

**Grain Export Bans in Theory and in Practice
Draft Policy Note**

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1. INTRODUCTION

In light of the expected good maize harvest for the 2013-14 Meher season, the government of Ethiopia is considering removing a ban in the export of maize. This note describes the likely impact of removing the export ban based on economic theory and the experience of other countries. The impact is described in qualitative terms because a more in-depth analysis is not possible in the time frame available.

2. THEORY OF EXPORT BANS

The impact of removing a ban on exports on domestic prices depends largely on how “binding” the ban is. At one extreme, removing an export ban has no effect if exports are not profitable even under free trade. For example, if the price of maize in Ethiopia is ETB 700 per 100-kg bag (US\$ 360/tonne) and the price of maize in Kenya is US\$300/tonne, then exports are not profitable and removing an export ban would have no effect. For the remainder of this section, we will assume that exports are profitable and, therefore, that an export ban is binding.

2.1. Graphic representation

Figure 1 illustrates the impact of an export ban. With the ban, no trade is allowed, so the market price is set at the level where domestic supply and demand are equal, which is labeled the autarky price in Figure 1. If the ban is removed, the domestic price will rise to the international price, causing production to expand and consumption to contract in the next agricultural season.

Because removing the ban will cause prices to rise, producers (farmers) gain while consumers lose. Figure 1 allows us to estimate the size of these gains and losses. The blue area shows the loss to consumers while the blue and green areas show the gains to farmers that produce the crop. The green area describes the net gain to the economy.

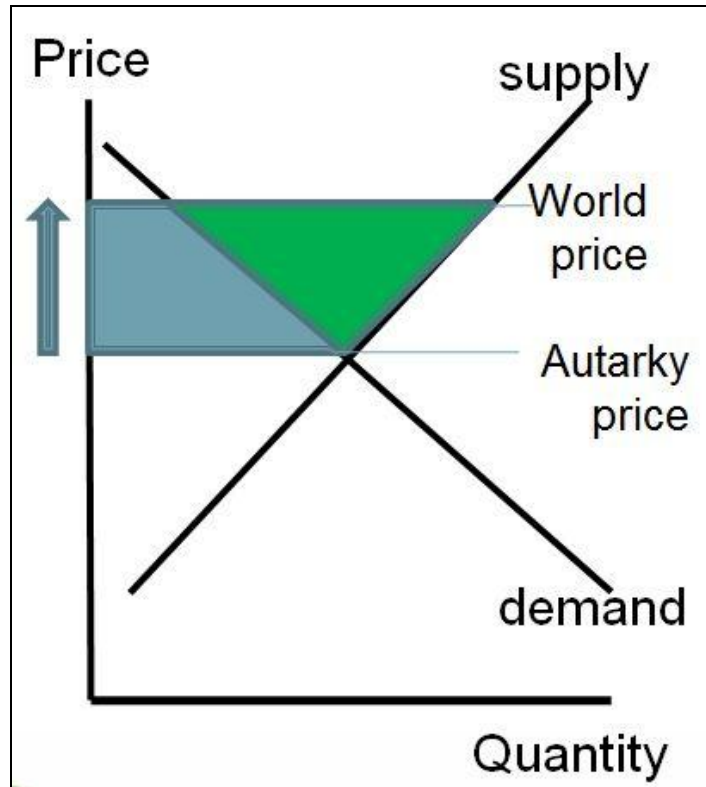


Figure 1. Impact of an export ban

2.2. Calculating the gains and losses

The producer gains and consumer losses can be calculated as follows:

$$\text{Producer gain} = (p_1 - p_0)(Q_{s0} + Q_{s1})/2$$

$$\text{Consumer loss} = (p_1 - p_0)(Q_{d0} + Q_{d1})/2$$

$$\text{Net gain} = (p_1 - p_0)(Q_{s1} - Q_{d1})/2 = (p_1 - p_0)X/2$$

where p_0 and p_1 are the prices before and after removing the ban
 Q_{s0} and Q_{s1} are the quantities supplied before and after
 Q_{d0} and Q_{d1} are the quantities demanded before and after
 X is the quantity exported after removing the ban.

With the information on the original price and the export price combined with the elasticity of supply (ϵ_s) and the elasticity of demand (ϵ_d), we can calculate the quantity of exports and the impact on producers and consumers.

$$\text{Exports} = X = Q_{s1} - Q_{d1} = Q_{s0}(1 + \epsilon_s(p_1 - p_0)/p_0) - Q_{d0}(1 + \epsilon_d(p_1 - p_0)/p_0)$$

$$\text{Producer gain} = (p_1 - p_0)(Q_{s0} + \frac{1}{2}(\epsilon_s(p_1 - p_0)/p_0))$$

$$\text{Consumer loss} = (p_1 - p_0)(Q_{d0} + \frac{1}{2}(\epsilon_d(p_1 - p_0)/p_0))$$

$$\text{Net gain} = (p_1 - p_0)(Q_{s1} - Q_{d1})/2 = \frac{1}{2} (p_1 - p_0)[Q_{s0}(1 + \epsilon_s(p_1 - p_0)/p_0) - Q_{d0}(1 + \epsilon_d(p_1 - p_0)/p_0)]$$

These are called the static gains from trade because they reflect a one-time change in incomes based on a comparison of the static situation before and after the policy change. They do not take into account any dynamic effects of trade, such as a change in investment, which could affect the rate of economic growth. For example, if traders believe that the removal of the export ban is permanent or likely to last a long time, they may invest in long-distance trucking capacity and more storage capacity, which could have ripple effects in other sectors. Although the dynamic gains from trade are thought to be fairly large because they affect the growth rate over a number of years rather than a one-time change, it is difficult to calculate them because of uncertainty about how policies affect investment. If the removal of the maize export ban is seen as a temporary measure, it is unlikely to stimulate any investment in transport capacity.

2.3. Simplifying assumptions

In applying these equations to a specific case, it is important to keep in mind that they are based on several simplifying assumptions.

- Strictly speaking, the equations are correct only for a small price change and a particular type of supply and demand function (that is, the double-logarithmic form). However, they are a reasonable approximation in the absence of further information about the shape of the supply and demand functions.
- Figure 1 and these equations assume that there are no transportation costs. We can adjust for this by redefining p_1 as the export parity price; that is the international price at the border minus the cost of transporting the commodity to the border.
- Heterogeneity and transportation costs within the country imply that each variable (p_0 , p_1 , Q_s0 , and Q_d0) will vary across different regions of the country. Generally, price changes will be larger near the exporting border, and the price change could be smaller or even zero as one moves away from the border. Taking this heterogeneity into account would require a spatial model of grain markets in Ethiopia (see Minot, 2008).
- We are assuming that there is just one price in each location, whereas the prices faced by farmers and consumers are different. If the marketing margin between farmer and consumer prices is proportional to prices, then both prices would change by the same percentage. However, if the marketing margin is fixed, then consumer prices would change by a smaller percentage than producer prices, which would affect the calculation of gains and losses.
- It is assumed that the country is a “small country” that cannot influence international maize markets. This assumption is built into the horizontal line representing the international price. In practice, the exporting country may be “large” relative to its market. For example, if Ethiopia exported 100,000 tonnes of maize to Kenya, it is likely that the additional maize supply would reduce maize prices in Kenya. This would reduce the export parity price, thus reducing the quantity of exports and size of gains and losses relative to the situation if Kenyan prices were not affected.
- Finally, these calculations estimate the impact of removing an export ban assuming no other changes in the economy. However, the export ban is being considered as a response

to a good maize harvest. Thus, removing the maize export ban would raise prices higher than they would be with the ban still in place, but maize prices could remain constant or even fall as a result of the combined effect of removing the ban and the larger harvest.

Thus, economic theory indicates that removing an export ban will increase the domestic price, hurt consumers but benefit producers, and have a net positive effect on the economy. However, the magnitude of these changes depends on the difference between domestic and international prices, transportation costs, and supply and demand elasticities, among other factors. Empirical analysis is necessary to quantify the impact of the removal of an export ban in a particular case.

3. INTERNATIONAL EXPERIENCE WITH GRAIN EXPORT BANS

Interest in the impact of grain export bans has increased since the 2007-08 global food crisis because they were blamed for exacerbating the spike in global prices. Russia, Argentina, and the Ukraine implemented bans or other restrictions on wheat exports as prices started rising, thus further limiting supply for importing countries. Similarly, India and Vietnam announced or implemented restrictions on the export of rice, exacerbating the surge in world rice prices during this period.

Diao et al. (2013) used a computable general equilibrium (CGE) model to examine the impact of Tanzanian policy to ban maize exports in most years. Farmers in the southern highlands of Tanzania produce maize surpluses, but export bans generally prevent them from exporting the maize to Zambia. Diao et al (2013) found that the ban on maize exports reduced maize producer prices by 9-19% depending on the location within the country. The price reduction was greatest in the southern highlands where surplus maize producers are concentrated. The CGE model traces the effect of lower maize prices on factors of production, finding that the ban reduces the returns to unskilled labor and to farmland. The final impact of these changes was that urban households primarily captured the benefits of the maize export ban. All five quintiles of urban households benefited, with the export ban raising income by 1-2%. In rural areas, the ban harmed most income groups, with the income of the poorest quintile falling 1.5%. The only income category in rural areas to benefit from the export ban was the highest income quintile. Overall, the maize export ban was estimated to increase the poverty rate by about 0.4% compared to the free-trade scenario.

Studies outside of Africa give similar results. A study of rice export restrictions in Vietnam used a spatial-partial-equilibrium model of food markets in seven regions of the country (Minot and Goletti, 2000). They found that export liberalization would raise prices 26% in the rice-surplus south and 19% in the rice-deficit north. By simulating the effect of rice price changes on each household in a national household survey, they showed that the net effect of relaxing the export restrictions was to reduce the rate of poverty but by less than 1 percentage point.

Porteous (2012) used data from 12 countries in southern and eastern Africa over 10 years to examine the effect of maize export bans. He finds that the export bans do not increase the price margin between neighboring countries. Furthermore, the export bans tend to be associated with price increases on both sides of the border. His interpretation is that the export bans cause traders to stock up on maize, thus raising the domestic price.

Similarly, Chapoto and Jayne (2009) examine the effect of maize export bans in Zambia on domestic prices but do not find any statistically significant relationship between the two. They interpret this result as evidence that export bans are not well enforced, so they have little effect. The results of both Porteous (2012) and Chapoto and Jayne (2009) could also be explained by the fact that export bans tend to be implemented in response to rising prices. Unless prices in other countries are rising even faster, the higher domestic prices are likely to make exports unprofitable and the ban unnecessary.

Dorosh et al (2009) uses a partial equilibrium model of food markets in Zambia to study the effect of drought-related maize supply shocks with and without international trade and cassava substitution. They find that private cross-border trade and substitution into cassava could offset two-thirds of the consumption effect of a drought year on poor households. This is because cross-border exports impose a floor on domestic maize prices while the potential of maize imports puts a ceiling on domestic prices.

Several studies emphasize the policy uncertainty associated with grain export bans. In Tanzania and Zambia, export bans are imposed and lifted depending on the size of the harvest and the expected level of prices. In Malawi, Zambia, and Kenya, the government has been actively involved in large-scale maize imports in response to supply shortfalls. In some cases, this is accompanied by a ban on private trade in grain. Even when private-sector trading activity is allowed, the uncertainty associated with government trading activity makes it almost impossible for traders to profitably import large quantities. If the government imports the right quantity at the right time, it can replace private traders and maintain stable prices. Often, however, government procurement is delayed because of the political decision making process and/or the imported quantities are smaller than needed because of funding constraints. The result is that grain imports are too small or too late, yet the private sector is unable or unwilling to fill the gap. This combination of events has resulted in price spikes, in which domestic prices rise above import parity, on several occasions in Malawi, Zambia, Kenya, and Ethiopia (Jayne et al, 2008; Chapoto et al, 2010; Minot, 2010; Rashid, 2010).

4. ETHIOPIAN EXPERIENCE WITH MAIZE EXPORTS

This section explores the patterns of maize exports and prices in Ethiopia in order to shed light on the possible volumes of maize that could be exported if the export ban were lifted.

4.1. Maize exports

Most international maize trade in Ethiopia is cross-border trade with neighboring countries. In particular, most maize exports have been to Kenya through the border town of Moyale. The main internal flows of maize are shown in Figure 2, prepared by FEWS-NET (2013). Because it is difficult to collect statistics on cross-border trade, there is some variation in the figures across different sources.

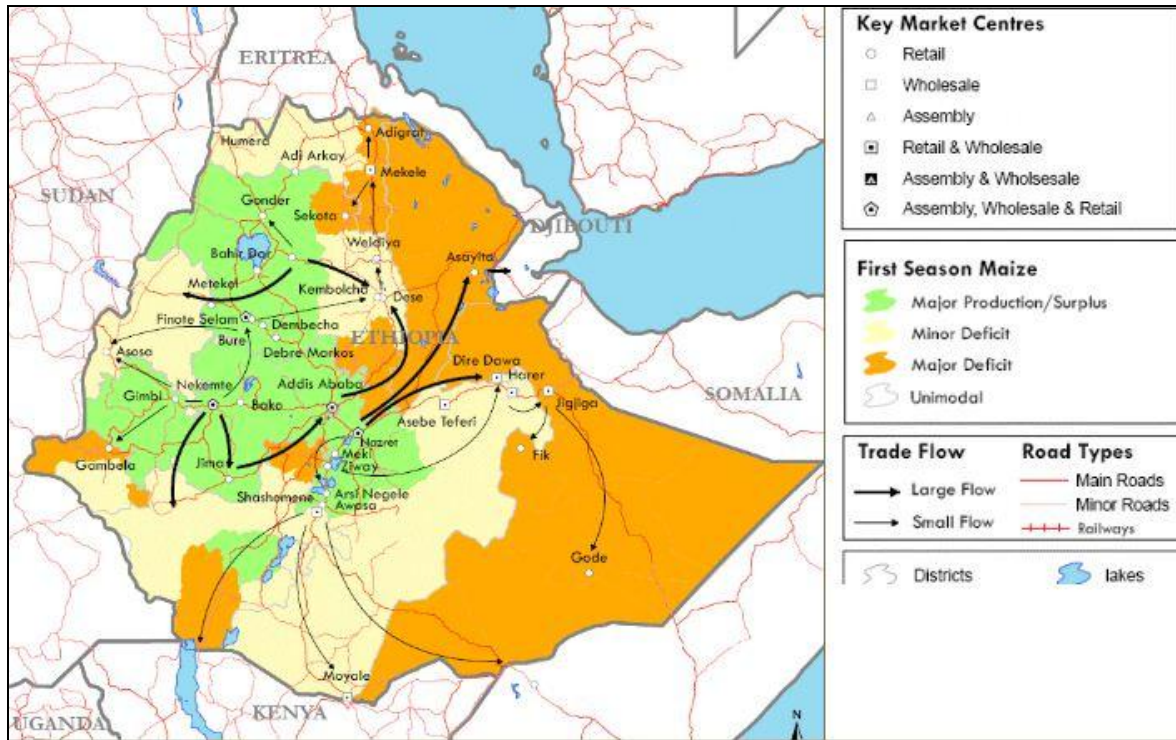


Figure 2. Map of main maize trade flows in Ethiopia (FEWS-NET, 2013)

Table 1 shows maize exports from Ethiopia from 1993 to 2011, according to the FAO. RATES (2003) gathered prices from FAO and the Ethiopian Grain Trading Enterprise and concluded the following:

[The] volume of official maize export is estimated to be about 48,000 metric tons in 1996/97, 385.0 metric tons in 1999/00, 1,327.0 metric tons in 2000/01 and 856.0 metric tons in 2001/02 (RATES, 2003).

According to these figures, maize exports have surpassed 10 thousand tonnes in no more than five of the last twenty years. First, according to RATES (2003), maize exports were 48 thousand tonnes in 1996-97, which followed bumper harvests in 1995-96 and 1996-97. Second, in 2002 after two successive years of bumper harvests, which resulted in very low domestic prices, the EGTE organized the export of 12 thousand tonnes. Exports rose to 11 thousand tonnes again in 2004, 36 thousand tonnes in 2010, and 60 thousand tonnes in 2011. It is possible that the “exports” in 2010 and 2011 refer to purchases by the World Food Programme for distribution as food aid.

Table 1. Maize exports from Ethiopia

Year	Maize exports (tonnes)
1993	0
1994	0
1995	0
1996	0
1997	0
1998	1,701
1999	979
2000	385
2001	1,327
2002	12,848
2003	746
2004	11,086
2005	2,606
2006	672
2007	17
2008	0
2009	0
2010	35,994
2011	60,148

Source: FAO, 2013

It is not clear whether export figures from FAO and EGTE include informal cross-border exports. However, studies that look specifically at cross-border trade have not found large volumes. For example, one study sent researchers to four important border posts (Humera, Kumuruk, Metema, and Moyale) to gather information on cross-border trade (IFPRI, 2009). The results suggest that cross-border exports of maize were between 10 and 20 thousand tonnes per year between 2003-04 and 2007-08. The vast majority of these exports were through the Moyale border to Kenya. Although maize may also be exported on smaller roads and even paths, the volumes would have to be quite small because it would be transported in small quantities. Given the maize production of more than 4 million tonnes, it is clear that only a small fraction of Ethiopian maize has been exported in the past.

4.2. Maize prices

Since international trade is driven by price differences between countries, it is useful to examine maize prices in Ethiopia compared to its neighbors. Figure 3 shows that the domestic price of maize in Addis Ababa, as well as the import and export parity prices calculated from the US Gulf of Mexico price of yellow maize and the cost of transportation. The graph reveals that the wholesale price of maize in Addis rarely falls to the level of the export parity price at which

maize exports become profitable. According to this graph, the domestic price declined to the export parity price just twice over this period. The first time was in 1996-97, which corresponds to the period when EGTE (but not FAO) reported maize exports of 48 thousand tonnes. The second time was in 2002, when EGTE organized the export of 12 thousand tonnes following two successive bumper harvests.

Because most maize exports pass through the Moyale border post, it could be argued that the Nairobi price of maize is more relevant to the profitability of maize exports than the US Gulf price. However, an analysis that calculated export parity prices based on Nairobi maize prices obtained similar results (Rashid et al, 2011).

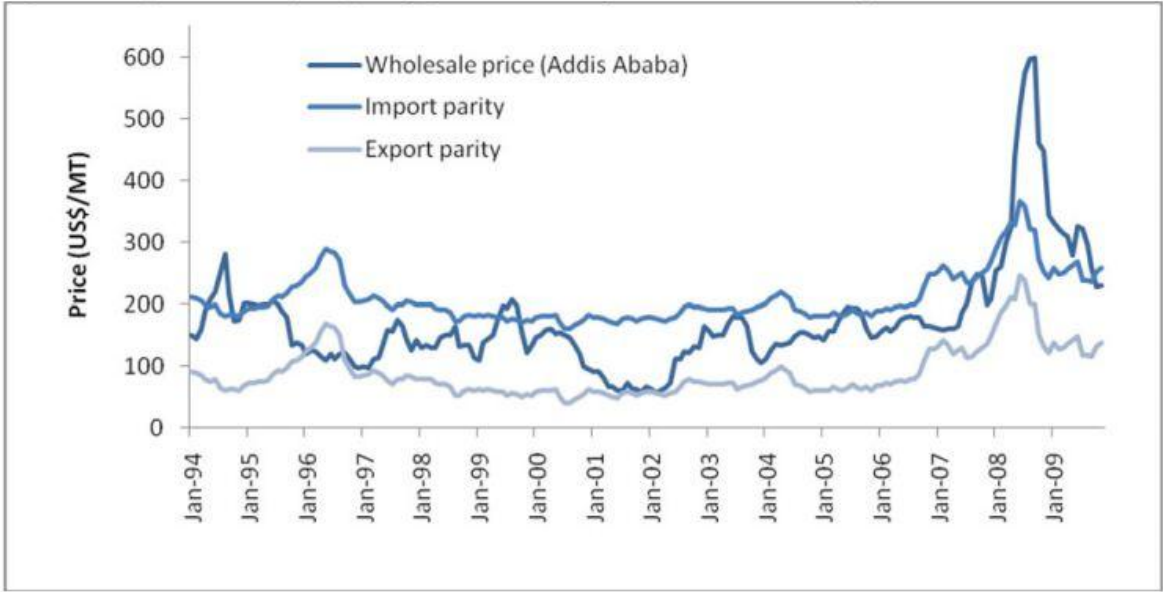


Figure 3. Maize prices in Ethiopia

4.3. Sample calculation of the impact of removing an export ban

In this section, we apply the equations in Section 2.2 to a case that is similar to Ethiopia but based on hypothetical assumptions. This example is used to illustrate the equations but should not be considered an estimate of the actual impact of removing the maize export ban. For reasons discussed below, the assumptions almost certainly generate estimates of export volumes far higher than are likely to be achieved.

For the calculation, we adopt the assumptions shown in Table 2. The level of maize production and the elasticities are plausible. However, the level of the export parity price (the international price minus transportation costs) is entirely hypothetical.

Table 2. Assumptions to calculate the impact of removing an export ban under hypothetical circumstances

Assumptions	
Maize production with the ban	4.2 million tons
Maize consumption with the ban	4.2 million tons
Maize price elasticity of demand	-0.7
Maize price elasticity of supply	0.3
Domestic maize price with the ban	US\$ 300/tonne
Export parity price	US\$ 330/tonne

Based on these assumptions and the equations presented in Section 2.2, the results are shown in Table 3. Removing the export ban would cause the domestic price of maize to rise to the export parity price of US\$ 330/tonne. This 10% increase in the domestic price would cause maize consumption to fall 6%. In the short run (within the year), exports would be equal to the reduction in consumption, 268 thousand tonnes. In the long run (after one year), the higher prices would cause maize production to increase 3%. The additional production would contribute to more exports, resulting in a total increase of 389 thousand tonnes.

Table 3. Results of simulations the impact of removing an export ban under hypothetical circumstances

Results	percentage change		
	Before	After	
Production (t)	4,200,000	4,320,528	3%
Consumption (t)	4,200,000	3,931,681	-6%
Short-term exports (t)	0	268,319	
Long-term exports (t)	0	388,848	
Price (US\$/t)	300	330	10%
Long-term consumer benefits (m US\$)		-120.63	
Long-term producer benefits (m US\$)		126.40	
Net change in welfare (m US\$)		5.77	

The loss to consumers associated removing the export ban would be US\$ 121 million while the long-term gains to farmers would be \$126, for a net gain to the economy of about US\$ 6 million.

How do we reconcile the large volumes of maize exported in this hypothetical example with the much smaller volumes of maize exported by Ethiopia? There are three assumptions in the example that are probably not realistic.

First, it may not be realistic to think that the no-trade price of maize in Ethiopia could fall to 10% below the export parity price of maize. This is because the wholesale price of maize in Addis is fairly close to the wholesale price of Nairobi. Using monthly data from 2005 to 2011, Rashid et al (2011) showed that the average wholesale price in Addis was US\$ 200/tonne compared to US\$ 236/tonne in Nairobi. Their analysis indicates that even when the price

difference is US\$ 100/tonne, this does not appear to be enough to stimulate significant maize exports. This may be the result of the poor condition of parts of the route between Addis Ababa and Nairobi. The section between Awassa and Moyale in Ethiopia and the section between Moyale and Marsabit are in particularly bad condition. In addition, there are occasional security problems between Moyale and Marsabit. These factors add to the transportation costs, which reduce the export parity price in Ethiopia. Since the export parity price sets a floor on the maize price in Ethiopia, the poor roads between Ethiopia and Kenya contribute to maize price instability in Ethiopia.

The second reason that the simulation results over-estimate maize exports are that they assume Ethiopia is a “small country” that cannot affect international prices. Although this would be a valid assumption for Ethiopian exports to the world market, it is probably not valid for exports to Kenya. More specifically, the calculations assume that Ethiopia can export 388 thousand tonnes of maize to Kenya without affecting Kenyan prices. In reality, as exports to Kenya reached 50-100 thousand tonnes, they might begin to reduce prices in Kenya, which will lead to less profitable trade and eventually cut off exports well before 388 thousand tonnes. The quantity that can realistically be exported to Kenya will depend on the elasticity of import demand for maize in Kenya. The more inelastic the import demand, the greater the reduction in Kenyan prices in the face of Ethiopian maize and, the smaller the equilibrium level of maize exports to Kenya.

The third reason that the model overestimates likely maize exports is that it assumes no policy response from Kenya. As exports to Kenya begin to affect Kenyan prices, Kenyan policymakers may restrict maize imports to protect local maize farmers. Unlike Tanzania, which frequently bans exports to protect local consumers, maize policy in Kenya is designed to support maize prices through import tariffs and maize purchases by the National Cereals and Produce Board, a state trading enterprise.

The other potential market for Ethiopian maize exports is South Sudan. Although cross-border exports of maize into South Sudan have been negligible, averaging less than 2000 tonnes per year, road and market infrastructure development in the country could create a new source of demand for Ethiopian maize.

5. SUMMARY AND CONCLUSIONS

5.1. Summary

Assuming the an export ban on maize is binding, removing the ban will increase the domestic price of maize above what it would be with the ban, hurting consumers but benefiting maize farmers. The net gain (the sum of the gains minus the sum of losses) will be positive.

Quantification of the impact of removing the ban on prices and household welfare requires information on the gap between the domestic price and the export parity price, the elasticity of supply and demand for maize in Ethiopia, and the elasticity of maize import demand in Kenya.

At current prices, the ban on maize exports may not be binding, meaning that maize exports may not be profitable even under a free trade policy. However, if the 2013-14 maize harvest is

significantly larger than average, domestic prices will decline, perhaps enough to make maize exports profitable.

Studies of export bans in other countries are generally based on either multi-market partial-equilibrium models that simulate the markets for key agricultural commodities or computable general equilibrium models that simulate agricultural and non-agricultural sectors. These studies confirm that relaxing export restrictions will increase prices, hurting consumers but benefiting farmers. Studies in Tanzania and Vietnam revealed that the net effect of the relaxing export restrictions was to reduce the incidence of poverty, although the effect is small. Some studies note that international trade (including cross-border trade) can set an upper and lower limit on commodity prices, but only if trade is allowed and transportation costs are not too high. Finally, several studies note the negative impact of frequent and unpredictable changes in trade policy, which discourage private traders from participating in cross-border trade and investing in increasing capacity.

Ethiopia has never exported more than a tiny fraction of its maize production. Under the hypothetical scenario that maize prices in Ethiopia were 10% below export parity price, we might expect exports of more than 350 thousand tonnes. The difference between the historical experience of small exports and this simulation that shows large exports can be explained by three factors. First, it may not be realistic to think that domestic prices could fall 10% below export parity prices because prices in Addis Ababa are only slightly lower than prices in Nairobi and there are significant costs and risks associated with transporting grain from maize surplus areas in Ethiopia to Nairobi. Second, large exports to Kenya would probably lower prices there, reducing the incentive to export. Third, large exports to Kenya might provoke policymakers there to restrict imports to protect their maize farmers.

5.2. Conclusions

In light of these findings, we offer the following recommendations regarding the maize export ban:

- *If the upcoming maize harvest is expected to be above average, it makes sense to remove the maize export ban.* The opportunity to export maize legally would set a floor on the domestic price of maize equal to the export parity price. This would prevent farmers from being discouraged by glut prices. Consumers would pay a higher price for maize than they would pay with the ban still in place, but they would probably not be paying more for maize than they did last year. In other words, the effect of maize exports may offset the effect of a bumper harvest.
- *The lifting of the export ban should be implemented as soon as possible.* At current prices, it is probably not profitable to export maize, so removing the ban would have no immediate effect on prices. However, it would create incentives for EGTE and/or traders to watch for profitable opportunities. Exports would begin when the domestic prices fall to the export parity price, preventing the domestic price from falling further. If the maize harvest does not live up to expectations and is just normal, then maize exports will probably not be profitable so the lifting of the ban will do no harm.

- *There is little reason to re-impose the maize export ban after the harvest season or in drought years.* Maize exports are only profitable when domestic prices are unusually low, such as during the harvest season of a high-production year. Most likely, the policy of imposing the export ban when domestic prices are high and rising has very little effect on trade flows because maize exports are not profitable in any case.
- *Private traders should be allowed to participate in cross-border trade.* The incentives of private traders are aligned with those of the government. Traders will only make a profit if they buy Ethiopian maize when the price is low and ship it to Kenya or South Sudan for resale. They have no incentive to buy maize when Ethiopian supplies are short and prices are high. This trading pattern meets the government's interest in stabilizing maize prices and preventing price gluts as occurred in 2002-03.
- *To promote investment by traders in transport capacity, the government should be as transparent as possible about its intentions.* Uncertainty about government intervention in grain markets is a major source of risk for private traders and a key reason they are reluctant to invest in grain trading.
- *In the long-term, investment in road infrastructure linking Ethiopia to Kenya and South Sudan would help stabilize maize prices.* Better roads would reduce transport costs and increase maize export parity prices, which serve as the floor price during good harvests. Ethiopia should also seek complementary investment in roads by Kenya and South Sudan.

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