from Tanzania during this year are that (1) there were significant exports, but official figures did not capture them, or (2) some of the surplus production in Tanzania and high level of imports in Kenya the previous year was used to rebuild national stocks, which had substantially declined the previous year. In the following crop year (2010/11), production was again abundant in Tanzania, with the country registering total maize production of 4.3 million MT. This was despite poor vuli harvests in the bimodal areas, which resulted in elevated food prices in the early part of the calendar year 2011. For instance, average prices during Jan-May in Arusha rose to 373/kg, a figure that is comparable to the low production years of 2008.

One would have expected that after a very good main crop was assured in 2010/11, prices would have declined. Yet prices actually rose in Tanzania. Arusha prices from June to Oct averaged 451/kg. This was heavily influenced by sharp price increases in Kenya. As the Graph 5 shows, prices in Nairobi rose to close to TZS 800/kg by July of 2011 and continued to stay above 600 TZS/MT until early 2013. One clear response was that Tanzania exported almost 130,000 MT of

maize to its neighbors in 2011, of which close to 100,000 MT are estimated to have been exported to Kenya. This was in spite of an export ban having been placed in effect in July 2011. After the ban was lifted in early 2012, these exports continued, though data are not yet available regarding the magnitudes involved.

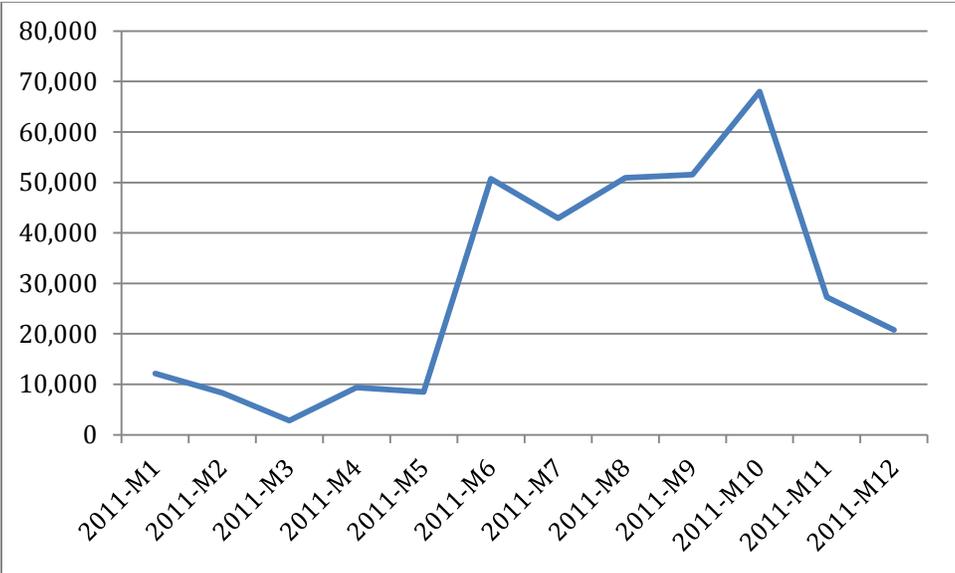
An important question is why the surge in Kenyan prices occurred. This appears to be due to a combination of factors.

1. There was a severe drought in Kenya in 2011, which affected most of East Africa.
2. Imports were prevented from being used as a safety valve because the primary source of white maize was South Africa, and this maize was not allowed into the country because of GMO restrictions.
3. After this restriction was lifted in July 2011, it took some time to arrange for import shipments and transportation. Nevertheless, as shown in Graph 7, imports of maize into Kenya did increase in the latter half of 2011, helping to dampen the price rise.

**3.1.2 Price Correlations**

Analysis of maize prices, trade, and government policy during 2008 to 2012 shows that Tanzanian maize market is linked to the world market mainly through Kenya, while the Kenyan market is integrated with the world market through South Africa. A simple correlation analysis based on monthly prices for the period January 2008 to December 2012 indicates a close linkage between the Arusha and Nairobi markets (correlation coefficient  $r = 0.75$ ). The Kenyan market tends to have a strong influence on Tanzania maize markets through several channels. One is

**Graph 7: Kenya Imports of Maize, 2011(MT)**



Kenya's domestic demand for maize, which has been outpacing production for the last several decades, creating a persistent and structural deficit in maize. This deficit is normally filled by importing not only from neighboring countries such as Tanzania, but also from the South African market, though there is wide variation in the volume of South African exports from year to year. Arusha, through the borders at Namanga and Holili, serves as an assembly area for maize that is exported from Tanzania to Kenya and other countries in the region such as South Sudan and Somalia. There can also be a reverse movement of maize from Kenya to Tanzania when the Tanzanian vuli season underperforms and Kenya experiences good harvest years. This tends to put a downward pressure on prices in Arusha, which in turn moderates prices in Dar es Salaam (for the same period, the correlation coefficient between Arusha and Dar es Salaam was  $r = 0.92$ ).

Nevertheless, there are several constraints that hinder the integration of the Tanzanian market with the Kenyan market and by extension the rest of the world. Some of these constraints have to do with transportation costs, which tend to be quite high in East Africa. This makes it difficult for maize to respond to price signals. Other constraints have to do with the enabling policy environment, which has a track record of being unpredictable in the region despite the fact that both Kenya and Tanzania are part of the East African Community. Both countries frequently impose import and export bans, depending on the objectives that the government wants to achieve. For instance, Tanzania regularly imposed export bans on cereals during 2008 to 2012, while Kenya has at times imposed export bans during its harvest season. Indeed, there was an export ban in effect in Kenya during the 2012/2013 vuli season, which coincided with good production in Kenya and poor performance of vuli in Tanzania.

In summary we can say that prices of food in Tanzania, and their relations with external prices, are determined by many different factors. The size of the harvest is only one of these. Also important is the magnitude of the harvest at different times of the year, and especially the vuli harvest in Tanzania in comparison with that in Kenya, which can influence the direction of trade for several months of the year. Second is what is going on in Kenya and its import suppliers, which has an important influence on prices in Kenya, and through trade on prices in Tanzania. Finally there is the effect of trade policy – import and export permits, export bans, and trade taxes. All of these interact in a very complex way and impact the market environment in which NFRA operations take place.

### **3.1.3 Links to Food Security**

High food prices negatively impact the ability of vulnerable households to access food. The Government, through forecasts by MAFC and subsequent Rapid Vulnerability Assessment (RVA) reports, determines the availability of food by region and Districts that are likely to experience food insecurity. MAFC's Final Food Crops Production Forecast of December 2008 indicated that 21 districts in nine food-deficit regions were potentially food insecure despite an overall food surplus in the country estimated at 534,000 MT. The RVA report, which generally estimates food assistance needs for the period between October and February, with the

assumption that vuli harvests would cushion food assistance needs until the next harvest, estimated that there were an additional 19 food insecure districts bringing the total to 40 districts in 11 regions. However, the report did not find any acute food needs for the regions it assessed. Instead, the report found that a total of 279,607 people in 20 districts in 9 regions would likely be moderately food insecure between April and mid-May 2009. The total food needs for the affected areas were estimated at 3,979 MT. The RVA preliminary report covered only a few months of the total period that food secure households would need assistance. Indeed, actual deliveries of food assistance show that between February and October 2009, about 54,000 MT were distributed to affected households.

In June 2009, MAFC's Preliminary Food Crops Production Forecast indicated that 61 districts in 17 regions would be potentially food insecure during the 2009/2010 consumption year, while, overall, Tanzania had a food surplus of 343,000MT with 11 regions in deficit. The October 2009 RVA updated this assessment and found that 65 districts in 16 regions would be food insecure during the 2009/2010 consumption year, further noting that "in some cases, extreme coping mechanisms were reported among them and the general observation is that the number of food insecure population has increased tremendously more than ever before." The RVA estimated that a total of 1.57 million people in 59 districts in 15 regions would be moderately food insecure between November 2009 and January 2010 and recommended food assistance amounting to 56,740 MT. During the crop year 2009/2010, 112,000 were reported to have been delivered by the PMO.

In May 2010, MAFC's preliminary food supply assessment estimated an increase in total food production by 17% over the previous year, although it also highlighted major inter and intra-regional and district variations due to localized food crop failures of varying magnitudes. The overall food surplus was estimated to be 1,176,000 MT with only 4 regions in deficit. Final figures compiled by the same Ministry showed a total production of 4.5 million MT, which was more than a million MT increase over the previous year (this is despite a vuli harvests season that turned out to be poor). The overall food surplus was estimated to be 1,176,000 MT with only 4 regions in deficit.

The RVA of October 2010 supported the increased production reported by MAFC, although it noted that pockets of food insecurity remained. The total number of food-insecure people was found to be about 420 thousand, requiring 13,766 MT of food assistance for the period of November 2010 to January 2011. Furthermore, the RVA estimated that a total of 25,608 MT of food would be required by 830,032 people who were deemed moderately food insecure for the period between November 2010 and February 2011. But the overall RVA findings were of significant food security and nutrition improvements among the populations in the assessed Councils and throughout the country compared to 2009/10. The report concluded that most of the population in the affected Councils would have fairly stable access to food at least until December 2010 and early January 2011.

In June 2011, MAFC produced its Preliminary Food Crop Production Forecast and estimated that the country was poised for a satisfactory overall food availability for 2011/12 at the national level, although major inter and intra-regional and district variations were also reported. The report identified 58 Districts in 15 regions that were likely to experience food shortage. After an in-depth assessment was carried out in order to establish the specific areas and number of people affected by food shortages, the report found that a total of 1.1 million people would be generally food and nutrition insecure in the period of October through December 2011. Additionally, the assessment estimated that another 865,000 people in 19 districts were potentially vulnerable to food and nutrition insecurity. It was recommended that the Government distribute 26,394 MT to the acutely affected population between October 2011 and February 2012; no recommendations were made for those households which were potentially vulnerable. The MAFC's final assessment confirmed the favorable preliminary conclusion, showing a 1,440,000 MT surplus and only 6 regions in deficit.

The March 2012 preliminary RVA report identified about 1 million acutely affected people and estimated that 22,692.6 MT would need to be distributed to 27 Districts in 10 regions during the period May and June 2012. Furthermore, the report noted an additional 575,188 people who were considered moderately food insecure, requiring 13,756 MT of food from June through July 2012. MAFC's final assessment of food availability during 2012/13 showed an overall surplus of 1,376,000 MT, with 6 regions in deficit.<sup>19</sup>

### **3.2 Conclusions from This Recent Experience**

The major conclusion to be drawn from this analysis of Tanzania's recent experience with food security is that the country is immersed in a web of agro-climatic, technological, demographic, and market relationships over which the Government has relatively little control other than to establish a broad enabling environment within which the private sector may function and to supplement the activities of the private sector where needed. Demand for basic food staples is increasing everywhere within the East and Horn of Africa region. Tanzania is fortunate to have abundant natural resources and an agro-climatic environment suitable to its becoming a major export of these products within this region. This has become especially evident in the past few years as food surpluses have continued to be produced. Maintaining a stable enabling environment that will allow the private sector to take advantage of this situation is the most important step that the Government can take to assure broad-based food security.

It is also clear that there are people who are not able to participate in this expanding economy and who are in need of assistance. Without this assistance they are vulnerable to food insecurity due to lack of availability, access, and utilization of adequate and proper food. It is a perfectly legitimate role of the Government to provide this assistance in whatever form may be most appropriate. The next section will analyze in greater detail what form this assistance should take,

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<sup>19</sup> MAFC, *AGSTATS for Food Security, Volume 1: The 2011/12 Final Food Crop Production Forecast for 2012/13 Food Security*.

how much of it should be offered, and how NFRA operations regarding procurement, storage, and distribution should be organized to meet this goal in the most cost-effective manner.

A third approach to increased food security is the maintenance of a strategic reserve stock as insurance against a severe slump in production. The cost of doing this through storage must be weighed against the cost of importing additional food from external sources, including the probability that those imports will have to be purchased at time when world market prices are very high and accessibility is low.

These three approaches to achieving food security will be analyzed in the next section.

#### **4. Analysis of Three Approaches to Achieving Food Security**

This section analyses the three approaches suggested above for achieving food security and how they can be implemented in the most cost-effective manner. The approaches should not be thought of as substitutes for each other but rather as complementary ways of dealing with particular needs involving the role of government.

##### **4.1 Maintain a Stable Enabling Environment in Support of Food Exports**

This is probably the most cost-effective way of achieving food security for most members of the population. Previous analysis has shown that a free market in which the Government provides basic infrastructure, agricultural research and extension, appropriate disease and pest control, market information, support for an enabling financial sector, and a legal and regulatory framework that supports the private sector is most conducive both to food security and to economic growth and employment.<sup>20</sup> The Government needs to provide a stable environment without quantitative restrictions on trade, such as export bans or the current requirement for food export and import permits.<sup>21</sup> It would also be helpful if the Government were to work within the EAC to reduce the import duty on rice and maize in order to discourage investment in unproductive technologies behind high tariff walls and to reduce or eliminate other tariff and non-tariff barriers to trade.

Other reforms can be envisioned that would involve NFRA more directly. Among the more important of these would be efforts to increase the consistency, transparency, and predictability of market interventions in order to assure minimum adverse impact of those interventions on private grain markets. Procurement prices paid by NFRA should respect market conditions with

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<sup>20</sup> NAFKA/SERA/AIRD, “Study of Policy Options for Increasing Tanzanian Exports of Maize and Rice in East Africa While Improving Its Food Security to the Year 2025,” Revised Final Report, July 26, 2012, by Dirck Stryker and Mukhtar Amin.

<sup>21</sup> The problems associated with the export ban were discussed in NAFKA/SERA/AIRD, “Study of Policy Options.... Those resulting from the permit system are analyzed in a companion paper, SERA/AIRD, “Assessing the Impact of Export and Import Permits on Staple Food Trade in Tanzania”, Draft Final Report, August 2013, by Mukhtar Amin and Dirck Stryker.

just enough of a premium over market prices to assure that the NFRA can buy the grain that it needs to carry out its responsibilities. Procurement prices should not be set to cover the cost of production. One obvious reason is that these costs vary enormously across regions, seed varieties, input use, and other factors for which there is little information. An even more important reason is that purchasing grain above its market price will set up expectations that cannot be met, given NFRA's limited storage facilities and financial resources. As a result, buying at this price will eventually cease and the market will collapse. This will create great uncertainty in the market, which will hinder its development.

Sales by NFRA at prices below those prevailing on the market will also introduce distortions and uncertainty into the market. They will give rise to economic rents captured by those able to gain access to the grain at reduced prices. This leads to rent-seeking behavior, corruption, and misallocation of resources. Since NFRA will not be able to continue these sales indefinitely, the market will be disrupted once again.

The final casualty of this type of behavior is NFRA, which sees its profits reduced, forcing it to rely on subsidization by the central government. This is not in keeping with its original mandate, which calls for it to be "a well-managed, business-like agency".

In a more positive vein, NFRA could help develop private storage sector. For example, a warehouse receipts system might be coupled with the option of NFRA using part of its storage capacity for private storage, conditional upon the private trader making those stores available for public distribution at an agreed upon price in the event of an emergency. There might also be a role for forward contracts for food delivery to NFRA.

#### **4.2 Procurement, Storage, and Delivery of Food for Assistance Programs**

It is clear that there is a requirement for assistance programs to benefit those who are truly in need. Whether these programs should involve cash transfers or food assistance is a question that has already been discussed and goes beyond the scope of this study. Here we assume that the food will be distributed in kind as food. Furthermore, we also assume that, to the extent the Government of Tanzania procures domestically most of the food that is distributed, the food must be readily available on the market and must be easily stored without serious losses in storage provided cost-effective measures, such as fumigation, are taken to ensure against these losses. The most obvious candidates are food grains and possibly dried beans.

Food security in Tanzania is monitored through the Tanzania Food Security and Nutrition Analysis System (MUCHALI). This system, which is jointly overseen by the Disaster Management Department, Prime Minister's Office (DFD/PMO) and the National Food Security Division, Ministry of Agriculture, Food Security and Co-operatives (NFSD/MAFC), makes an assessment and projections of food production and requirements in each region and for each of the two cropping seasons. It also identifies districts that are likely to be vulnerable. This leads to

a Food Security and Nutrition Assessment (FSNA), based on the findings of the MAFC Food Crops Forecast – with a separate assessment based on its preliminary and final versions.

The first FSNA takes place in March-April based on the NFSD/MAFC’s Final Food Crop Production Forecast Survey of the current crop year, which projects availability and needs for the forthcoming year by region, as well as major inter and intra-regional and district variations due to localized food crop failures. This information is verified by getting an update of the food and nutrition situation from the regions and district councils, as well as from relevant sector ministries and other food security and nutrition stakeholders. Multiple teams to assist the national MUCHALI team are composed of representatives from government agencies, development partners, and national and international non-governmental organizations (NGOs). These are joined with selected regional and council food and nutrition security (FNS) professionals.<sup>22</sup>

The FSNA is then conducted in order to establish the specific areas and number of people affected by food security and nutrition problems, as well as to make specific recommendations regarding appropriate levels of food that should be set aside for distribution, taking into account factors other than production shortfall that might also affect availability, access, and utilization, such as pestilence, drought, and other conditions.

A second assessment is made later in the year, usually in September, after the NFSD/MAFC has gathered post-harvest information to finalize its forecasts. This assessment makes final recommendations regarding the distribution of food assistance during November – January or October – February, depending on the severity of food deficiencies.

The quantities of food recommended for distribution, according to these reports, is shown for the past four years in Table 3, where they are compared with the quantities reported by NFRA to be

**Table 3: Food Need Assessments and PMO Distribution, 2009/2010 – 2012/13**

Year	Population Identified as Acutely Food Insecure	Required Food Assistance for Acutely Food Insecure (MT)	Population Identified as Moderately Food Insecure	Required Food Assistance for Moderately Food Insecure (MT)	PMO Distribution	Months of Distribution
2009/2010	--	--	1,569,890	56,740	111,950	Nov-Jan
2010/2011	423,530	13,766	830,032	25,608	32,147	Nov-Feb
2011/2012	1,124,713	26,394	--	--	82,922	Oct-Feb
2012/2013	526,603	18,418	761,799	18,357	23,782	Nov-Jan

distributed by the DFD/PMO. There appears to be some confusion in the reporting of households that are “acutely food insecure” and ‘moderately food insecure’, but the numbers make sense if we look at total needs. It is evident that the quantity that has been distributed in each of the past four years has often varied substantially from the total quantities reported as needed. For example recommended distribution in 2009/2010 was 56,740 MT whereas PMO distribution was

<sup>22</sup> Comprehensive Food Security and Nutrition Assessment Report, October 2012.

reported as 111,950 MT. In 2010/2011, total needs were 39,374, which was greater than the 32,147 MT reported as being distributed. In 2011/2012 the situation was reversed with needs reported as 26,394 MT whereas the total amount of grain actually distributed was 82,922 MT. For 2012/13, recommended distribution was 36,775 MT, compared with 23,782 MT of actual distribution.

The major reason why actual distribution in 2012/2013 was so low is that prices had risen in East Africa to such an extent that the NFRA was not authorized to offer a price that would be competitive. Instead it had to work out a deal with the Food Reserve Agency in Zambia to buy some of its grain that would otherwise have had to be sold to private millers in Zambia at a highly subsidized price. Some of the discrepancies in Table 3 are also doubtless due to the fact that decisions are made as the year goes along about the need for food assistance on the basis of new information that becomes available.. Furthermore, the years shown in Table 3 are not entirely representative of the situation over a longer period of time. The presumption from Graph 1 in Section 2.4, which shows per capita food production over two decades, is that production has been increasing and food shortages have been decreasing in importance, at least at the national level. This trend has been especially marked in the last few years. Nevertheless, policy makers may well be reluctant to lower their needs assessment until this trend has been substantiated over a longer period of time.

Based on this analysis, it would be reasonable for NFRA to store something over 100,000 MT per year to satisfy the need for food assistance.<sup>23</sup> However, with the recent trend in expanding production and decreased need for food assistance, the Agency could expect to turn over a substantial proportion of this grain at the end of most crop years. Table 4 presents data on NFRA procurement, sales, and stocks. For the most part these stocks have been substantially below 100,000 MT, though they did rise to 156,000 MT at the end of 2010/2011. This followed a year

**Table 4: Maize Procurement, Sales, and Stock Balance (MT), 2008/2009 – 2011/2012**

	Opening Stock	Procured	Total Stock	PMO Distrib	Other Sales	Net Transfers	Closing Stock
2008/2009	68,976	61,588	130,564	27,911	8,389	-00	94,265
2009/2010	89,843	73,683	163,525	111,950	6,913	3,585	48,248
2010/2011	47,686	181,019	228,705	32,147	40,554	-00	156,004
2011/2012	154,507	125,846	280,353	82,922	132,779	1,573	66,225

Source: NFRA

in which PMO deliveries of food assistance topped 100,000 MT. In fact, 2009/2010 was a year of record harvest, with maize production of 4.5 million tons. As a result the requirement for food assistance was quite low. Procurement was at record levels, however, responding to the large amount of food assistance that had been delivered the previous year. This led to the huge run-up

<sup>23</sup> In only three of the last 12 years has NFRA maintained a stock of grain that exceeded 100,000. The first two of these years (2004/2005 and 2006/2007) were prior to the recent upsurge in maize production, and the last year (2010/2011) appears to have been due to a miscalculation of the quantity of maize that would be required for food assistance because of high prices that were externally driven in a bumper crop year.

of stocks by the end of the year. The following year (2011/2012), procurement was reduced and PMO distribution and other sales were increased, so that stocks were reduced to 66,225 MT.

The overall impression that one gains from this review of the recent experience of NFRA is that the process of forecasting the need for food assistance is quite imperfect. For example, fears of shortages developed in 2011/2012 largely in response to a rise in prices, which was a reflection more of what was going on in Kenya than in Tanzania, where the harvest was very good. Exports that year appear to have been at record high despite the ban that was imposed at the beginning of the crop year. Furthermore, over 80,000 MT of food assistance was delivered despite the excellent harvest. It appears likely that some of this assistance was diverted to the market to take advantage of the high prices there.

Superimposed on the imprecision of needs assessment given the vagaries of the regional market are the demands made by the Government for NFRA to provide some price stabilization, especially when markets prices are very low at harvest time or high before the next harvest. This disrupts the market, creates increased uncertainty, and prevents NFRA from operating in a cost-effective manner. For example, NFRA announced a higher-than-market purchase price for 2011/2012 and then ran out of funds with which to purchase all the supplies that were offered. This together with the ban that was placed on exports caused substantial market disruption and created abundant rent-seeking opportunities all along the value chain. It also left NFRA in a precarious financial position.

### **4.3 Food Security Stocks for Emergencies**

The third approach to holding food stocks is as a hedge against emergencies. Although it is difficult to analyze this possibility for all foods because of their heterogeneity and lack of good production data over a long period of time, we can do this for maize. In doing so, however, we corrected the Government's production data for what appears to be systematic underestimation when compared with data from household budget studies.<sup>24</sup>

Baseline consumption in both rural and urban areas was taken from the household budget survey of 2000/01. This was adjusted forwards and backwards on the basis of population growth, growth in per capita income, and income elasticities of demand for maize for rural and urban areas. Production was derived from consumption by adding exports and seed, feed, and losses, and subtracting imports. Adjustments were also made for changes in stocks where these were available.

The resulting series yielded a production figure of 5.13 million MT of maize in 2007/08, which was quite close to production of 5.44 million MT measured by the agriculture survey census of that year. Furthermore, if we set the MAFC estimate of maize production for 2012/13 equal to the 2012/13 figure on production estimated from consumption, and then multiply this times the

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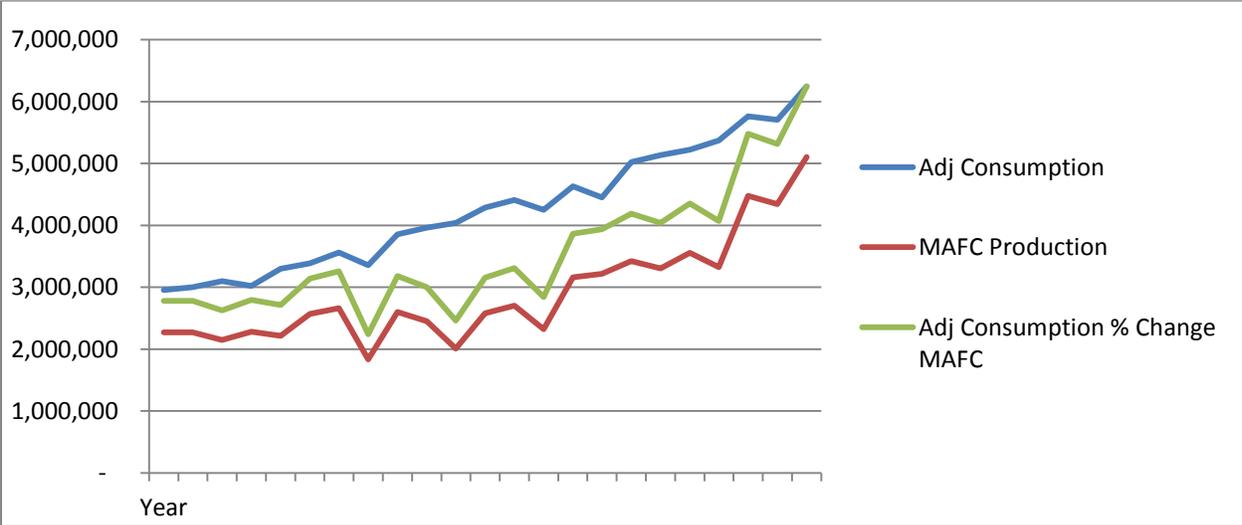
<sup>24</sup> This underestimation is described in detail for rice and maize in NAFKA/SERA/AIRD, "Study of Policy Options..." pp. 5-10.

year-to-year percentage change in the MAFC production data going back to 1990/91, the difference between these two estimates is only about 6% in that year even though there are much larger differences during the intervening years. This suggests that the revised estimate is a better indicator of trends in production, if not year to year changes.

The resulting trend lines are shown in Chart 8. The trend to the adjusted consumption estimate is reasonable, though year to year variations appear to be too regular, as one would expect from the

**Chart 8: Alternative Estimates of Maize Production, 1990/91 – 2012/13**

(metric tons)



poor quality of the trade date, which is the major source of these variations over the years. The MAFC estimates, on the other hand, show a very flat production trend over the 1990s, with per capita production even declining, while production in the ensuing years shows a very strong upward trend. Furthermore, the level of production is too low in relation to alternative estimates obtained from the consumption data. So we have chosen to use the intermediate estimate of production taken from the household studies but adjusted for year to year variations in in the MAFC production estimates.

Taking the last thirteen years as the relevant range of experience, and removing the trend, which shows the growth of production over time, we have a standard deviation of about 108,000 MT. This implies that national production will fall below its mean level on the growth trend by more than 108,000 MT in only 1.4 years in 10. It will fall below its mean level on the growth trend by more than 216,000 MT – still only 3.6% of that mean level adjusted for growth -- only 1 year in 40. This suggests that an overall food emergency of this magnitude is likely to be a relatively rare event. Furthermore, the shortage in such an emergency is less than 50% of the total quantity of food estimated to currently be carried over in storage from year to year, most of which is

maize.<sup>25</sup> A shortage of this magnitude is not likely to have a major impact on the food security of the bulk of the population since the private sector, including better off farmers with multiple sources of income, will make up for part of this shortage with food purchases, eventually spilling over into imports.

The holding of emergency food reserves then ultimately comes down to providing for unusual needs on the part of people who are already food insecure or vulnerable to food insecurity. The reasons why they do not have enough food in the first place relate to problems of availability, in more remote regions, and of access, when they do not have either the income or the land, animals, equipment, or other forms of wealth that would enable them to escape from a situation of food deprivation. Thus we start from a base requirement of about 100,000 MT in perhaps one in five years and add whatever might be necessary to cover the one in 40 year eventuality. If the total shortfall in this situation would be a little over 200,000 MT, we can certainly assume that half this quantity would be furnished from storage or imports by those who can afford it. That leaves about another additional 100,000 MT to be furnished from public sources. This would comprise stocks or imports purchased and distributed by the public sector. The source of these reserves would depend, among other things, on their relative cost.

## **5. Cost of NFRA Holding Food Stocks versus Cost of Imports**

In this section, we compare the cost of NFRA holding 200,000 MT as protection against a once-in-forty year shortage as opposed to holding 100,000 MT for food assistance needs once in every five or so years and going to the import market to satisfy additional needs one in every 40 years.

### **5.1 Cost of NFRA Holding Food Stocks**

National NFRA grain storage costs at the national level are reported in Table 5. These cost figures are based on projected annual expenditures for the period from July 2012 to June 2013.<sup>26</sup> The planned expenditures include crop procurement, fumigation, food stock relocation, repair and maintenance of storage infrastructure and office buildings, acquisition of working tools, salaries of employees, and other recurrent expenditures. Among these various cost categories, two line items account for over two thirds of total storage costs. First is a finance charge, which is calculated from total grain procurement costs and the average lending rate of the Bank of Tanzania. This finance charge on stored grain accounts for 37% of total annual storage costs. It is unclear if the NFRA actually incurs a finance charge on the funds it uses to procure grain, but we include this cost in the analysis in order to capture the true economic cost of the grain held in storage regardless of the financial arrangements involved.

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<sup>25</sup> MAFC, AGSTATS for Food Security, Volume 1: The 2011/12 Final Food Crop Production Forecast for 2012/13 Food Security.

<sup>26</sup> MAFC, National Food Reserve Agency (NFRA), *Business Plan, July 2012 – June 2013*, Dar es Salaam, June 2012.

The finance charge shown in Table 5 assumes that the grain is stored for a period of one year. If the grain is stored for several years, even if it is rolled over to preserve quality, the finance charge and many of the other costs shown in Table 5 are incurred in each year in which the grain is held in storage.

**Table 5: NFRA Storage Costs**

<b>NFRA Storage Cost Analysis</b>				
<b>Parameters</b>				
<i>Interest Rate</i>			12%	
<i>Quality deterioration</i>			0.1%	
<i>Exchange Rate</i>			1650	
<i>Average transfer-in grain price/MT (TZS)</i>			510,705	
<b>Cost Category</b>	<b>Service Life (Yr)</b>	<b>Upfront Cost (TZS)</b>	<b>Financial Cost (TZS)</b>	<b>Financial Cost (USD)</b>
Interest on Grain Inventory		97,994,274,213	11,759,312,906	7,126,856
Land, buildings & other infrastructure	20	4,149,040,400	555,468,467	336,648
Fumigation			645,699,710	391,333
Storage Equipment and Tools	10	2,825,400,000	500,051,057	303,061
Stock Transfers			11,073,750,331	6,711,364
Staff recruitment & training			465,754,800	282,276
Transport facilities			614,000,000	372,121
Office equipment and tools	5	516,400,000	143,254,386	86,821
Salaries government employees			1,556,550,000	943,364
Salaries wages NFRA employees			695,880,000	421,745
Staff statutory payment & allowances			570,968,040	346,041
Repair and maintenance of building & other infrastructure			683,914,228	414,493
Service and repair of storage equipment & tools			389,100,000	235,818
Service and repair of vehicles			118,500,000	71,818
Service and repair of office equipment and tools			180,900,000	109,636
Consultancy and non consultancy services			297,344,000	180,208
Workers council, advisory board and tender meetings			343,200,000	208,000
Office expenses			986,886,400	598,113
Quality deterioration			97,994,274	59,390
<b>Total Annual Storage cost</b>			<b>31,678,528,599</b>	<b>19,199,108</b>
Opening Stock			66,241	66,241
Procured Stock			200,000	200,000
Available Stock			266,241	266,241
Storage cost per unit			118,985	72.11

Source:

The second most significant cost the NFRA incurs is for stock transfers, which amount to 35% of annual storage costs. Every season, NFRA transfers some of its stocks from zones with surplus production to zones near areas of food deficit. The transfer is necessitated by the requirement to move the food closer to where it will be needed and to create space for new procurement in the food surplus production zones. In the example here, stock transfers are anticipated for 98,000 MT. Almost all grain is transported by road. Transportation costs in Tanzania depend on

distance, topography, road quality, and fuel costs.<sup>27</sup> Studies have shown that these transport costs are high in Tanzania compared with other East African countries.<sup>28</sup>

Based on a projected stock procurement of 200,000 MT and an opening stock of 66,241 MT, we find total projected storage costs for the period July 2012 to June 2013 to be 31.8 billion TZS, or US\$19.2 million. This translates into a per-ton cost of 118,985 TZS or US\$72.11.

While there are not many studies on the cost of holding stocks in East Africa, a recent study on Ethiopia's Emergency Food Security Reserve Administration provides some indicative figures. The study estimates storage costs 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. However, the study does not include labor costs and other administrative costs, which can be a significant part of national storage costs. A more comparable case is a study done on India's national wheat storage. This study found that the average cost in 2000–2001 was R 2,410 per metric ton, which is equivalent to about US\$60 per ton at 2000–2001 exchange rates. A preliminary conclusion is that Tanzania's national grain storage costs are on the higher side, although a more detailed study based on actual costs incurred (as opposed to planned expenditures) would provide a more accurate picture.<sup>29</sup>

It is important to realize that this average cost figure combines costs incurred in order to meet several goals. One is simply to stockpile the food needed for the average level of food assistance in most years. From Table 4 this would appear to be about 30,000 MT. The requirement here would be to acquire the grain shortly after harvest time and to make it available later in the year. Actual storage would be for substantially less than a year so the finance charge would be correspondingly smaller. Much of this grain would be subject to stock transfers. The full cost of storage and transfers would be borne by the Government for its food assistance program.

More grain might actually be procured because of uncertainty regarding the crop forecasts and how much grain might actually be needed. To the extent that this grain is in excess of what is needed, it can be sold before the next harvest, with the seasonal rise in prices normally paying for the cost of holding the grain.

To the extent that excess grain is carried over from year to year to be available for the food assistance program when there is unusual need, the costs of this storage are not normally recoverable. The longer excess grain is held before it is eventually needed, the more costly this storage becomes. We said earlier that a stock of 100,000 metric tons would normally cover the

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<sup>27</sup> Gasper C. Ashimogo, "Annex 3, Tanzania: Maize Trade Country Profile", in Lucy Aliguma, Gasper Ashimogo, Geoffrey S. Mwale, James Nyoro, Alexander Phiri, and Lulama Ndibongo Traub, *Maize Market Sheds in Eastern and Southern Africa*, Country Annexes, June 2008.

<sup>28</sup> World Bank, *Eastern Africa: A Study of the Regional Maize Market and Marketing Costs*, December 31, 2009.

<sup>29</sup> NFRA recently furnished us with actual cost data, which will be compared with the projected data shown here. However, these actual costs are quite high because of low levels of capacity utilization, whereas the projected costs are more representative of what could be achieved if NFRA were regularly holding 200,000 MT, which is the maximum quantity necessary to assure food security to most of the population in 39 out of 40 years.

needs that might be experienced once in five years. This means that annual storage costs would be accumulated for the excess grain being held over the number of years in which that grain is not used, for on average 2.5 years, in which case the cost of storage would be 2.5 times US\$ 72.11, or about US\$ 180/MT. If 200,000 MT of grain were stored against the 1 in 40 year shortage, the cumulative cost of storage could become astronomical - on average 20 times US\$ 72.10, or \$1,442/MT. It clearly is important to look at alternative ways of meeting this kind of need, such as through imports.

## 5.2 Cost of Importing Additional Food Stocks

If NFRA were to rely on the import market for additional food in the event of a severe shortage that would surpass the availability of domestic stocks to provide necessary food assistance, how would this change the cost calculation? We assume for the purposes of this analysis that storage costs per ton would not increase very much if less storage capacity were used. Most of these costs are variable and not fixed costs, so this assumption is reasonably accurate. The trade-off, then is between the cost per ton of stored grain versus the cost per ton of imported grain.

We assume that the imported grain would come from South Africa, where white maize is readily available and can be shipped within a very short period of time. The only problem is that there will be no absolute assurances that some GMO maize will not be mixed in with the shipments. However, the need to have available more than 100,000 MT for food assistance is likely to be a sufficiently rare event that it is pretty safe to assume that GMO restrictions would be temporarily lifted. This is what Kenya did in 2009 when it imported over one million tons of maize from South Africa. Even if the Government decided that its policy would be to retain the restriction on GMO imports, any loss incurred because of this restriction would simply be a cost of the restriction to be compared with foreseen benefits.

The average spot price of white maize on the Johannesburg commodity exchange in September 2012, which is probably when NFRA would have been buying maize for delivery to Dar es Salaam a month or so later,<sup>30</sup> would have been 2,219 rand/MT, or about US\$ 291/ MT at the prevailing exchange rate. To this one would add US\$ 83/MT for transport from Durbin to Dar es Salaam, plus US\$ 25/MT for port charges and unloading. Delivery upcountry to the food-deficit regions would cost an additional US\$ 25, using the same stock transfer costs per metric ton that are given in Table 5 for domestic transfers. The total cost for this maize, delivered to the food-deficit region, would then be US\$ 424/MT. This may be compared with the cost of purchasing maize domestically at a lower price of US\$ 297, for the procurement shown in Table 5, plus the cost of storage, including transfer to the food-deficit regions, of US\$ 72/MT. This totals US\$ 369/MT, which is considerably lower than the cost of imports in the example chosen, though this

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<sup>30</sup> The time required for delivery to the port of Dar es Salaam would be about two weeks. That required for offloading and transportation to NFRA's warehouses in food deficit regions would depend on the prioritization given to these shipments, but the Government surely could keep this to no more than two additional weeks. Therefore, food purchased from outside the country and food procured within Tanzania would each be available for delivery from the end of October at the latest.

very much depends on local market conditions both on the Johannesburg market and within Tanzania.

If one compares the cost of these two sources of grain to meet food assistance requirements in most years, when costs of storage are lower because the grain is held for a shorter period of time, – or even if excess grain is procured because of uncertainty within a given year but it is sold before the next harvest – then it is cheaper to buy and store domestically produced grain. But if the objective is to carry over larger stocks from year to year to meet unusual needs, then it may pay to rely on imports. This is particularly true if the unusual needs are likely to occur only very infrequently, such as the 1 in 40 year possibility for which 200,000 MT of domestically stored grain would cost on average US\$ 297 for the grain plus US\$ 1442 in storage costs, or \$1,739 total, compared with \$424 for imported maize.

## **6. Conclusions and Recommendations**

The following conclusions and recommendations emerge from the analysis.

1. In the long run, the most cost-effective way of promoting food security in Tanzania is to take advantage of its comparative advantage within the region in food production, especially of rice and maize, and build up its capacity to increase that production in ways that involve the poorer elements of the population as farmers or wage laborers. This will increase their incomes, providing them with their best insurance against food insecurity.
2. Since increases in grain production will result in the generation of growing surpluses in most years, it is important that the Government do everything that it can to encourage the export of those surpluses to neighboring countries, which are likely to increasingly be in food deficit. This will raise incomes in Tanzania and contribute to broader based food security. This means avoiding any quantitative restrictions on trade, such as export bans and trade permits. These do not work as intended and are quite disruptive to grain markets, which inhibits their development and discourages growth of production.
3. In the meantime, the Government has an obligation to assist those households which do not produce enough food for their own needs and do not have the income and wealth to supplement their own food resources. The choice has been made to provide most of this assistance in the form of food, primarily maize.
4. The analysis shows that 100,000 MT of food reserves will be sufficient for the food assistance program in most years, especially now that production of maize and rice has increased quite markedly. This is almost double the amount of food assistance that has been recommended in each of the past four years.
5. The magnitude of emergency food needs that are likely to occur only once in forty years because of variations in production about the trend -- only 3.6% of the mean of that trend

– is very low in relation to the size of carryover stocks and the capacity of the private sector to fill much of the gap through food imports.

6. Nevertheless, the shock of this shortfall will fall disproportionately on poor households without the means to supplement their own production through food purchases. To cushion these household, perhaps an additional 100,000 metric tons of food supplies will be needed. This will be the case only very rarely, however, and storing food against this eventuality may not be very cost effective in comparison with importing the food to fill the gap.
7. The cost of NFRA storing food is projected at about US\$72/MT annually. This assumes some reduction in cost from current levels as a result of improved efficiency. The cost of storage in India, which has many years of experience in storing food, is about US\$60/MT.
8. The comparison cost of purchasing and shipping maize from South Africa, as well transporting it to food-deficit regions, which is included in NFRA costs for locally procured maize, would in late 2012 have been US\$ 424. This may be compared with the cost of carrying grain stocks beyond the next harvest of US\$ 477 for the 1 in 5 year shortage and of US\$ 1,739 for the 1 in 40 year shortage.
9. The final recommendation for NFRA holding of grain reserves is between 100,000 MT and 200,000 MT, depending on the extent to which the Government is willing to incur the additional costs of storage associated with very infrequent events rather than depend on food imports in particularly bad, but infrequent, years. This quantity should be varied over time to the extent that the population in need of assistance grows or declines.
10. In the event of the unlikely coincidence of a very bad crop year and a price spike on world markets, Tanzania would have to take extraordinary measures to assure adequate supplies of food for its population. This would likely involve assistance from the international community. All the evidence presented in this paper suggests, however, this is coincidence is extremely unlikely and it would be highly costly to protect against in advance.
11. Prices of food in Tanzania are linked first of all with food prices within the region, and particularly in Kenya, where prices are determined by local demand and supply conditions and by the price of grain imported from South Africa. Demand and supply conditions in Tanzania are also important, especially during the vuli season, which can determine the direction of trade with Kenya early in the year. When the major crop is harvested, however, Tanzania becomes an exporter to Kenya and its prices are determined largely as a residual after subtracting transport and other transfer costs. The Government can do very little to alter these market relations and any attempts to do so

will just disrupt the market, creating rent-seeking opportunities and lower prices to farmers without lowering prices for consumers.

12. The issue of the optimum location of storage is determined by economies of scale in storage, the cost of transport, the degree of heterogeneity of consumption patterns, the timing of harvest and hungry seasons, and numerous other variables, which are likely to change over time. No thorough analysis of existing patterns of intra-NFRA transport and storage has been attempted here, though these costs appear to be high. Furthermore, no data were available to analyze quantitatively and under what conditions the relative merits of storage by farmers, traders, and NFRA.
13. One way in which NFRA could lower its cost would be to operate competitively in a transparent and rules-based way. This not only would reduce the market disruptions that occur, but it would also enable NFRA to maximize its trading profits to offset its other costs. This is especially important to the extent that it will have large carryover stocks to roll over because in most years the demand for food assistance will be well below the stocks that it is carrying against bad years.
14. Although it is important that Tanzania be well integrated into the East and Horn of Africa grain market, this does not imply that there would be much benefit to Tanzania from participating in a regional public storage program. The experience in SADC is not reassuring regarding the ability to get agreement among member states on such a program. Furthermore, climate conditions among potential members are not sufficiently different that there would be important gains from taking a regional approach. Finally, transportation costs and other barriers to trade would minimize any advantages that might pertain.
15. NFRA could help develop private storage sector. For example, a warehouse receipts system might be coupled with the option of NFRA using part of its storage capacity for private storage, conditional upon the private trader making those stores available for public distribution at an agreed upon price in the event of an emergency. There might also be a role for forward contracts for food delivery to NFRA. This would help to reduce the risk associated with market transactions.