

**The Impact of a New WTO Agricultural Agreement
on Cereals Markets in Sub-Saharan Africa**

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ABSTRACT:

The members of the World Trade Organization are currently negotiating a new agricultural agreement. If the new agreement includes rules to decrease agricultural subsidies, world prices of cereals are likely to rise. Such a change would benefit farmers but hurt consumers of cereals. This paper uses two methods to examine the effect on cereals markets in Africa if the new WTO agricultural agreement requires developed countries to significantly reduce their domestic supports to agriculture.

Currently, developed countries heavily subsidize their agricultural sectors. In particular, large subsidies allow countries such as the United States, the European Union and the United Kingdom to export cereals at prices that are below the cost of production, which depresses the international prices of these products. Some argue that because the majority of the world's poor are farmers, developed countries' grain subsidies have a negative effect on developing countries. However, others argue that because many of the poorest countries are net importers of food, these countries would be harmed if developed countries' grain subsidies are removed.

This paper's first section uses agricultural trade and production data from the Food and Agriculture Organization to measure the net welfare effect on each African country if the prices of maize and wheat increase. The welfare analysis finds that the removal of wealthy countries' subsidies would lead to welfare losses for most African countries, although the net effects are a small percentage of GDP in each country.

Within any country, households that are net buyers of cereals would be hurt by a price increase, while households that are net sellers of cereals would see their welfare increase with cereals prices. The price changes' effects on the poor depend on whether poor households tend to be net buyers or net sellers of cereals. This paper's second section considers the distribution of gains and losses within one heavily agricultural and poor country, Ethiopia. Using data from Ethiopia's Welfare Monitoring Survey and the Household Income, Consumption, Expenditure Survey of 1999-2000, I examine the distribution of net-cereal-buying and net-cereal-selling households by income level, occupation, and region. The surprising result is that even in rural farming areas, there are many more net buyers than net sellers of cereals. A significant percentage of poor farmers are actually net buyers of grain, due to the fact that most farming households do not produce enough grain to cover the household's food needs, and due to the margins between producer and retail prices. These results, taken with those of the first section, suggest that the argument that "poor farmers would benefit if wealthy countries got rid of their agricultural subsidies" does not hold in Africa.

INTRODUCTION

“The rural poor, growing maize for subsistence [see] their livelihoods destroyed by a flood of cheap US imports.”

- Oxfam briefing on agricultural subsidies, 2002

“It must be acknowledged that unqualified assertions by many, including the heads of some multilateral institutions, that subsidies and other interventions in agriculture in the OECD countries are hurting the poor countries are not grounded in facts... The claim that the change will bring net gains to the least developed countries as a whole is at best questionable and at worst outright wrong.”

- Economist Arvind Panagariya, 2002

Developed countries heavily subsidize their agricultural sectors. The total value of agricultural support was estimated to be over \$300 billion in 2001, making up one-third of farmers' gross receipts (Soledad Bos 2003). Subsidies allow countries such as the United States, the EU and the UK to sell their agricultural products on world markets at prices that are below the cost of production. Some argue that depressed agricultural prices disadvantage developing countries, and in particular, poor farmers who make up the majority of the population of developing countries and who depend on agricultural income for their livelihoods. Others argue that because many least developed countries, especially in Africa, are net importers of food, developed countries' subsidies, on net, benefit the poorest countries. The debate over subsidies is one of the most contentious points in the ongoing negotiations for a new World Trade Organization agricultural trade agreement. A group of developing countries insists that the new agreement should require developed countries to dramatically reduce domestic support to

agriculture. If the new agreement were to require OECD countries to reduce agricultural subsidies, would African countries benefit or be harmed? This paper considers the effect on both the net welfare of African countries, and the effect on poor farmers in Africa.

In the case of non-food crops, such as cotton, the effect seems clear: the removal of subsidies would decrease production of cotton in subsidizing countries such as the United States, which would increase the international price, raising the income of poor cotton farmers and the African countries in which cotton is an important crop. In fact, in recent months the issue of the United State's high cotton subsidies has received a large amount of attention from NGOs and the media, and the message sent by these groups has been clear: developed countries' subsidies threaten the livelihood of farmers in developing countries. However, a more complicated picture emerges when we consider the effect of subsidies to food crops. In particular, maize and wheat are both heavily subsidized in developed countries and significant food staples in Africa.

Maize and wheat are the two most consumed cereals in Africa. Maize is also the most-produced cereal in Africa. Together maize and wheat comprise about half of all cereals production in Africa. They are the top two cereals imported into and exported from African countries. At the same time, OECD subsidies to wheat are equal to 36% of its price and subsidies to maize are equal to 24% of its price. Changes in the crops' prices would have negative effects for net consumers, but positive effects for net producers.

Since domestic support encourages overproduction, reducing agricultural subsidies would decrease production and thus increase prices. The common argument is that this would increase farmers' income but hurt consumers. In Africa, where the majority of the population is involved

in agriculture, the welfare of farmers is an important consideration. In some countries, such as Rwanda, Burundi, Burkina Faso, and Nigeria, up to 90% of the population are involved in agriculture (WDI 2004). Where farmers are a majority, increased cereals prices could be a benefit to the country – *if* farmers are net sellers of cereals. This paper finds that the common perception of African subsistence farmers as net sellers is a misconception.

Although higher cereals prices would benefit net producers, many African countries are net food importers. An increase in cereals prices would cause a net welfare loss to net food importers, at least in the short run. In addition, high food prices can create an acute crisis for poor consumers. Since most African countries are in a state of “food insecurity,” fluctuations in the prices of staples can cause serious harm to vulnerable populations. Of 44 countries in Sub-Saharan Africa, 40 are food insecure (Soledad Bos 2003). This fact brings a note of urgency to the WTO’s agriculture negotiations, as trade in food crops is a crucial issue for countries that face food insecurity. It also raises the question of whether a policy that would increase food prices is in African countries’ best interest. Would the harm to consumers outweigh the benefit to farmers?

This paper uses two methods to examine the effect on Africa of the removal of OECD agricultural subsidies. The first approach is a welfare analysis that measures the change in consumer and producer surplus if the prices of wheat and maize increase, in each country of sub-Saharan Africa. The analysis emphasizes the different effects for countries that are net exporters or net importers of these products. Many African countries would face net welfare losses if maize and wheat prices increase. Although the results seem to contradict the arguments of

NGOs and some developing countries in the WTO negotiations, the results are not surprising when one considers the fact that most African countries are net importers of maize and wheat.

A limitation of this approach is that it treats producers and consumers as though they're separate groups. In reality, most of the poor obtain their food both by purchasing in the market and by growing their own grain for domestic consumption. Households that are net buyers will suffer if the price rises, but households that are net sellers will benefit. Thus, it is important to understand the distribution of net buyers and sellers of cereals in African countries, in order to predict the effect of price changes for the poor. The final section of this paper uses household survey data from Ethiopia to determine household net expenditure on maize and wheat, by household expenditure quintile, by location and by income source. The results indicate that the majority of poor households, even those for whom farming is the main source of income, are net buyers of maize and wheat. The implication is that the main assumption behind the argument against subsidies – poor farmers would benefit if cereals prices increase – does not reflect the situation in least developed African countries.

The paper's first section provides background on the current WTO Agreement on Agriculture, the use of subsidies by developed countries, and the negotiation process for the new agreement. The second section discusses the effect of developed countries' subsidies on Africa, considering the significance of maize and wheat in Africa, the effect of OECD subsidy removal on the price of cereals, and existing literature on the subject. The third section presents the welfare analysis of a price increase in maize and wheat in Africa. The fourth section examines the distribution of net buyers and sellers of cereals in Ethiopia, by household expenditure level and by the household's main source of income.

1. Background on the WTO and Domestic Support to Agriculture

1.1 The Agreement on Agriculture

Agricultural markets are notoriously distorted by high import barriers and huge domestic subsidies, policies that lead to overproduction and depressed commodity prices. The WTO Agreement on Agriculture was an attempt to mitigate the historical huge distortions in agricultural markets. It was developed, along with the WTO itself, during the Uruguay Round negotiations of the General Agreement on Tariffs and Trade (GATT). The Agreement on Agriculture was implemented during 1995-2000 in developed countries, and during 1995-2004 in developing countries. A new agreement is currently in negotiation.

The first Agreement on Agriculture required reductions domestic support along with export subsidies and tariffs. Each member country's commitments depend on its status as developed, developing, or a least developed country (LDC).¹ Developed countries are required to reduce their Aggregate Measure of Support, a measure of the total domestic support to agriculture, by 20%. They also must make an average tariff cut of 36%, with a 15% minimum tariff reduction per product. They must decrease the value of their export subsidies by 36% and decrease the volume of subsidized exports by 21%. Developing countries' reductions are two-thirds those of the developed countries, and their implementation period is ten years rather than five years. LDCs have no reduction commitments; however, they may not increase their tariffs, export subsidies, or domestic support during the implementation period.

¹ Description of the Agreement's rules can be found on the World Trade Organization website, http://www.wto.org/english/tratop_e/agric_e/ag_intro00_contents_e.htm

The Agreement classifies domestic support programs into three types, called Boxes: Green Box, Amber Box, and Blue Box. The names of the boxes refer to traffic signals. Countries have a “green light” to proceed with the unlimited use of Green Box subsidies. The Agreement defines this category as having “no, or at most minimal trade-distorting effects on production” (WTO 2004). This includes government funding of research, disease control, infrastructure, disaster relief, and income support that isn’t related to production. The Green Box also includes, in developing countries, investment subsidies, input subsidies to poor farmers, and programs to discourage farmers from cultivating narcotics crops.

The Amber Box refers to the amber-colored “proceed with caution” traffic light. The Agreement defines this category as “trade-distorting” (WTO 2004). The Amber Box includes market price support, such as intervention buying, input subsidies, and government payments to farmers based on production levels, such as per-hectare or per-head payments. Under the Agreement, developed countries may use Amber Box subsidies up to 5% of the value of the production of any product. Above this “de minimis” level, countries must reduce – but not eliminate – their subsidies.

The third box, the Blue Box, was introduced to define Amber Box subsidies that are coupled with regulations that limit production. For instance, the EU requires that farmers receiving its per-hectare payment leave fallow 10% of their arable land. Because these subsidies include such production-limiting measures, the Agreement considers the Blue Box to be “partially decoupled” from production (WTO 2004). Countries do not have to reduce their Blue Box subsidies.

Of the three types of domestic support, only the payments defined as Amber Box are included in the Aggregate Measure of Support. In the eyes of the Agreement, only Amber Box subsidies affect international trade, so the Agreement exempts Blue and Green Box subsidies from reduction commitments. The Agreement's treatment of domestic support allowed overall levels of support to stay high because countries had the option to replace Amber Box subsidies with Blue or Green Box programs, rather than reduce their spending on subsidies. The extent to which the Blue and Green Box supports actually affect trade is a matter of debate. Blue and Green Box programs are used extensively in developed countries, and much of the tension in the WTO agriculture negotiations centers on whether such programs should be restricted, abolished, or allowed to remain exempt from reduction commitments.

1.2 The Agreement in Action: How subsidies are used

The most common measure of domestic support is the PSE, or Producer Support Estimate, which estimates the value of market price support (an Amber Box program) as well as subsidies, whether Amber, Blue or Green Box. Based on the PSE, the world spent \$311 billion to support agriculture in 2001. One-quarter of this was spent on research, marketing and infrastructure. The other \$233.3 billion was paid to farmers, accounting for one-third of farmers' gross receipts in 2001 (Soledad Bos 2003).

With huge budgets available to them, the heaviest subsidizers are naturally the world's wealthiest countries. The top spenders are the European Union, Japan, and the United States. Together, these countries account for 80% of the world's support to agriculture (Soledad Bos 2003). Measured as a percentage of gross receipts to agriculture, Switzerland, Norway, Korea,

Iceland and Japan provide the heaviest domestic support (Soledad Bos 2003). The products receiving the most support are rice, sugar, and milk, for which domestic support makes up half of producers' gross receipts.

Wheat and maize, staple foods in many African countries, are also heavily subsidized in developed countries. Overall, the PSE for wheat is equal to 36% of the price of wheat and PSE for maize is equal to 29% of the price of maize. Wise (2004), discussing the United States' maize subsidies, argues that the PSE inflates actual levels of agricultural subsidies, because the measure relies on reference prices that are distorted by other factors. However, Wise (2004) also notes that in the United States, maize subsidies amount to \$262 per hectare and account for up to 47% of maize farm income.

During the Agreement on Agriculture's implementation period, the overall level of domestic support hasn't changed significantly, but the types of subsidies used have changed. The trend has been a reduction in Amber Box subsidies, while other types of subsidies have increased. For instance, in 1986-88, about one quarter of OECD subsidies could be classified as Green Box. By 1995-98, OECD countries expanded their Green Box subsidy programs to comprise nearly half of all domestic support (Rae and Strutt 2003).

For example, the EU has decreased market price support while increasing direct payments to producers. By 2006, per-hectare payments will make up 68% of its agricultural budget (ActionAid 2002). Direct payments qualify as Blue Box subsidies if they are accompanied by a production-limiting factor such as a requirement to leave land fallow. The United States also uses subsidies that are currently exempt from the Agreement's reduction commitments. One of these subsidies, known as Step 2, compensates exporters and processors

for differences between international and domestic prices (Oxfam). Because these subsidies are available to domestic processors as well as exporters, the US doesn't classify them as "export subsidies." The US also uses export credits to increase sales of its agricultural products abroad. Under the "Export Credit Guarantee Program," the government guarantees foreign importers' loans as they borrow dollars from banks at US interest rates. The US doesn't consider this to be an export subsidy scheme, although the effect is the same: foreign firms face artificially low costs when importing US products. In addition, the US Farm Bill of 2002 authorized the increase of total agricultural support by \$18 billion per year for the next ten years (Oxfam). The subsidy policies of the US and EU have angered a group of developing countries in the WTO, who hope to use the next WTO agricultural agreement to compel developed countries, especially the US and EU, to reduce their domestic support to agriculture.

1.3 Shaping a new Agreement

Negotiations for a new WTO agriculture agreement began in 2000, with the goal of completing the agreement by 2005. According to the Doha Declaration of November, 2001, the new agreement is to continue the work of the first Agreement on Agriculture in that it will further "correct and prevent restrictions and distortions in world agricultural markets"(WTO 2001). The Doha Declaration also stated that the negotiation modalities should be completed by March 31, 2003, but more than one year past this deadline, WTO members have not yet agreed

on a framework for the new agreement.² It is very unlikely that the final agreement will be completed by 2005.

A number of countries formed alliances that submitted proposals for negotiation modalities just before the WTO Ministerial conference in Cancún in September, 2003. The proposals included a joint proposal from the US and the EU, a counterproposal from a new alliance of developing countries, and a proposal from the “tripartite alliance” that combines the countries of the African Union, the Least Developed Countries, and the African, Caribbean and Pacific countries.

The proposal from the United States and the European Union, known as the US-EU text, disappointed many developing countries, who wished for tighter restrictions on Green and Blue Box programs. In response to the US-EU proposal, about 20 developing countries formed an alliance known as the G-20. The G-20’s goal is to pressure developed countries into decreasing domestic support and improving market access for developing countries. The G-20 modalities proposal includes the elimination of all Blue Box subsidies. However, the US-EU text is more lenient, suggesting that the value of Blue Box subsidies shouldn’t be more than 5% of the total value of agricultural production. The US-EU text also increases the scope of the Blue Box, in order to allow the United States to continue programs that it introduced in 2002. The two proposals also diverge in their treatments of the Green Box. The G-20 requests that developed countries limit any direct payments to farmers and that “additional disciplines shall be elaborated and agreed upon,”³ while the US and EU haven’t addressed the issue in their proposal. Finally,

² The modalities are the framework for the agreement, including numerical targets for reductions. The current *proposals* for modalities do not yet contain specific numbers. For instance, a clause in the G-20 text reads: “Members will reduce their Amber Box subsidies by [] to [] %”

³ From the modalities text proposed by the G-20, as quoted in “Agricultural Negotiations at the WTO: Post-Cancun Outlook Report,” International Centre for Trade and Sustainable Development, Geneva, Nov. 2003.

the G-20 suggests stricter adjustments to the Amber Box, stipulating that subsidies should be reduced for each product, where the EU-US text recommends a reduction in total support. This would allow countries to retain very high subsidies in certain products.

Currently, the G-20 includes three countries of sub-Saharan Africa: Nigeria, Zimbabwe, South Africa (ICTSD 2004). The African members of the G-20 are net exporters of several crops that are heavily subsidized by developed countries, so they consider subsidy reductions to be in their interest. The rest of the African members of the WTO are represented by the “tripartite alliance” of the existing African Union, Least Developed, and African, Caribbean and Pacific alliances. In the fall of 2003, the tripartite alliance submitted a modalities proposal that calls for ‘substantial reductions, with a view to phasing out’ Amber and Blue box subsidies, while limiting any Green Box subsidies that distort trade (ICTSD 2003).

At this point, it is difficult to predict how much the new agreement will actually change developed countries’ domestic support policies. However, as even the EU-US modalities proposal allows for some reductions in domestic support, it is important to understand the potential effects for Africa. If the effect of diminished domestic support is negative or inconsequential, African members of the WTO would be advised to apply their energy to other aspects of the agreement, rather than allow the disagreements over domestic support to continue to delay the negotiations.

2. The Impact of OECD Domestic Support on Sub-Saharan Africa

2.1 The Importance of Wheat and Maize in Sub-Saharan Africa

The 1996 World Food Summit defined food security as existing “when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet all their dietary needs and food preferences for an active and healthy life” (Soledad Bos 2003). Diaz-Bonilla et al. (2000) crafted a more specific definition of food security, which classifies countries in three categories: food secure, food neutral, or food insecure. A country’s classification depends on its per capita calories, protein and food production, the ratio of total exports to food imports, and the proportion of non-agricultural population. Soledad Bos, applying the Diaz-Bonilla et al. definition to Africa, found that of 44 countries in Sub-Saharan Africa, 40 are food insecure. While Nigeria, Cape Verde, Gabon, and Swaziland can be classified as food neutral, no Sub-Saharan African country fit the Diaz-Bonilla et al. criteria to be considered food secure.

As staple foods, maize and wheat are important to food security in Africa. Sections two and three of this paper consider the impact of OECD subsidies on wheat and maize markets in Africa. These crops are both economically and nutritionally important in Africa. They are the two most consumed cereals in Africa.⁴ Together, wheat and maize account for 60% of cereals consumption. The two cereals are nutrition staples; in sub-Saharan Africa, on average, maize provides 332 calories per person per day and wheat provides 148 calories per person per day. On the production side, maize is the most produced cereal in Africa, while wheat is the third most produced cereal. Together, maize and wheat comprise more than half of all cereals production in

⁴ Cereals consumption and production data is from the year 2001 and found on FAOSTAT, the online database of the Food and Agriculture Organization.

Africa. They are important to the incomes of many rural households. As they are significant both in production and consumption, changes in the crops' prices will have both negative and positive effects.

Meanwhile, wheat and maize are heavily subsidized in the developed countries that are most important to Africa's cereals trade. For example, according to Dimaranan, Hertel and Keeney (2003), 35% of the wheat imported into African countries originates from the United States, and 33% is from the UK. In addition, the United States dominates international trade in maize. The United States produces more than 40% of the world's maize (2003), while subsidizing maize production to the extent that subsidies account for 47% of maize farm income and U.S. maize is sold abroad at 20-33% below the cost of production (Wise 2004). In 2001, the United States exported 225,755 metric tons of maize to sub-Saharan Africa, accounting for 25% of all maize imported by sub-Saharan African countries (FAOSTAT 2004).

2.2 How Would Cereals Prices Respond to Subsidy Removal?

Developed countries' domestic support encourages the overproduction of cereals, which depresses cereal prices. There is evidence that even the supposedly benign Blue and Green Box programs in the US, UK and EU increase production, although the effect is smaller than that of Amber Box programs. Rae and Strutt (2003) argue that farmers are "generally risk averse" so any assistance that lowers the farmers' risks, such as crop or revenue insurance, will encourage the farmer to produce. These programs decrease revenue variance, soften debt constraints, protect against bankruptcy, increase investments that will increase future production, and "move farmers to less risk-averse regions of their utility functions." Rae and Strutt cite Westcott and Young (2000), who examined Blue and Green Box programs in the United States and found that

production flexibility contracts, crop and revenue insurance, marketing loans and disaster assistance all “marginally” increase exports. However, Burfisher, Robinson and Thierfelder (2003) contend Blue and Green Box programs’ effect on production is small; they found that a 50% increase in direct payments, a type of Blue Box subsidy, would increase production by only 1%.

Subsidies allow grains such as wheat, rice and maize to be sold at prices that are below the cost of their production. For instance, Tyers and Anderson (1992), cited in Valdes and Zietz (1995), say that due to industrialized countries’ agricultural policies, world prices for wheat are 11% lower, world prices for rice are 14% lower, and world prices for coarse grains are 2% lower than they would be in the absence of subsidies. Examining cereals production in the United States, Oxfam (2002) found that US wheat is priced 46% below the cost of production and US maize sells internationally at 20% below cost.

We expect these prices to rise if the distortions are removed. Many factors affect commodity prices; it is difficult to predict the extent to which the new agreement will increase prices. Valdes and Zietz (1995) note that for decades, agricultural prices have shown a downward trend. During the first Agreement’s implementation, world prices in agriculture declined. However, if the new agreement leads to a decrease in production, then prices would increase.

Table 1 demonstrates the dramatic variety in estimates of the cereals price changes that would occur with agricultural market liberalization. Rae and Strutt predict only small increases in price, even if tariffs and export subsidies are removed as well as domestic support. On the other hand, Bouët et al. predict percentage changes that are twice as large, given only a 55%

subsidy removal. The range of estimates underscores the difficulty of predicting movements in agricultural prices. However, all predict that the price change would be positive.

Table 1. Predicted Cereals Price Increases from Global Domestic Support Removal

Authors	Product	Policy	% Price Change
Diao, Somwaru, Roe 2001	Wheat	All domestic support removed	12.6
Ibid.	Rice		2.5
Ibid.	Other grains		13.1
Burfisher 2001, citing Diao, Somwaru, Roe, 2001	Wheat	OECD subsidies removed	12.0
	Rice	OECD subsidies removed	2.4
Ibid.	Other grains	OECD subsidies removed	12.2
Ibid.	Wheat	OECD subsidies halved	4.91
Ibid.	Rice	OECD subsidies halved	.26
Ibid.	Coarse grains	OECD subsidies halved	5.5
Rae and Strutt, 2003	Wheat	Tariffs & dom. sup. removed	5.92 (4.79)
Ibid.	Rice	(contribution of domestic	1.03 (.49)
Ibid.	Other grains	support in parentheses)	6.13 (5.45)
Bouët et al	Wheat	55% decrease in all dom. sup.	6.39
Ibid.	Rice		11.74
Ibid.	Other grains		
Anderson, Hoekman, Strutt, 2001	Agriculture	Full liberalization, all countries	4.3
Ibid.	Agriculture	Full lib., developed cos. only	4.7
Burfisher, Robinson, Thierfelder, 2003	Agriculture		12.5

2.3 Would a Reduction in OECD Support Benefit Africa?

Several studies have tried to quantify the welfare effects of developed countries' agricultural trade liberalization for both developed and developing countries. Most studies draw upon the successive versions of the Global Trade Analysis Project general equilibrium model developed at Purdue University. The first studies based on the GTAP model argued that developing countries' welfare would increase if all countries removed barriers to agricultural trade, including domestic support. For instance, Anderson, Hoekman, and Strutt (2001) predicted a gain of \$10.4 billion for developing countries if OECD countries remove domestic

support, tariffs, and export subsidies in the agricultural sector. Anderson et al. (2000), approaching the same question with an updated version of the GTAP model, found a similar positive effect, a gain of \$11.4 billion for low-income countries if high-income countries reform agricultural trade policies.

However, these studies do not address whether it is the removal of domestic support, rather than the removal of tariffs, that drives their results. Diao, Somwaru, and Roe (2001), also used a variant of the GTAP model to estimate the welfare effects that would occur if OECD countries removed tariff, export subsidies, and domestic support; an interesting aspect of this paper is that they calculated the contributions of each policy reform to the overall price change. For instance, they find that the elimination of domestic support in OECD countries would account for 30% of the rise in prices that would occur if all agricultural trade distortions were removed. They also find that although the removal of OECD tariffs would create small welfare gains for developing countries, the removal of OECD domestic support and export subsidies would create a small loss for developing countries. These results are consistent with the recent study by Rae and Strutt (2003), who apply four simulations of agricultural policy reforms to an updated version of the GTAP model. For each of the three simulations that involve the reduction of domestic support, they find that this reduction contributes negatively to the overall welfare effect of that policy reform. In addition, Rae and Strutt predict that developing countries' welfare would increase by \$2 billion if developed countries *increase* Blue and Green Box domestic support. Taken as a group, the recent general equilibrium studies suggest that the removal of OECD agricultural tariffs would benefit developing countries, but the removal of OECD domestic support would not be beneficial.

However, these studies ignore much of the heterogeneity among developing countries. In particular, changes in agricultural prices will have different effects for developing countries that are net exporters and net importers of food. Predicting the effects of policy reforms on “developing countries” as a group neglects this crucial difference. Since many of the world’s poorest countries are net food importers, it is important to understand the welfare effect of cereals price increases for this group of countries. Panagariya (2002) notes that 48 out of 63 low-income countries are net importers of food, and that 31 of the world’s 46 least developed countries are net importers of both food and agriculture. Further, of the 41 developing countries that are net exporters of agriculture, 22 are net importers of food. If cereals prices increase, we can expect net importers of food to see a decrease in their welfare. Panagariya argues that because agricultural price increases benefit exporters but not importers, the benefits of OECD trade liberalization would accrue to middle-income developing countries in Latin America and Asia, who are actual or potential exporters of currently-subsidized products. In contrast, least developed countries, which are more likely to be net food importers, will not as a group benefit from OECD agricultural liberalization. The predominance of low-income and net food importing countries in Africa implies that the region would see a decrease in welfare if cereals prices increase with the reduction of OECD agricultural trade distortions.

Recent empirical work supports this argument. Dimaranan, Hertel and Keeney (2003) apply the GTAP model to simulate various scenarios of OECD agricultural reform. They predict that Sub-Saharan Africa would lose \$126.1 million, or .42%, if OECD countries halve domestic support to agriculture. Dimaranan, Hertel and Keeney suggest that this loss is due to many African countries’ status as net importers of subsidized agricultural products.

Instead of building from the GTAP model, Soledad Bos (2003) uses a partial equilibrium approach, but also concludes that OECD subsidy reduction would lead to welfare losses in African countries. Soledad Bos calculates changes in consumer and producer surplus that would occur in the maize markets of five African countries if OECD countries were to reduce domestic support to agriculture by 100% or 50%. She finds negative net welfare changes in each of the countries she studies: Uganda, Kenya, Zimbabwe, Botswana and Mozambique. Although this is an interesting result, the scope of Soledad Bos' study is rather narrow, limited to five countries and one food crop. Section 3 of this paper builds upon Soledad Bos' study. To add to her results, I applied Soledad Bos' method to all African countries for which data is available, and looked at the results through both maize and wheat markets. Also, I make an adjustment to her method, as her method does not accurately calculate the *net* welfare effect. This is due to the fact that Soledad Bos acknowledged only two groups of actors, farmers and consumers. In measuring producer surplus, she used the farmgate price of maize, while to measure consumer surplus she used the retail price of maize. This is a flaw in her methodology, for by using separate prices, she doesn't account for the benefit that accrues to traders and processors when the price increases. Thus, her study does not measure the *net* welfare effect in the country.

Studies of net welfare changes, such as those of Soledad Bos and the others discussed in this section, share an analysis of the distributional effects of the removal of developed countries' domestic support. Much of the debate on domestic support has taken for granted the idea that because most developing countries are largely agricultural, and poor households tend to be farmers, increased agricultural prices will benefit the poor. This attitude is also common among NGOs such as Oxfam, and exemplified by Diao, Somwaru, and Roe (2001) who write that higher cereals prices are beneficial because "a majority of the poor in low-income countries

reside in rural areas where primary agriculture is a major source of income.” If it is true that high cereals prices increase the welfare of poor farmers, then poor households could benefit from OECD subsidy removal, even if the country experiences a negative net welfare effect. The prevailing argument is that higher-income urban households would bear the negative effects of cereals price increase, while poor rural households would benefit from the increase in farm incomes. The argument assumes that urban households are net buyers of cereals and farm households are net sellers of cereals.

However, simply knowing the distribution of farming households in a country is not enough to conclude that those households will be helped by higher prices. Farming households may be net sellers of cereals, or they may be net buyers, due to poverty, poor yield, or high margins between selling and purchasing prices. This paper’s fourth section explores the distribution of net-cereals-buying and net-cereals-selling households in Ethiopia. I find that a significant percentage of both rural and urban households are net buyers of cereals. These results undermine the assumption that higher cereals prices benefit poor subsistence farmers.

3. Welfare Analysis:

African Maize and Wheat Markets' Response to a Reduction in OECD Domestic Support

3.1 Concept and Method

To measure the net welfare effect of a reduction in OECD subsidies, I apply a partial equilibrium model of a cereal market in an African country. The model assumes that for each cereal market, there are three groups: farmers, consumers, and a third group that includes traders, millers and other middlemen. In the event of a price increase, some of the benefit would accrue to farmers, while the group of traders and processors would also receive some of the benefit. In contrast, consumers would face a decrease in their overall welfare if prices increase.

Figures 1 and 2 illustrate how the three groups shape the supply and demand in the market. To discuss the model, I'll use the example of maize. The graph's horizontal axis represents quantity, while the vertical axis represents the price of maize. As the price increases, farmers produce increasing amounts of maize. This relationship is illustrated by the line S_F . Traders and processors buy maize from the farmers, and then sell the maize to consumers. The line S_T illustrates the middlemen's willingness to supply maize at each price. It is higher than the farmers' line, because the middlemen purchase maize from farmers to sell to consumers. The line D represents consumers' demand for maize. At higher prices, consumers wish to purchase less maize.

Before the new Agreement on Agriculture is implemented, the world price of maize is W . Assuming that the domestic market is linked to the world price, the price of maize in the

country will be W .⁵ Thus P is the amount of maize produced before the Agreement is implemented. Also at price W , consumers wish to purchase the quantity C . In Figure 1, the net-importing country, consumers demand more maize than farmers produce. The difference between C and P is the quantity of imports into the country. In Figure 2, the net-exporting country, production exceeds domestic consumers' demand, so the difference between C and P is the quantity of exports from the country.

The world price, W , is artificially depressed due to maize subsidies in developed countries. If developed countries remove agricultural subsidies, the world price would rise to W^* . We assume that the domestic price rises by the same percentage. At the new price, traders and farmers increase their production to P^* . At the same time, consumers decrease their purchases to C^* . The new difference between P^* and C^* is smaller, as imports decrease. The new price benefits producers, but hurts consumers.

⁵ This assumption may fail in countries that receive large amounts of food aid. It would also fail in countries with significant import barriers.

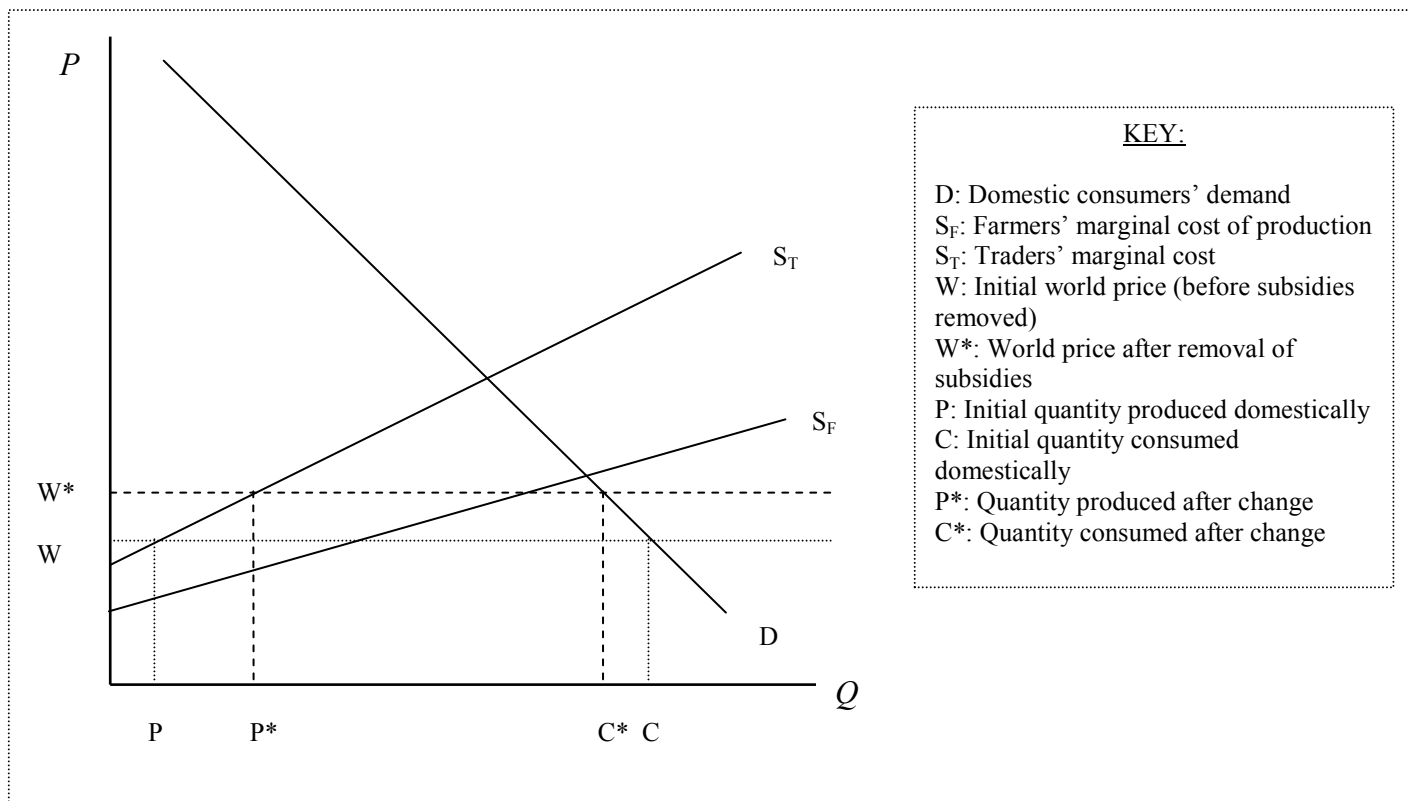


Figure 1. The market for a cereal, in a net-importing country.

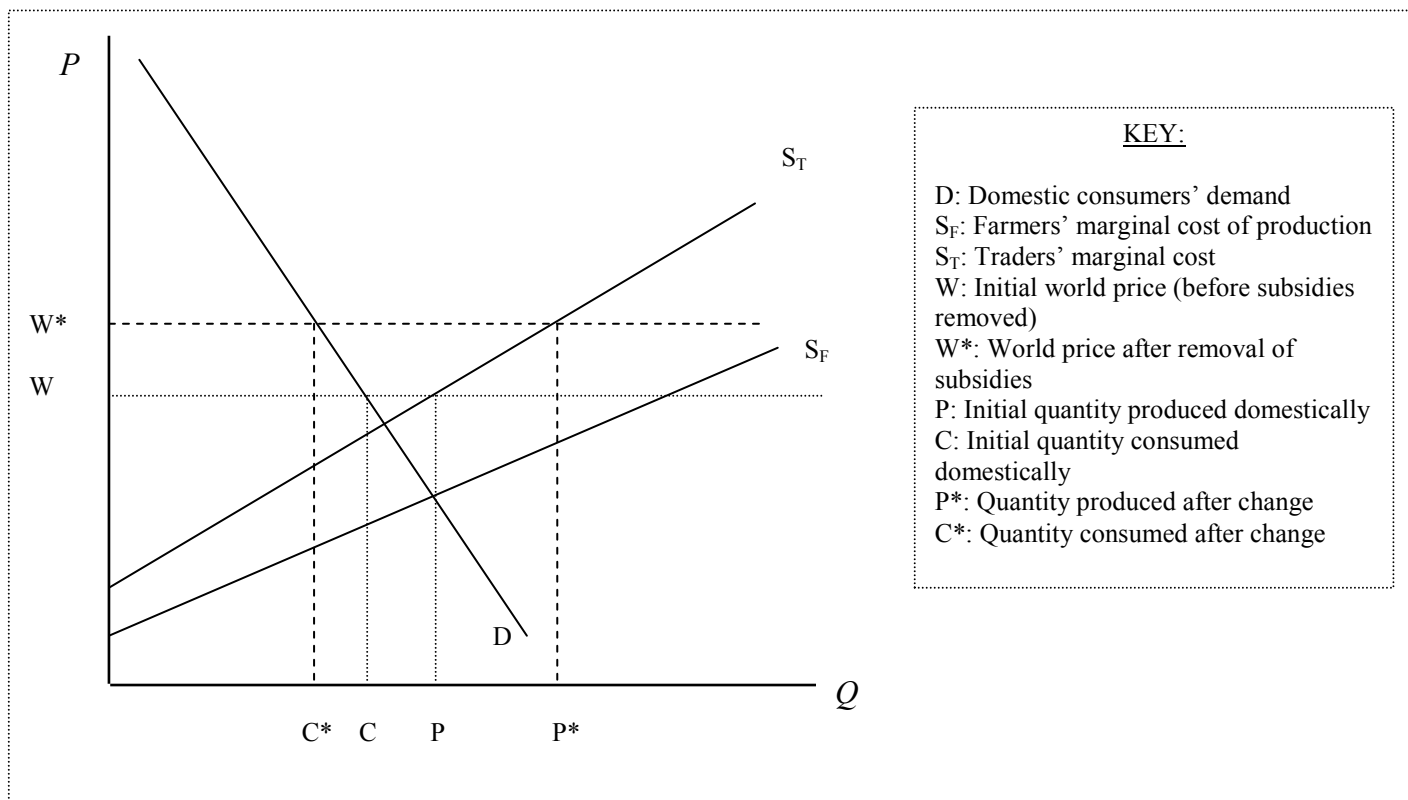


Figure 2. The market for a cereal, in a net-exporting country.

In a net-importing country, the population consumes more than it produces. Therefore, we expect the negative consumption effect to be greater than the positive production effect. In this case, the removal of subsidies would bring a net loss of welfare to the country. Most countries in Africa are net importers of maize and wheat.

In a net-exporting country, farmers' production exceeds domestic consumers' demand. If the price increases, we expect the production effect to dominate the consumption effect. In Figure 2, we see that exports, illustrated by the difference between P and C, increase when the world price increases. In 2001, four sub-Saharan African countries were net exporters of maize: South Africa, Uganda, Burkina Faso and Côte D'Ivoire. South Africa was the only net exporter of wheat in 2001.⁶

We must also acknowledge a third case. With an increase in the cereal's price, an initially net importing country can become a net exporter. Figure 3 illustrates this situation. If an initially net-importing country becomes a net exporter, the net welfare effect may be positive or negative.

⁶ Maize and wheat trade data from FAOSTAT, 2004.

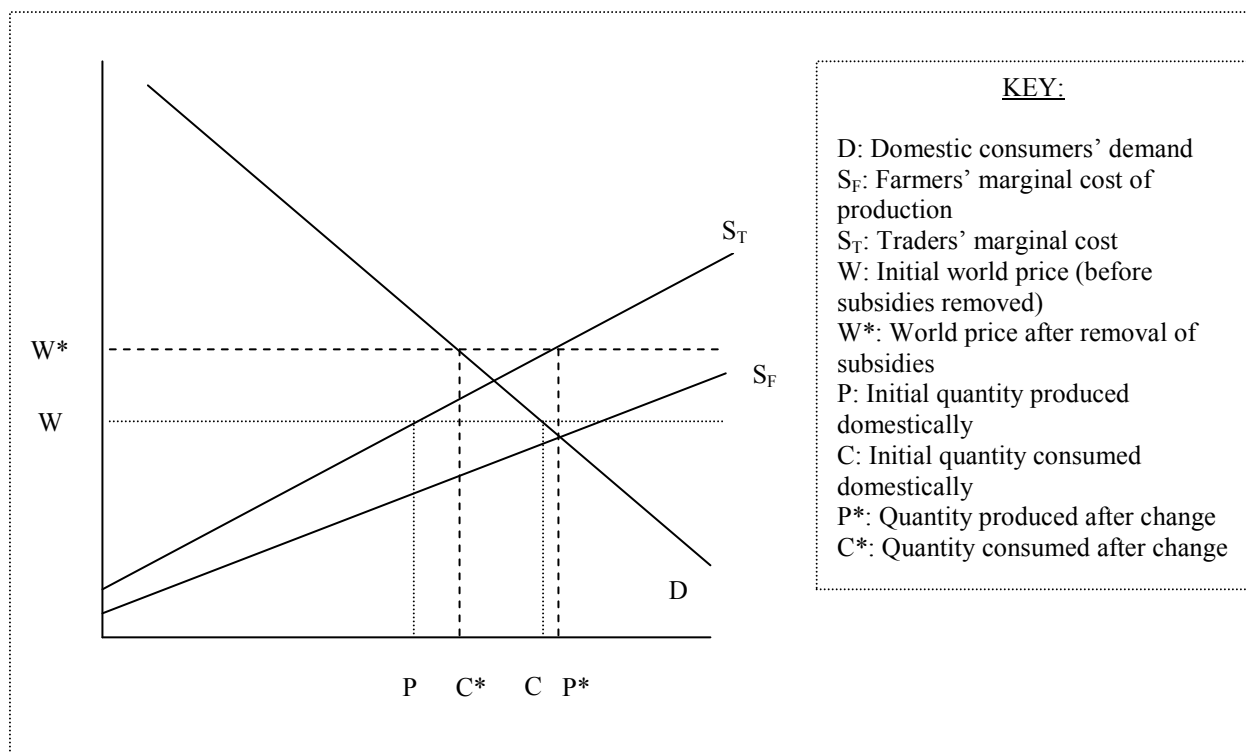


Fig. 3: An Initially Net-Importing Country becomes a Net Exporter

The magnitude of the net welfare effect depends on the magnitude of the price change, the initial price and quantity, and the consumers' and producers' sensitivity to price changes. If consumers exhibit a high elasticity of demand, then they will greatly decrease their consumption when faced with a price increase. This flexibility allows them to escape the new high price, which softens the effect. On the other hand, if consumers have inelastic demand for the good, changes in the price bring only a small response from consumers. In this case, price increases have a more harmful effect on consumers' welfare, as they don't escape the higher price by decreasing their consumption of the good. Essential goods, such as staple cereal foods, tend to be associated with inelastic consumer demand. Thus, we expect consumers to only slightly decrease their consumption of maize and wheat after subsidies are removed, so that the new price will increase the amount that consumers must spend on these staples, decreasing the money that they have available to spend on other goods. I adopt the estimate of Regmi et al (2001), who

found that low-income countries have own-price elasticities of demand for cereals of about $-.6$. The estimate is based on 1995 International Comparison Project data from 99 countries. Regmi et al. note that food demand is more elastic to price changes in poorer countries, due to the constraints on consumers' income levels.

The welfare effect also depends on the producers' sensitivity to price changes. If producers have elastic supply, then they will greatly increase production at the higher price. However, in Africa and other developing countries, there are many factors that can decrease the elasticity of supply. These include poor transportation infrastructure, and limited ability to increase productivity due to a lack of access to credit. I adopt Soledad Bos' (2003) estimate of an elasticity of supply of $.45$. A higher elasticity of supply would mean that a certain percentage increase in the price would incite a greater increase in production, while a lower elasticity of supply would mean that producers aren't very sensitive to price changes.

For this analysis, I've included traders and processors in the "producers" group, as the price increase would affect their welfare in the same way. By calculating the change in producer and consumer surpluses using a single price, I included the middlemen's surplus in my measurement of producer surplus. Although my analysis can't distinguish how much of the producer surplus accrues to farmers rather than traders or processors, my method measures the *total* welfare change for all actors. The goal of this analysis is to determine the net welfare change for the country.

To measure the net welfare change, we combine the change in producer surplus with the change in consumer surplus.⁷ *Producer surplus* is difference between the cost of producing a unit of a good, and the price at which that unit is sold. With any quantity of the good, the producer surplus is the sum of the differences between the marginal cost and the price of each unit. Thus, producer surplus increases with each additional unit, up to the point where the marginal cost equals the price. Similarly, *consumer surplus* is the difference between the price of a unit of a good, and the maximum amount that the consumer would have been willing to spend on that unit. With quantity, consumer surplus is the sum of the differences between the marginal value of each unit and the price of that unit, so consumer surplus increases with quantity until the point where the marginal value equals the price of the good.

In Figures 1-3, the initial producer surplus is the area between S_T and W .⁸ The initial consumer surplus is the area between D and W . When the price increases from W to W^* , the producer surplus increases while the consumer surplus shrinks. Figures 4-6 illustrate the changes in consumer and producer surplus that occur when the price increases to W^* . In Figure 4, the net-importing country, we see that the *negative* change in consumer surplus overlaps and exceeds the *positive* change in producer surplus. The net change is the area $abcd$, which is the amount by which the change in consumer surplus is greater than the change in producer surplus. Thus, the net-importing country experiences a net welfare loss upon the price increase. In contrast, Figure 5 demonstrates that the net change in welfare is positive in the net-exporting country. The change in producer surplus overlaps and exceeds the change in consumer surplus.

⁷ This analysis treats producers and consumers as two distinct groups, although in actuality most farmers buy some food and most net-food-buyers grow some cereals. Section 4 discusses the overlap of producers and consumers.

⁸ Note that S_T , the trader's marginal cost curve, also includes farmers' marginal costs, as the traders purchase the grain from farmers.

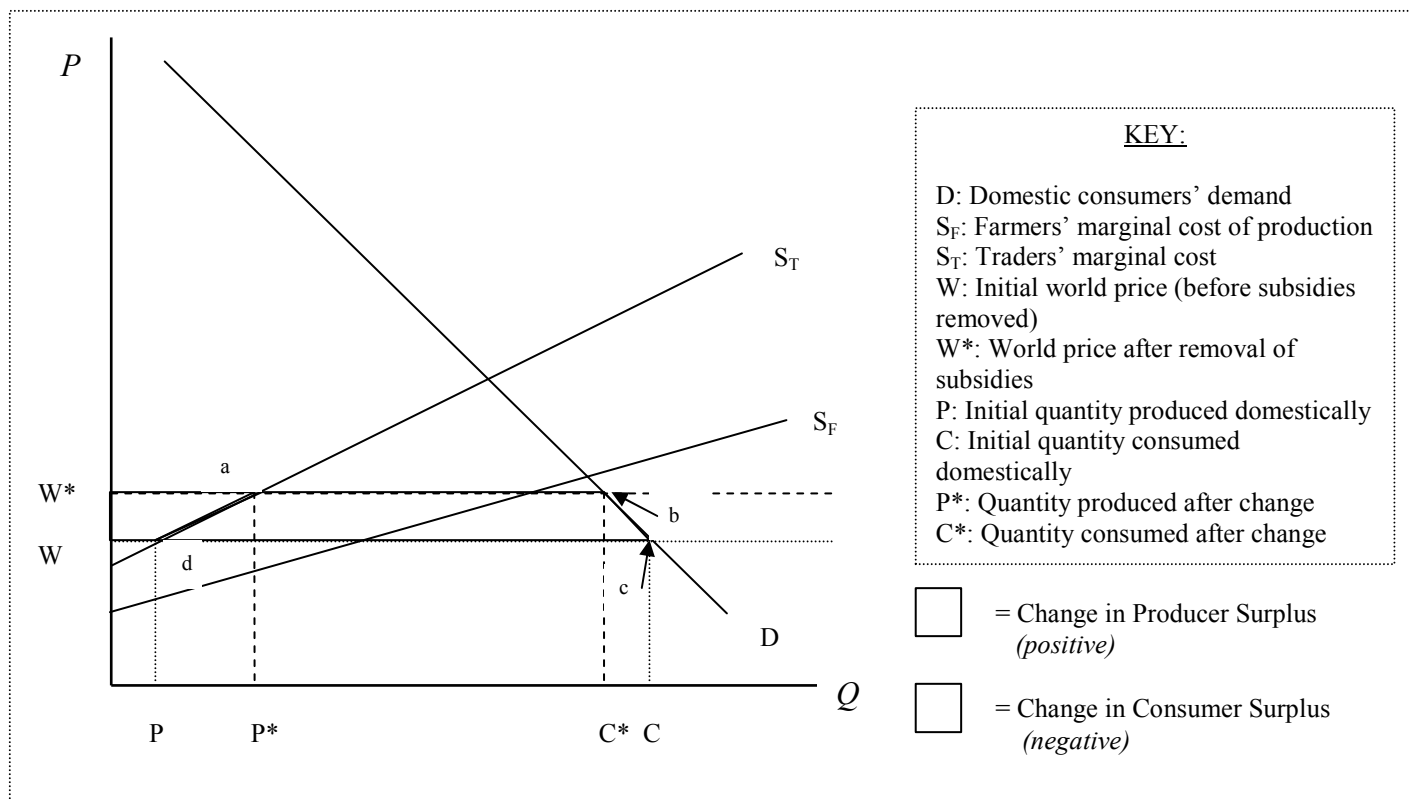


Figure 4. Change in CS and PS when price increases in a net-importing country.

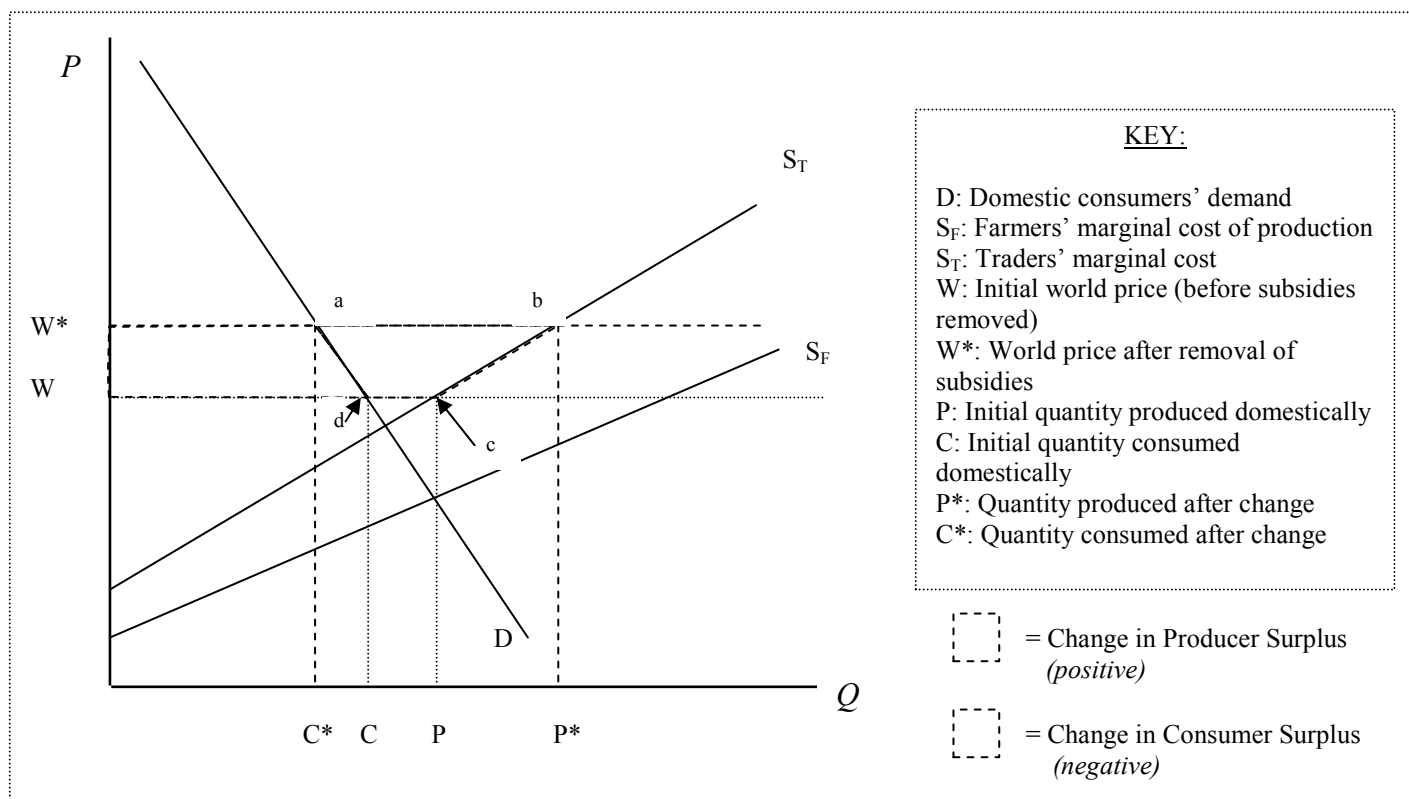


Figure 5. Changes in CS and PS when price increases in a net-exporting country.

If the price increase causes the country's net trade position to change from importer to exporter, the net welfare effect may be positive or negative. Figure 6 gives an example of each of these scenarios. In Panel 1, the country experiences a positive net welfare effect. The country in Panel 2 experiences a negative net welfare effect. In Panel 2, the country is initially more dependent on imports than the country in Panel 1. In a country where a larger proportion of the domestic supply consists of imports, the decrease in consumer surplus will be more significant than the increase in producer surplus.

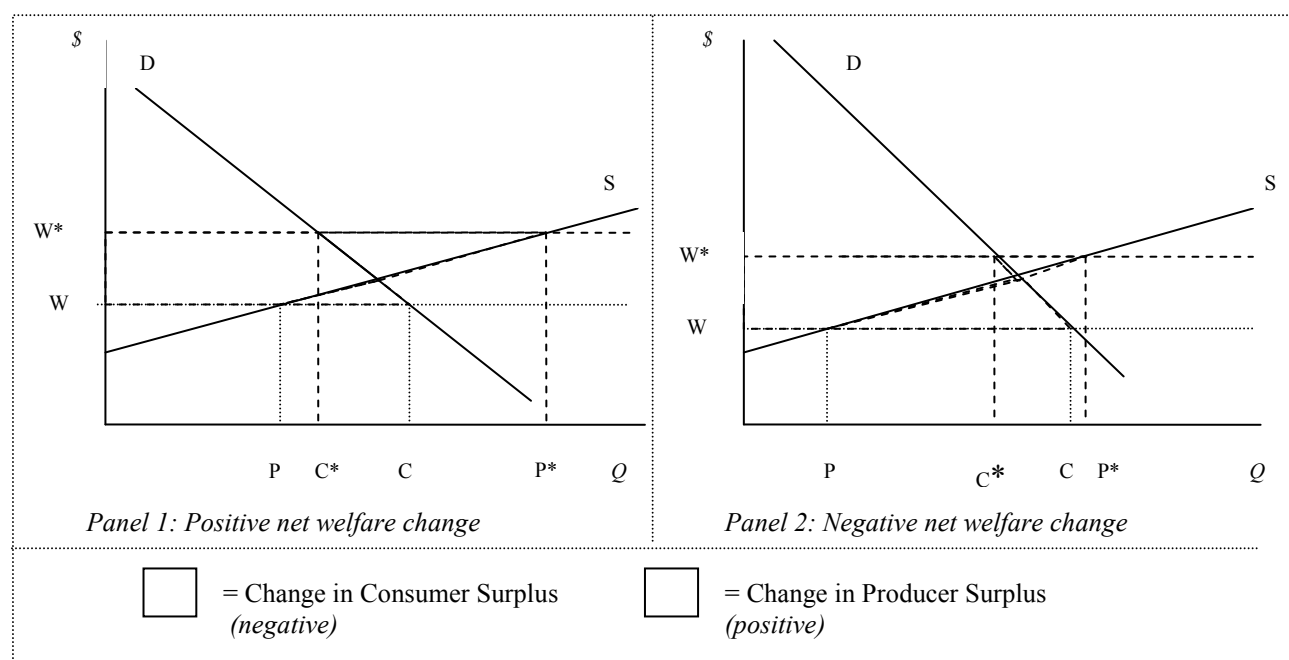


Fig. 6: Changes in CS and PS when an Initially Net-Importing Country becomes a Net Exporter

3.2 Data

The cereals consumption and production data is obtained from the Food and Agriculture Organization's online database, FAOSTAT. To build the database, the FAO relies on the information that it receives from the governments of each country, primarily through annual

FAO questionnaires. The FAO also receives data from electronic media, national publications, and the United Nations Statistics Division. If a country does not monitor certain statistics, or does not provide official data to the FAO, the FAO provides its own estimates. If the FAO can't obtain official trade data from a country, the FAO may use data from the country's trading partners. The FAO allows countries to review its estimates and will adjust them upon the receipt of better information.

For each cereal, the necessary data are initial quantity consumed, initial quantity produced, and initial price.

Initial quantity consumed: In the FAOSTAT database, this variable is “Domestic Supply” in 2001. The FAO defines Domestic Supply as:

Production + Imports - Exports + Changes in stocks = supply for domestic utilization.

For each cereal, the amount includes consumption for food, animal feed, processing, waste, and other uses of the cereal.

Initial quantity produced: FAOSTAT “Production” data for 2001. The production data include “crops harvested for dry grain only.” The data do not include wheat, maize, or rice that was harvested as hay, harvested green for food, feed, or silage, or used for grazing.

Initial price: “Import Value” divided by “Import Quantity,” which gives the value per unit of the cereal in 2001.

The FAO reports import values as c.i.f., which includes the cost of transport. South Africa, Zambia, and Zimbabwe, report import values as f.o.b., so the FAO converts the import

values from those countries to c.i.f. by inflating them 12%. Also, the trade data of the countries within the Customs and Economic Union of Central Africa excludes trade within the union.

The FAO states that its import data include food aid. This statement is inconsistent with the fact that FAOSTAT reports some countries as receiving more “food aid shipments” of cereals than “imports” of cereals. FAOSTAT obtains its data on food aid from the World Food Programme. Stevens (2003) notes that the WFP data relies on donor countries’ self-reporting of their shipments, which may be inaccurate. However, the confusion over food aid probably does not drastically distort the import data, as food aid comprises only a small percentage of total cereals imports into sub-Saharan Africa (Stevens 2003).

In addition, data on each country’s GDP is obtained from the World Development Indicators of the World Bank Group, 2001. The World Bank obtains its national accounts data from national statistical offices, central banks, and World Bank missions. The World Bank converts GDP data into dollars according to official exchange rates, except where the official exchange rates do not reflect actual foreign exchange transactions, in which case the World Bank uses an alternative conversion. The GDP data do not reflect purchasing power (PPP) differences or informal economic activity, each of which could be a source of inaccuracy in the African region.

3.3 Results

Example of a calculation of net welfare change:

Before discussing the results in more detail, it is useful to reproduce a calculation of net welfare effect for an example. We will use the example of maize in Lesotho, referring to Table 2 in Appendix A, page [#]. In 2001, Lesotho was a net importer of maize. The initial quantity

consumed, QC_0 , was 429.7 thousand metric tones (Column 1). Lesotho imported 107,748 MT of maize, valued at \$21 million. The value divided by the quantity gives our estimate of P_0 , the initial price of maize, \$194.90 per ton (Column 3).

Following the study by Diao, Somwaru and Roe, we expect the price of maize to increase 12.2% if OECD countries remove all subsidies to agriculture (Column 4). Combining the price change with the elasticity of demand,⁹ we expect the change in quantity consumed to be:

$(.122)*(-.6)*(429.7) = -31.5$ MT (Column 6). Therefore the new quantity consumed, QC_1 , is 398.2 MT (Column 2).

The change in consumer surplus is given by: $(P_0 - P_1)*[QC_1 + (QC_1 - QC_0)/2]$. This can be confirmed by referring to Figures 4-6 in Section 3.1. In Lesotho, the change in maize consumer surplus is about -\$9.84 million (Column 7).

The initial level of production, QP_0 was 102,700 MT in 2001 (Column 8). Combining the change in price and the supply elasticity, we obtain the change in quantity produced (Column 10) and the new quantity produced, QP_1 , which is 108,340 MT (Column 9).

Following Figures 4-6 in Section 3.1, the change in producer surplus is given by:

$$(P_1 - P_0)*[QP_0 + (QP_1 - QP_0)/2]$$

In Lesotho, the change in maize producers' surplus would be about \$2.5 million (Column 11). Combining the changes in producer and consumer surplus, we obtain the net welfare effect, -\$7.33 million (Column 12). The following row repeats the analysis, but uses a 5.5% price increase, to simulate a 50% reduction in OECD subsidies rather than the removal of all OECD subsidies, which is not politically feasible for the developed countries. Given a 50% removal in OECD subsidies, we would expect the net welfare effect to the maize market in Lesotho to be -\$3.42 million (Column 12).

⁹ As discussed above, the elasticity of demand is assumed to be -.6 and the elasticity of supply is assumed to be .45.

We now consider the welfare effects for the rest of sub-Saharan Africa. The full results are given in Tables 2 and 3 in Appendix A, while Tables 4 and 5 summarize the effects of a 50% removal or a complete removal of OECD agricultural subsidies. For each of the cereals, the analysis indicates that most countries experience a net welfare loss. This is not surprising, given that most African countries are net importers of these cereals.

Table 4: Net Welfare Effects Summary – MAIZE – 2001

<i>Country</i>	<i>Maize net effect (1000\$)</i>		<i>Effect of Full Removal as % GDP</i>
	<i>100%</i>	<i>50%</i>	
NET MZ. EXPORTERS:			
Burkina Faso	903.2	370.2	0.04%
Uganda	3819.7	1011.9	0.07%
Cote D'Ivoire	-2001.3	-1128.2	-0.02%
South Africa	-12683.0	-8152.3	-0.01%
NET MZ. IMPORTERS:			
Angola	-2641.3	-1352.3	-0.03%
Botswana	-1456.2	-673.6	-0.03%
Cameroon	3049.3	1149.2	0.04%
Cape Verde	-978.5	-457.8	-0.17%
Chad	-29.4	-34.7	0.00%
Djibouti	-3.5	-1.6	0.00%
Gabon	-123.8	-74.9	0.00%
Kenya	-4043.5	-2683.8	-0.04%
Lesotho	-7333.6	-3415.3	-0.92%
Malawi	-4442.4	-2848.0	-0.25%
Mali	-596.1	-316.4	-0.02%
Mauritius	-708.3	-326.1	-0.02%
Mozambique	-4475.6	-2450.1	-0.13%
Namibia	-1516.5	-703.8	-0.05%
Niger	-176.8	-81.9	-0.01%
Rwanda	-2007.6	-991.1	-0.12%
Sao Tome & Principe	-37.9	-18.9	-0.08%
Senegal	-750.7	-373.3	-0.02%
Sierra Leone	-1032.5	-488.2	-0.14%
Sudan	-131.1	-62.5	0.00%
Swaziland	-1011.6	-492.5	0.00%
Zambia	-23367.7	-11064.6	-0.64%
Zimbabwe	-9878.4	-12481.4	-0.11%
CHANGE IN STATUS:			-0.03%

Benin	1886.9	364.0	0.08%
Burundi	-8.2	-59.3	0.00%
Central African Rep.	57.9	10.1	0.01%
Dem. Rep. Congo	-630.5	-630.8	-0.01%
Ethiopia	4578.7	449.6	0.07%
Gambia	34.3	6.8	0.01%
Ghana	869.9	125.6	0.02%
Guinea	-290.1	-457.0	-0.01%
Madagascar	127.5	-10.7	0.00%
Mauritania	-7.5	-7.9	0.00%
Tanzania	47.9	-1510.4	0.00%
Togo	-73.5	-168.5	-0.01%
<i>Sub-Saharan Africa Total:</i>	-67061.8	-50030.5	--
<i>Mean:</i>	-1719.5	-1282.8	-0.06
<i>Median:</i>	-290.1	-326.1	-0.01
<i>Greatest Loss:</i>	-23367.7	-12481.4	-0.92
<i>Greatest Gain:</i>	4578.7	1149.2	0.08

Maize:

In the case of maize, the average result was a welfare loss of about \$1.7 million with a 100% OECD subsidy removal, and a loss of about \$1.2 million with a 50% removal. Thirty-one of the 39 countries experience losses and eight see a net benefit. The most surprising results are the net losses for South Africa and Cote d'Ivoire (each of which was a net exporter of maize in 2001, according to FAOSTAT), while Ethiopia and Cameroon, net importers of maize, experience positive effects. In fact, these results may be due to erroneous data.

In general the results are mostly as expected, with importers losing, exporters gaining, and status-changers either gaining or losing. In every country, the loss or gain was less than 1% of its GDP. The largest negative effect, \$23.4 million, was in Zambia. This represents .6% of Zambia's GDP. As a percentage of GDP, Guinea sees the most significant loss, just under 1% of its GDP. The most positive effect was in Ethiopia, but the amount was only .08% of its GDP. The combined effect for Africa as a whole was a \$67.1 million loss.

In general, the 50% subsidy removal has a softer effect than the full removal, decreasing the magnitude of the negative effects but also limiting the gains for the countries that experience positive effects. Tanzania and Madagascar experience a small positive effect with a 100% subsidy removal, but negative effects from a 50% removal. This can be understood in the context of Figure 6 in Section 3.1. Consider the effect if W^* in Panel 1 rose just half as far above W as it does in the Figure – the net welfare effect would then be negative. With a 50% removal, the price change is not large enough to make the increase in production more significant than the decrease in consumption.

These results are consistent with those of Soledad Bos, who predicted that most African countries would see a negative welfare change from the maize price increase if OECD subsidies are removed. However, where Soledad Bos found a welfare loss in Uganda, I found a gain. This is due to her decision to calculate welfare using separate consumer and producer prices. Soledad Bos' method discounts the gains to traders and other middlemen in the process of bringing maize to the market, which underestimates the positive effects of a price increase.

Table 5: Net Welfare Effects Summary – WHEAT – 2001

<i>Country</i>	<i>Wheat net effect 1000\$</i>		<i>Effect of Full Removal as % GDP</i>
	<i>100%</i>	<i>50%</i>	
NET EXPORTERS:			
South Africa	4273.7	1188.7	0.00
NET IMPORTERS:			
Angola	-4671.0	-1954.3	-0.05
Benin	-923.5	-386.2	-0.04
Botswana	-1839.7	-769.6	-0.04
Burkina Faso	-1024.4	-428.4	-0.04
Burundi	-299.8	-130.7	-0.04
Cameroon	-7809.6	-3266.1	-0.09
Cape Verde	-401.1	-167.7	-0.07

Central African Rep.	-765.0	-319.9	-0.08
Chad	-1014.9	-425.4	-0.06
Comoros	-281.3	-117.6	-0.13
Dem. Rep. Congo	-4502.6	-1884.7	-0.09
Rep. of Congo	-1833.6	-766.8	-0.07
Côte d'Ivoire	-4753.5	-1987.9	-0.04
Djibouti	-1149.6	-480.8	-0.20
Eritrea	-3298.4	-1384.3	-0.48
Ethiopia	-18734.4	-8274.6	-0.30
Gabon	-1310.1	-547.8	-0.03
Gambia	-386.0	-161.4	-0.10
Ghana	-7069.8	-2956.6	-0.13
Guinea	-2118.3	-885.9	-0.07
Guinea-Bissau	-299.4	-125.2	-0.15
Kenya	-17665.4	-7500.7	-0.16
Lesotho	-461.8	-199.4	-0.06
Liberia	-1711.2	-715.6	-0.33
Madagascar	-1543.4	-648.0	-0.03
Malawi	-1426.1	-596.9	-0.08
Mali	-1870.5	-785.5	-0.07
Mauritania	-5703.9	-2385.5	-0.57
Mauritius	-1550.6	-648.5	-0.03
Mozambique	-2176.6	-910.4	-0.06
Namibia	-984.4	-412.9	-0.03
Niger	-1479.2	-620.9	-0.08
Nigeria	-33317.9	-13946.5	-0.08
Rwanda	-427.1	-182.8	-0.03
Sao Tomé & Príncipe	-129.5	-54.2	-0.28
Senegal	-5830.8	-2438.4	-0.13
Seychelles	-102.9	-43.0	-0.02
Sierra Leone	-1683.5	-704.0	-0.22
Sudan	-7669.7	-3282.3	-0.06
Swaziland	-655.3	-274.2	-0.05
Tanzania	-6273.2	-2653.0	-0.07
Togo	-1800.0	-752.8	-0.14
Uganda	-1314.9	-558.1	-0.02
Zambia	-2040.0	-886.8	-0.06
CHANGE IN STATUS:			
Zimbabwe	-64.3	-125.9	0.00
Sub-Saharan Africa Total:	-158094.6	-67559.6	--
Mean:	-3436.8	-1468.7	-0.11
Median:	-1547.0	-648.3	-0.07
Greatest Loss:	-33317.9	-13946.5	-0.57
Greatest Gain:	4273.7	1188.7	0.00

Wheat:

The removal of subsidies to wheat also resulted in mostly negative effects in my analysis. Only one country, the sole net exporter South Africa, experiences a positive effect. With a 100% subsidy removal, the mean effect is -\$3.4 million and the median effect is -\$1.5 million, with a total effect of -\$158 million over the 46 countries. However, the effects appear to be fairly insignificant compared to each country's GDP. The results aren't surprising, as wheat makes up 60% of Africa's cereals imports but only 15% of cereals production; most countries are net importers and more wheat is consumed than produced in Africa.

These results for wheat and maize are consistent with those of Rae and Strutt (2003), who found that developing countries would see a decrease in welfare if developed countries reduce domestic support to agriculture. Rae and Strutt highlight countries' net food importer status as a primary reason for the welfare loss. In addition, the effects' small magnitude is consistent with Valdes and Zietz (1995) who predicted that welfare changes due to reductions in domestic support would be less than 1% of countries' GDP.

Factors Affecting the Results

For this analysis I've applied others' estimates of the elasticities of supply and demand. I now consider how adjusting the elasticities would affect the results. First, if we would like to assume that consumers' demand for cereals in low-income countries more closely resembles that of consumers in high-income countries, we decrease the elasticity of demand to reflect a less-flexible consumer response to the price change. If we decrease the elasticity of demand to -.3, then the results are not greatly changed. In general, the results are more negative, and the

positive effects decrease. One country, Tanzania, changes from a positive to a negative effect. These changes are due to the larger decreases in consumer surplus that occur when consumers are less flexible in their spending. In contrast, if we double our original elasticity of demand, the results become more positive, because the decrease in consumer surplus is softened by consumers' substitution to other foods. With an elasticity of -1.2 instead of -.6, seven countries display positive rather than negative effects. With a more moderate increase to -.9, only four countries change from negative to positive effects: Burundi, Guinea, and Togo with a 100% subsidy removal, and Madagascar with a 50% subsidy removal.

In addition, it is possible that the estimate of elasticity of supply is too low. If we increase the elasticity of supply to .6, reflecting a greater capacity for producers to respond to the price increase, then the results become more positive. Burundi and Togo display positive, rather than negative net effects. If we further increase the elasticity of supply to .9, then Chad, Guinea, and Madagascar also display positive results.

In the long run, the elasticities of supply and of demand will be greater than in the short run. With time, consumers and producers are more able to change their activities in response to the change in prices. Changes in the relative prices of cereals should also lead to changes in consumption and production patterns, which maximize the benefit and mitigate the negative effects of price increases in cereals that are heavily imported such as wheat and maize.¹⁰ Currently, sorghum and millet account for about 22% of cereals consumption in Africa, while maize, wheat and rice together account for about 72% of African cereals consumption. If maize

¹⁰ Some argue that in the long run, the higher price increase will create an incentive to overcome current barriers to production, such as poor transportation infrastructure, to the extent that countries that are currently net importers of cereals would become net exporters of cereals.

and wheat become more expensive relative to other cereals, we would expect consumption of millet and sorghum to increase. We would also expect production to increase as these cereals become more lucrative for farmers.

To simulate the passage of time, we increase the elasticities of demand and supply to $-.9$ and $.6$ respectively. In this scenario, Burundi, Chad, Guinea, Mauritania, Madagascar, Mauritania, and Togo show positive rather than negative results. For a more optimistic long-term scenario, we double both the elasticities, to -1.2 and $.9$. The effects become more positive, but no additional countries show positive rather than negative results.

From these exercises, we conclude that the elasticities affect the results, but they do not change the conclusion: even doubling the elasticities, more countries experience negative effects than positive effects. The countries that change status when we adjust elasticities are countries that produced nearly as much maize as they consumed in 2001, or consumed very little maize.

The results could also be affected by inaccuracies in the FAOSTAT data. As noted in Section 3.2, the FAO relies on countries' own reports, or on its own estimates, to build the FAOSTAT database. For some African countries, the data are not highly reliable. Also, countries do not necessarily retain the same net exporter/importer status from year-to-year; the status could change due to market conditions or due to errors in certain years' data. To consider the effect of data errors or year-to-year changes in net trade position, I examined the FAOSTAT year 2000 data on net trade position. Some changes do occur: it appears that Burkina Faso, Malawi, Nigeria, South Africa, Zambia and Zimbabwe were net exporters of maize in 2000 while Uganda was a net importer. In addition, Zimbabwe was a net exporter of wheat in 2000

but not in 2001. However, these are not drastic differences in the numbers of net cereals exporters and importers, so the conclusion remains: most countries in sub-Saharan Africa are net importers of wheat and maize, and can expect to experience net losses if cereals prices increase.

Food Aid:

The analysis doesn't include the impact of food aid. In some countries in Africa, a significant percentage of the cereals imports arrive in the form of food aid. According to FAOSTAT data, food aid only accounts for about 5% of African cereals imports (Stevens 2003). Although it comprises a small percentage of total cereals imports into Africa, food aid is significant in certain countries. In the years 1997-2001, more than thirty countries received some aid and seven countries received greater than 50% of their imports as aid for at least one of those years.¹¹ In 2001, five countries received greater than 100,000 MT of cereals aid shipments: Ethiopia, Eritrea, Mozambique, Angola, and Kenya. In addition, seven countries received more than 50% of cereals imports in the form of aid in 2001: Burundi, Eritrea, Rwanda, Sao Tomé and Principe, Uganda, Zambia, and Zimbabwe.

Consumers in countries that receive significant amounts of food aid are partially insulated from fluctuations in the world price of cereals, since they receive some of their food for free or as wages in food-for-work programs. The change in consumer surplus that I found above would be less accurate in countries that receive a significant amount food aid, since an increase in the world price of cereals wouldn't change the price that aid-receiving families pay for that food.

¹¹ FAOSTAT provides data on food aid receipts and on total imports. However, it is difficult to determine the percentage of imports that are food aid. According to FAOSTAT, its "imports" data include food aid receipts; however it is unclear from the data whether this is actually the case. Stevens (2003) mentions the issue but assumes that the FAO is correct on this point.

However, if developed countries reduce agricultural subsidies, cereals production will decrease. This suggests that there will be less surplus grain in major donor countries. An Oxfam study (2002) notes that historically, wheat donations decrease in years that the price of wheat increases. A decrease in food aid would add to the negative welfare effect for consumers in aid-receiving countries.

If we exclude the major recipients of food aid from the analysis (the 11 countries listed above) the overall results do not change, as the countries above displayed a mix of positive and negative results.

Additional Considerations:

This analysis is subject to the weakness of partial equilibrium approaches, which is that it does not account for factor market effects. In particular, an increase in cereals prices would also increase agricultural wages, which could be important in countries where agricultural labor is a significant source of income.¹² The analysis also doesn't consider the interaction between agriculture and other sectors, or the macroeconomic effects such as the effect of increased or decreased cereals imports on the exchange rate. General equilibrium studies have attempted to account for these interactions, but they have done so at the expense of the commodity-level of detail provided here. In addition, the partial equilibrium approach allows for a simple and transparent model.

¹² However, in many countries in Africa, such as Ethiopia, agricultural wages are not a significant source of income. See Section 4 of this paper, Table 9: only .8% of rural survey respondents work as agricultural laborers.

Most important, the net welfare effect does not tell us about the cereals price increase's effect on the poor. If the poor are predominantly rural farmers, then we may expect the decrease in OECD subsidies to benefit the poor by augmenting farmers' income. This is a natural argument, but the answer doesn't end there. The effect on a household of a price increase in maize or wheat will depend on the household's status as a net buyer or seller of the good. The next section examines the distribution of net buyers and sellers of maize and wheat in Ethiopia, in order to predict which households stand to gain or lose from the price changes incited by OECD subsidy removal.

4. But Would it Help Poor Farmers?

A Discussion of Net Buyers and Sellers of Wheat and Maize in Ethiopia

The argument against subsidies is centered on the notion that since the majority of the world's poor are farmers, and most of the world's farmers are poor, then policies that depress agricultural policies must harm the poor. Advocates for subsidy removal, such as Oxfam and other international organizations, highlight facts such as: 96% of the world's farmers live in developing countries, and in African countries 70-80% of the population is engaged in agriculture (Oxfam 2002). In African countries, urban areas tend to be wealthier than rural areas, and the poor are predominantly farmers. Thus, the basic argument is that even if the net welfare effect for a country is negative, most of the harm would be borne by relatively better-off urban residents, while rural farmers would benefit from higher cereals prices. However, understanding the distributional consequences of a cereals price requires more information just determining which households are cereals farmers. A serious flaw in the anti-subsidies debate is that it assumes that farmers necessarily benefit from higher prices.

In reality, “producers” and “consumers” are not two distinct groups. An individual or a household could belong to both groups. Households can buy or sell a certain grain, or they can engage in both buying and selling. A farming family can find it necessary to buy grain to cover the household's food needs. For instance, in Ethiopia, where most rural households mainly support themselves through farming, most households surveyed report that their crop does *not* feed the household for the entire year.¹³ Thus, most maize and wheat-growing households are

¹³ According to the 2000 Welfare Monitoring Survey report, in Ethiopia 54% of households' crops feed the household for six months or fewer.

consumers, as well as producers, in the market. A household that produces surplus grain during the harvest season may buy grain later in the year.

To illustrate, consider a rural household that grows maize. At harvest, the household sells some of its crop, while saving some to feed the household. Their maize store lasts almost until the next harvest, but to tide the family over, they purchase some maize outside the home. However, they purchase a small amount of maize compared to the amount they grew and sold. The household is a net seller of maize.

Consider a second rural household that also grows maize, but owns less land or had a smaller yield than the first household. The household sells some maize at harvest time. A few months later its own maize store is exhausted and for the rest of the year the family must purchase maize. The household purchases more maize than it grew, so it is a net buyer of maize.¹⁴

A household is a net buyer of a grain if its expenditure on the grain is greater than its income from the grain. Thus, a household can be a net buyer of maize even if it sells a greater quantity than it purchases. This is due to the margin between the price farmers receive and the final price that consumers pay in the market. For example, consider a household that sells most of its crop at harvest time. It is obligated to do so because of a need for cash to pay debts, school fees, or any other expenses. This is not an uncommon situation; Desselegn et al. (1998) report that 79% of grain sales in Ethiopia occur at harvest time. Households buy grain at a higher price than they receive from selling grain. If the price difference is significant, the household's

¹⁴ Note that "income" includes the value of households' production that they consume themselves rather than sell.

expenditure on grain could be greater than its income, even if the quantity purchased is less than the quantity sold.

Why does it matter whether a household is a net buyer or seller of maize? The effects of a price increase are a small-scale version of the difference between net-importing and net-exporting countries explored above. If the price of maize rises, net buyers of maize will face a welfare loss. Assuming that consumer and producer prices change by the same percentage, the increase in the household's food bill will be greater than the increase in its income.¹⁵ On the other hand, net-selling households will benefit from the price increase. The increased value of their own maize offsets the higher price they must pay for maize in the market.

Knowing which types of households are net buyers or net sellers of grain can help predict the distributional consequences of a price increase. We saw in the previous chapter that most African countries can expect a small welfare loss if the prices of certain cereals were to increase; but the effect on the poor can't be determined from the country's net welfare effect alone. If most net buyers of grains are higher-income urban dwellers, and most net sellers of grains are poor rural farmers, then the price increase would be relatively better for the country's poor. On the other hand, if most of the poor are net buyers of grain, then the country should be concerned if cereals prices increase.

This section examines the distribution of net buyers and net sellers in Ethiopia. Ethiopia is a heavily agricultural country, with the majority of the population engaged in farming.

Agricultural activities provide 46% of its GDP, 86% of its population is rural and nearly 90% of

¹⁵ In reality, it is unlikely that retail and farmgate prices change in harmony. Section 4.4 addresses the reasons and consequences of this.

the rural population report that farming provides their main source of income (Degefe et al. 2002; CSA 2001b). Yet, as we have discussed, the state of being a cereals farmer does not guarantee that one is a net seller of cereals. The simple assumption that farmers benefit from cereals price increases could be a dire mistake in the case of Ethiopia, a country facing widespread poverty and food insecurity. With a per capita GDP of \$123, Ethiopia is one of the poorest countries in Africa.¹⁶ The country is classified as “very food insecure” in the Diaz-Bonilla et al. classification (Soledad Bos 2003). According to the FAO, per capita food supply is just 1887 calories per day (FAOSTAT 2004).

In Ethiopia, cereals are significant both in consumption and household income. On average, cereals provide 68% of Ethiopians’ daily calorie intake. The most widely consumed grains are teff and maize. In some regions maize is consumed in greater quantities than teff, while in others teff is the major staple. Other commonly consumed grains are wheat and sorghum. On the income side, maize is the second most common source of agricultural income, after livestock, while teff is an income source for nearly a quarter of sedentary rural households.

Teff is an important food crop in Ethiopia, but it is not extensively grown or consumed in any other country. It is not widely grown or subsidized in wealthy countries in the manner of maize and wheat. The importance of teff in Ethiopia suggests the possibility that maize-dependent families would increase their consumption of teff relative to maize and wheat if the prices of maize and wheat increase. However, teff is relatively expensive compared to other cereals in Ethiopia, especially maize.

¹⁶ Data from 2001, in 1995 dollars; World Development Indicators online database, World Bank, 2004.

In this section, I use data from two household surveys to examine the distribution of net buyers and net sellers of maize and wheat, by household expenditure, household income source, and geographic location. The results show that the majority of poor households, and even a large percentage of rural farmers, are net buyers of these grains and thus would be vulnerable to hardship if maize and wheat prices were to increase.

4.2 Data

The data include two surveys that Ethiopia's Central Statistical Authority concurrently administered in 1999-2000, the Welfare Monitoring Survey (WMS) and the Household Income, Consumption and Expenditure Survey (HICES). The WMS and HICES are representative samples of the sedentary population of Ethiopia. They exclude the nomadic populations of the Somali and Afar regions. The WMS covered 25,917 households and 123,735 individuals. The HICES covered 17,332 households. About 16,000 households were included in both of the surveys.

The WMS is divided into two sections, one of which asked about individuals in the household; the other refers to the household as a whole. The survey asked about the respondents' health, educational status, asset ownership, expenditure and income. The income and expenditure questions on cereals include maize, wheat, teff, sorghum and barley. The HICES covered data on the households' expenditure and income, in more detail than the WMS.

¹⁷ The HICES provides the measure of the household's total expenditure; all other data in this paper is provided by the WMS.

The dataset used for this paper includes households that were included in both surveys. The dataset excludes households that do not have a complete household roster, or if the roster is missing household members' age or sex (which are necessary for determining the number of adult equivalents in the household). I have also excluded households that give inconsistent values for household size in the HICES and WMS. This leaves 15,944 households for which I was able to calculate household expenditure, per capita and per adult equivalent.

The WMS was conducted from January to February, 2000. Thus, its variable for six-month income covers the main harvesting season, which is September to December.

Table 6 provides a summary of household characteristics measured by the surveys. Total household expenditure is given by the HICES while all other variables in Table 6 are provided by the WMS. In particular, notice widespread ownership of land and cattle, relatively far average distances to various facilities, and sparse ownership of luxury goods such as televisions, refrigerators, and automobiles as well as high-tech farming equipment such as tractors and sprayers.

Definitions:

Income: Income is defined to include the value of "domestic consumption of own crops and own livestock and livestock products, domestic consumption of goods and services

¹⁷ The HICES was conducted in two rounds, the first in August 1999 and the second in January-February 2000. This was to account for the harvest and non-harvesting seasons.

purchased for resale or produced or processed in the household enterprise other than agriculture, wages and salaries, allowance, overtime, bonus, pension, commission, discounts (i.e. concessions obtained), imputed rent of free housing (i.e. subsidized amount only), imputed rent of owner-occupied housing, other employee's benefit, interest received, profit and dividend received, remittance (regularly received), value of items obtained free (i.e. firewood, water, etc.), rent of personal possessions, alimony (regularly received) and other types of income.” (CSA 2001b). Although the Central Statistical Authority's definition states that “income” includes the value of the household's consumption of its own production, it appears that the data do not include the value of domestic consumption of own crops in either the income or the expenditure variables.

Expenditure: The Central Statistical Authority defines *domestic expenditure* as “total expenditure incurred by the household or any of its members and includes expenditure on consumption as well as non-consumption items.”

Household Expenditure Per Capita: The household expenditure divided by the number of persons in the household.

Household Expenditure Per Adult Equivalent: Calculating household expenditure based on adult equivalents, rather than the number of persons in the household, allows us to account for the difference in consumption across ages and genders. Each member of the household is converted to an adult equivalent by the following scale:¹⁸

¹⁸ Thanks are due to Julie Schaffner for providing the adult equivalency scale and regional index programs for Stata. The adult equivalency program is based on East African adult equivalency scale by Stefan Dercon.

<u>Adult Equivalent Scale:</u> ¹⁶	
Male or female, age 0-1	.4
Male or female, age 2-3	.48
Male or female, age 4-6	.56
Male or female, age 7-8	.64
Male or female, age 9-10	.76
Female, age 11-12	.8
Male, age 11-12	.88
Male or female, age 13-14	1
Male, age 15-18	1.2
Female, age 15-18	1
Male, age 19-59	1
Female, age 19-59	.88
Male, age 60-98	.88
Female, age 60-98	.72

Regional Expenditure Adjustment: The household expenditure per adult equivalent has been deflated by an index that accounts for differences in prices in the regions. This allows us to more accurately compare expenditure of households across regions.

Expenditure Quintiles: Expenditure quintiles are calculated from the household's expenditure per adult equivalent, then deflated by the regional price index. Total annual expenditure is given by the HICES, while adult equivalents are calculated based on the household rosters in the WMS. Table 8 presents household expenditure per adult equivalent quintiles. The poorest quintile spends between 219 and 932 birr per adult equivalent per year.

Urban and Rural: In Ethiopia, the sedentary population is about 14% urban and 86% rural (CSA 2001a). The Central Statistical Authority's definition of *urban* includes the capitals of Regions, Zones and Weredas, any locality that is within an Urban Dweller's Association (or Kebele), any locality with 2000 or more residents, and any locality with 1000 or more residents

whose residents are “primarily engaged in non-agricultural activities.” The dataset includes 7,826 urban and 8,118 rural households.

Income Source: Table 9 shows households’ main income sources in rural and urban areas. Rural respondents predominantly describe themselves as subsistence farmers, with 87% reporting that the households’ main source of income is subsistence farming. Only 4.1% of rural households support themselves with formal employment, while 2.4% rely on “casual labor.” The predominance of subsistence farmers in rural areas is no surprise, but it underlines the fact that agriculture is central to Ethiopians’ livelihood.

In urban areas, as expected, the picture is reversed: the majority of households’ main income source is formal employment, while an additional 10% rely on casual labor. Also, urban residents rely more on pensions, rent and family remittances than rural households.

Tables 10 and 11 provide more detail on income sources. In Table 10, we see that 90% of rural households report some income from agricultural activities. This implies that even households that do not rely on agriculture as their main income source have some participation in agricultural activities.

Table 11 provides the percentage of households that report any income from various types of agriculture. Livestock is the most common source of income, with nearly half of rural households recording income from livestock. Maize is also a significant source of income, providing income for 23% of rural households.

Since only 12% of rural households in the survey received any income from wheat, one doubts that an increase in wheat prices would have a significant positive effect in Ethiopia. Most of the wheat consumed in Ethiopia is imported, mostly in the form of food aid (Keyzer, Merbis, Overbosch 2000).

Killil:

Ethiopia is administratively divided into (11) regions, called Killils. Certain killils correspond with urban areas, such as Addis Ababa, Harari, and Dire Dawa. The other killils contain a combination of urban and rural areas.

Cereal consumption patterns vary by killil. A killil that heavily consumes and produces maize or wheat would be expected to be more affected by the WTO agreement than a killil involved more heavily in cereals that aren't subsidized in the OECD, such as teff.

Table 11 indicates, for each killil, the number of households that are involved in buying, selling, or both buying and selling each cereal. In Gambela, SNNPR and Afar, more than 65% consume maize, with 76% reporting maize expenditure in SNNPR, whereas in Addis Ababa only 11% of households show expenditure on maize. In Tigray, Addis Ababa, and Oromiya, the most widely consumed cereal is teff, although in the killil Oromiya, 55% consume maize. In Benshangul-Gomuz, the most commonly eaten cereal is neither teff nor maize, but is sorghum. In Somali region, almost 60% of households consume wheat. Thus, we infer that Somali, Gambela, SNNPR and Afar will be most sensitive to the changes in cereals prices that we would expect to proceed from the reduction of OECD domestic support.¹⁹

¹⁹ Assumed that a change in the world price of wheat or maize would translate to a change in the price paid by consumers or to farmers in Ethiopia.

Although teff is often described as the “national food” of Ethiopia, we see that in rural regions, a higher percentage of households participate in maize than teff. Of rural households, 58% show some expenditure on maize while 33% show some expenditure on teff. In contrast, 86% of urban households report expenditure on teff. The contrast may be due to the higher price of teff, as rural households are on average poorer than urban households. Table 12 indicates that maize is a very common food in rural Ethiopia, and that many more households consume than produce maize. We can infer from Table 12 that an increase in the price of maize would affect many rural households.

Missing Values:

Many values are missing in the expenditure and income variables. However, most households include some income or expenditure values for at least one cereal. Also, almost all of the existing values are not equal to zero. Since it’s reasonable to assume that many households aren’t involved in the buying or selling of *all* cereals, I have assumed that the missing values mean that the household had zero income or expenditure for that item.

Table 7 shows the percentage of values that are missing for each grain, in total and in each killil. Since maize and wheat are the cereals that would be affected by the new WTO agreement, I’ve included a column that lists the percentage of households that are missing all values for both wheat and maize. Almost 80% of rural households show some involvement in wheat or maize. Only 5.7% of all households record no values at all for income or expenditure on cereals. However, in the killil Dire Dawa, 17.4% of households are missing all income and expenditure values for cereals. Table 7b repeats Table 7 but excludes the households that are

missing all cereals values. We can see that Table 7 and 7b are similar, but Table 7b shows more households involved with each cereal. Thus, excluding households that have recorded no cereals values would make each cereal appear slightly more common.

4.3 Net Buyers and Sellers of Maize and Wheat

Determination of Net Expenditure on Cereals:

The Welfare Monitoring Survey includes two measures each for income and expenditure: for each cereal, it records the income in the past month, income in the past six months, expenditure in the past week, and expenditure in the past month. This creates four possible ways to measure net expenditure.²⁰ However, because the monthly expenditure and six-month income variables cover longer time spans, they cover the greatest number of households. The use of any combination of variables other than monthly expenditure and six-month income results in the exclusion of some households that participate in producing or consuming the cereal. In other words, the limited time frames of the other variables cast a more narrow net and so miss some households.²¹ Therefore, for each cereal, a household's net expenditure is calculated as:

$$\text{Net Expenditure} = 6(\text{Expenditure in Past Month}) - (\text{Income in Past 6 months})$$

It is important to note that consumption patterns may vary over the year. Specifically, households may consume more cereals in January-February (the period of data collection) than

²⁰ They are:

1. Monthly Expenditure – Income in past 1 month
2. 6*(Monthly Expenditure) – Income in past 6 months
3. 4.345*(Weekly Expenditure) – Income in past 1 month
4. 26*(Weekly Expenditure) – Income in past 6 months

²¹ Also, recall that the survey was conducted in January-February, and that the major harvest season is September-December. Thus, the six-month income variable more accurately reflects farming income than the one-month variable, which would only cover January-December income.

other months of the year, because these are the months immediately following the harvest, so cereals are more plentiful during this time. The six-month income variable that I used to calculate net expenditure measures income from the latter half of the year, which includes the harvest months as well as the months immediately preceding the harvest, when cereals are least plentiful. The expenditure variable includes only one month's expenditure, multiplied by six. Because cereals consumption is likely to be higher in the month immediately after the harvest than in the months preceding the harvest, this aspect of the data could make cereals consumption appear higher than it actually is, biasing the results toward an indication of more net buyers.

In calculating net expenditure, I assume that missing values in expenditure or income imply that the household had zero expenditure or income, respectively, for that cereal. A household with positive net expenditure is a net buyer. A household with negative net expenditure is a net seller.²²

By Expenditure Quintiles, in Urban and Rural Areas

Urban areas: Not surprisingly, urban dwellers are predominantly net buyers of cereals. This is true for all expenditure quintiles. For instance, in the lowest expenditure quintile, 91% of households that are involved with maize are net buyers, and 95% of households that are involved with wheat are net buyers. In the highest expenditure quintile, the percentages of net buyers range from 91% to 99% across the five cereals. Table 13 presents the distribution of net buyers

²² If a household's expenditure and income are almost equal, then the household is close to being either a net buyer OR a net seller. However, in this sample only a very small percentage of households have nearly even expenditure and income. As there are so few households along the border, I have included them with the net buyers and net sellers rather than create a third category for "even" households.

and sellers of cereals in urban areas, by expenditure quintile. The shaded columns indicate the percentages of net buyers and sellers among households that have recorded any income or expenditure values for the cereal. The unshaded columns (labeled “%a”) include all households in the expenditure quintile, so that we are able to observe changes in cereal market participation across the expenditure quintiles.

Rural areas: The survey indicates that the majority of rural households are also net buyers of cereals. Table 14 presents the distribution by expenditure of net buyers and sellers of cereals in rural areas. Of rural households that participate in either buying or selling each cereal, the majority are net buyers, at all levels of expenditure. In the poorest expenditure quintile, 70% of households involved in maize are net buyers, and 74% of households involved in wheat are net buyers. The lowest percentage of maize-participating households that are net buyers is 64% (third quintile) which is still a significant percentage. The percentages of wheat households that are net buyers range from 74% to 78% across the expenditure quintiles. In fact, for all cereals and all expenditure levels, more than half of households involved in the market participate as net buyers. In the maize market, the largest percentage of net buyers is in the lowest expenditure quintile. This implies that the poorest rural households are the most likely to be hurt rather than helped by a price increase in maize, at least in the short run.

Also, notice that as expenditure increases, consumption of teff increases while consumption of maize decreases. For instance, in urban areas, 23.5% of urban households in the lowest expenditure quintile are net buyers of maize, while just 13% of urban households in the highest expenditure quintile are net buyers of maize. The trend for teff is the opposite: 52% of the poorest urban households are net buyers of teff, while 74% of the wealthiest urban

households are net buyers of teff. In rural areas, maize consumption is more common and teff consumption is less common than in urban areas. The trends in rural cereal consumption are less pronounced, but similar to the urban areas: 15% of the poorest and 28% of the wealthiest rural households are net buyers of teff, while 29% of the poorest and 24% of the wealthiest rural households are net buyers of maize. Also, in rural areas, wheat, a more expensive grain than maize, exhibits greater participation at higher expenditure levels: 13% of households in the lowest rural expenditure quintile are net buyers of wheat, while 23% of the highest expenditure quintile are net buyers of wheat. Overall, maize appears to be the most prominent cereal in the diets of poorer households, and maize participation as well as maize net-buyer status are highest in the lower expenditure quintiles. Together these facts imply that poor households would be the most affected by an increase in the price of maize.

By Income Source

To examine the notion that farmers benefit from cereals price increase, Table 15 presents the percentage of households that are net buyers and sellers of cereals in each income source category. The income categories refer to the households' reported "main source of income." We find that 26% of all subsistence farmers (not just those who are involved with maize) are net buyers of maize. When we consider only subsistence farmers that participate in the maize market, who comprise 41% of subsistence farming households, we find that 64% of subsistence farming households that participate in the maize market are net buyers. Of all the income groups, subsistence farming households are the most likely to be net buyers of maize. This is consistent with the previous finding that maize is most prominent in rural areas. In contrast, it appears that subsistence farmers are the income group least likely to be net buyers of wheat.

However, when we consider only those subsistence farming households that participate in the wheat market, we find that 75% are net buyers. These results are interesting because they contradict the idea that higher prices always benefit producers.

4.4 Discussion

The survey indicates that 20% of rural households receive income from selling teff, but only 7% are net sellers. Similarly, 23% of rural households receive income from selling maize, but only 14% are net sellers. The results raise the question: why are so many farming households net buyers? This section presents three possible reasons why cereals farmers are net buyers rather than net sellers: 1) farmers may be producing only a small amount of the country's cereals consumption, so that the quantity consumed is greater than the quantity produced; 2) the cost of storing cereals increases the price of cereals later in the season relative to earlier in the season, causing farm households to spend more on cereals that they purchase late in the season after exhausting their own stores; 3) the cost of processing and marketing cereals (in particular, milling and transportation costs) creates a wedge between the selling and purchasing prices faced by farm households. Each of these issues will be discussed below.

Quantity Purchased Greater than Quantity Sold?

A household could be a net buyer if the quantity of grain it purchases is greater than the quantity it sells. In fact, the survey indicates that many households produce less food than they consume: 33% of households reported that the current year's crop would feed the household for 4-6 months and 22% reported that the current crop would feed the household for three months or

less (WMS Report). Clearly, some of the farming households are net buyers of cereals because their production is less than half of the household's annual needs.

However, it does not seem likely that all of the net buyers of cereals are producing less grain than they are consuming, because the level of imports is not large enough to justify the notion that most farmers are not meeting consumption needs. Specifically, in 1999 and 2000, Ethiopia imported just 1% of the maize it consumed (FAOSTAT). Therefore, most of the maize consumed in Ethiopia was produced by Ethiopian maize farmers. Then, is it possible that most of the maize is produced by a handful of large commercial farms, while most maize farmers produce very little? Based on the data in the surveys, that does *not* appear to be the case. Of the nearly 16,000 households in the survey, only 5 households are both commercial farmers and net sellers of maize.²³ It is highly unlikely that such a small percentage of the producers could provide 2.8 million MT of maize, the country's total production in the harvest year covered by the survey (FAOSTAT). The more plausible scenario is that most of the country's maize is produced by subsistence farmers -- a large percentage of whom are actually net buyers of maize. So, many of the net buyers must produce a greater quantity than they consume, as they appear to be the country's chief suppliers of maize. It appears that the large number of net buyers of maize must be due to the margin between producer and retail prices, rather than low-quantity production by the net buyers.

The same argument applies to the case of teff. Teff is not a major crop in any country but Ethiopia, and Ethiopia's teff imports are zero or negligible. The supply of teff, about 1.7 million

²³ Including all crops, 87% of rural households are subsistence farmers and .04% of rural households are commercial farmers (Table 9). Also, these commercial farms are not necessarily maize farms.

MT, is produced domestically.²⁴ It isn't likely that the few net sellers are growing enough teff to supply the entire market, since the farms would have to be larger operations to do so -- only four net-teff-selling households in the WMS own commercial farms. The data suggest that many of the net *buyers* are selling a significant quantity of teff. The difference in quantity sold vs. quantity purchased does not sufficiently explain the prevalence of net buyers of teff.²⁵

Storage Costs

In a study of grain markets in Ethiopia, Desselegn et al. (1998) found that the gross real returns to grain storage are 5.18% for white maize, 3.66% for mixed teff, and 3.24% for wheat, and the opportunity cost of holding capital in inventory is .833 – 1.17%. Therefore, those who can afford to store grain profit from selling grain at higher prices later in the season. However, poor households cannot afford to store grain, either because they lack storage facilities or because they have an immediate need for cash at harvest time. Desselegn et al. found that 79% of grain sales occur at harvest time. Households that sell their crop at harvest must later buy grain that others have stored. As Desselegn et al. describe, stored grain increases in value with time. A household may spend more to purchase a smaller quantity of stored grain than it earned from selling a greater quantity of grain at harvest.

Processing Costs

Another component of the margin between producer and retail prices is the cost of milling the grain. The HICES indicates that most household cereals expenditure is for milled

²⁴ FAOSTAT does not report teff trade data. Teff production data from Keyzer, Merbis, Overbosch (2000).

²⁵ The third major cereal, wheat, is discussed in the Food Aid section, as most wheat imports to Ethiopia are food aid imports, and most food aid delivered to Ethiopia is wheat or wheat flour.

cereals and milling charges, rather than whole grain; households either purchase milled grain or purchase whole grain and pay a fee to have the grain milled.

Marketing Costs

According to Desselegn et al., marketing costs – the costs faced by grain traders – account for 40-60% of the margin between consumer and producer prices. Specifically, grain traders in Ethiopia state that the main factors increasing their costs are: the “kella,” or checkpoints along roads where they must pay fees to transport grain; taxes; lack of access to credit; “absence of control of unlicensed traders;” lack of transportation services; high transport tariffs; lack of facilities at appropriate locations; and lack of market information (Desselegn et al 2000, 6). The kella charges are not centrally determined but are collected by local or regional governments, bringing uncertainty and time delays in addition to the monetary costs.

In addition, transportation infrastructure in Ethiopia is generally inadequate and in poor condition; there is just one railroad line in the country, and many communities are far from all-weather roads, which depresses producer prices in rural areas (Keyzer, Merbis, Overbosch 2000). According to the Welfare Monitoring Survey report, 26% of households live 15 kilometers or further from the nearest all-weather road. In the poorest expenditure quintile, a higher percentage of households live far from roads: 37% of the poorest rural households are located 15 kilometers (9.3 miles) or further from the nearest all-weather road, and 24% live 20 kilometers (12.4 miles) or further from the nearest all-weather road. It appears that poorer households are more likely to be located in remote areas (or households in remote areas are more likely to be poor) where marketing costs are higher due to insufficient transportation facilities and market

information. The high marketing costs help explain the large percentage of poorest-quintile households that are net buyers of cereals.

Substitution: Decreases the Burden on Net Buyers

If the price of maize and wheat increase, then other grains, such as teff, sorghum, and barley, will be relatively less expensive. Poor net-buying households could mitigate the effect of a price increase through substitution to other cereals. Currently, teff is more expensive than maize, and maize is more prominent in poor household's diets than teff. With an increase in the price of maize, households will consume more teff than they currently do. Also, while sorghum currently is consumed less than maize in Ethiopia, sorghum consumption would increase in response to an increase in the price of maize. In Ethiopia in 2001, sorghum consumption amounted to 24.7 kilograms per capita per year, while maize consumption was 47.1 kilograms per capita per year (FAOSTAT). Maize was the most important single food item in the average Ethiopian diet, accounting for 411 calories per day, while wheat, teff, and sorghum provided 297, 247, and 203 calories per day on average.²⁶ If maize and wheat prices rise, these patterns will adjust somewhat, as demand shifts in response to the new relative prices. Households that change their consumption patterns will soften the price changes' impact to their welfare.

Lessons

The argument against developed countries' agricultural subsidies has been motivated by the desire to improve the living standard of rural poor. In this section, we have seen that the data imply that higher international cereals prices won't benefit the rural poor in Ethiopia. Rather, it appears that the welfare of the poorest quintiles would improve if producer prices increase

²⁶ FAOSTAT does not specifically report data for teff. However we can expect that in Ethiopia, teff accounts for most of the "other cereals" category.

relative to retail prices. The clearest way to accomplish this is to decrease the costs that comprise the margin between producer and retail prices. According to Desselegn et al. (1998), producer prices in rural areas are determined based on the wholesale price of grain in Addis Ababa, minus the trader's costs and the trader's profit margin. Therefore, it appears that the rural poor would benefit from policies that decrease traders' costs and encourage competition among traders. Traders' marginal costs would decrease with the abolishment of the kella charges and improvements in transportation infrastructure. In addition, improving potential traders' access to credit would soften the fixed costs of trading, which discourage new traders from entering the market; increased competition would drive down traders' profit margins. The rural poor would also benefit from access to facilities to store grain, which would allow them to take advantage of the returns to grain storage (Desselegn et al. 1998).²⁷

Also, since most households do not produce enough grain to meet the household's needs for the entire year, it may be beneficial to take steps to improve cereals yields. Cereals yields have decreased in recent years as more marginal lands have been brought into cultivation. (Degefe et al. eds 2002). The 2002 *Report on the Ethiopian Economy* recommends increased fertilizer and use of improved seeds in order to increase cereals yields (Degefe et al. eds 2002). However, although most households in the Welfare Monitoring Survey own some land, each household's plot tends to be quite small (Keyzer, Merbis, Overbosch 2000); it might not be feasible for poor households to attain grain self-sufficiency, due to the small size of their landholdings. Therefore, it is more important to increase producer prices relative to the retail prices of grain, to improve farming households' net buying position.

²⁷ However, the farmers' poverty may make storage infeasible, because of their immediate needs for cash at harvest time.

It is also important to note that cereals production is *not* the most common or the most important source of income for rural households in Ethiopia. Rather, the Welfare Monitoring Survey indicates that livestock is the most significant income source. Almost eighty percent of rural households own cattle, including 63% of the poorest income quintile, and nearly half of all rural households receive income from the sale of livestock or livestock products (Table 11 and CSA 2001b). In addition, when asked how the household would raise 100 birr in one week if faced with an emergency, “sale of animals and their products” was the most common response in rural areas, with 36% of households (CSA 2001b). The second most common response was “Sale of crops,” with 21% of households. On the national level, livestock products, especially hides and skins, are Ethiopia’s second most valuable export (Keyzer, Merbis, Overbosch 2000).²⁸ However, the ability to profit from exports of hides and leather is limited, because the quality of hides is low compared to the preferences of large leather markets such as the European Union (Keyzer, Merbis, Overbosch 2000). In addition, Ethiopia faces difficulty exporting beef products, due to the health regulations of large beef markets (Keyzer, Merbis, Overbosch 2000). Each of these problems is related to the prevalence of endemic diseases among cattle herds in Ethiopia. Diseases lower the quality of hides, and the potential for disease causes beef to be ineligible for export. Thus, efforts to improve the health of Ethiopia’s cattle herds may be beneficial for rural households, both for the export of beef and to improve the position of Ethiopia’s leather tanning industry, which suffers from an inadequate domestic supply of *high-quality* hides (Keyzer, Merbis, Overbosch 2000). Like cereals farmers, households that sell livestock products would benefit from improved transportation infrastructure, which would decrease the cost of marketing livestock products.

²⁸ The most valuable export is coffee, but the Welfare Monitoring Survey indicates that in every killil but SNNPR, less than 10% of the rural population receives income from coffee. In SNNPR, 26% of rural households receive income from coffee. Efforts to raise the producer price or to increase exports of coffee could be beneficial to households in SNNPR.

CONCLUSION:

As WTO members negotiate a new agricultural agreement, some have argued that developed countries should drastically reduce their domestic support to agriculture. The proposal submitted by the “tripartite alliance,” which includes most African members of the WTO, calls for “substantial reductions, with a view to phasing out” developed countries’ domestic support to agriculture. Those who have proposed cuts in developed countries’ subsidies argue that because agriculture makes up a large share of developing countries’ economies, and because the majority of most developing countries’ populations are farmers, a decrease in wealthy countries’ subsidies would benefit poor farmers and developing countries. This paper concludes that the argument for subsidy removal has two major flaws: it does not acknowledge the negative effect of agricultural price increases in net-food-importing developing countries, and it assumes that poor farmers would necessarily benefit from price increases in the goods they produce. In fact, because of the substantial margins between producer and consumer prices, households that sell a greater *quantity* of grain than they purchase may *spend* more on grain they purchase than they received in income from the grain they sold, because grain is priced higher when sold to consumers than when purchased from farmers.

The removal of developed countries’ subsidies to wheat and maize is more likely to have negative rather than positive effects in most countries in sub-Saharan Africa – even for farmers. Although some countries could benefit from the removal of subsidies in certain non-food crops, such as cotton, it is not in the interest of most sub-Saharan African countries to pursue cuts in developed countries’ cereals subsidies as part of the next WTO agricultural agreement.

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APPENDIX A: WELFARE ANALYSIS CHARTS

NOTES FOR TABLES 2 and 3:

Net Welfare Effect of the Price Increase Resulting from 100% or 50% Reduction of Subsidies

Table 2. Maizepages 73-75

Table 3. Wheat.....pages 76-78

1. QC_0 is the Domestic Supply in 2001, from FAOSTAT. It includes food, animal feed, processing, waste, and other uses.
2. PC_0 is the Import Value of 2001 divided by the Import Qty of 2001, from FAOSTAT. It is assumed that all consumers face the same price, which is the price of the imports.
3. QC_1 is the original quantity consumed plus the change, which is found by multiplying the percentage price change, elasticity of demand, and original quantity consumed.
4. PC_1 and ΔPC : According to Diao, Somwaru, and Roe (2001) a 100% removal of subsidies would result in an increase of 12.8% in world agriculture prices. A 50% decrease in subsidies would lead to a 5.5% increase in world agriculture prices.
5. Elasticity of demand for cereals, in low-income countries, is about -0.6 (Regmi 2001).
6. QP_1 is the quantity produced in 2001, from FAOSTAT.
7. The analysis is calculated as if producer and consumer price are equal. In actuality there is a margin between the consumer and farm prices that is captured by traders, processors etc. Thus the producer surplus here includes the surplus that is captured by traders etc. The net welfare effect for each country is not affected.
8. Elasticity of supply from Soledad Bos (2003).
9. GDP Data is from the World Development Indicators of the World Bank Group, 2001.
10. The highlighted rows show the effect of a full removal of subsidies, while the white rows show the effect of a half removal of subsidies.

Net Welfare Effect of a 100% or 50% Reduction in Domestic Support, 2001
Table 2. Maize

(SEE NOTES P. 71)

Column #	1	2	3	4	5	6	7	8	9	10	11	12
COUNTRY	QC ₀ 1000MT	QC ₁ 1000MT	P ₀ \$/MT	P ₁ \$/MT	(P ₁ -P ₀) /P ₀	ΔQC 1000MT	ΔCONS. SURPLUS	QP ₀ 1000MT	QP ₁ 1000MT	ΔQP 1000MT	Δ PROD. SURPLUS	NET \$Δ WELFARE
Angola	598.8	554.9	158.82	178.20	0.122	-43.8	-11177.40	428.8	452.31	23.54	8,536.1	-2641.3
Benin	598.8	579.0	158.82	167.56	0.055	-19.8	-5144.01	428.8	439.38	10.61	3,791.7	-1352.3
Botswana	687.7	637.3	366.22	410.90	0.122	-50.3	-29599.72	685.9	723.56	37.66	31,486.6	1886.9
Burkina Fas.	687.7	665.0	366.22	386.36	0.055	-22.7	-13622.52	685.9	702.88	16.98	13,986.5	364.0
Burundi	83.6	77.5	169.80	190.52	0.122	-6.1	-1669.08	10.0	10.55	0.55	212.8	-1456.2
Cameroon	83.6	80.9	169.8	179.14	0.055	-2.8	-768.14	10.0	10.25	0.25	94.5	-673.6
Cape Verde	440.7	408.4	37.31	41.87	0.122	-32.3	-1932.54	606.3	639.58	33.29	2,835.7	903.2
Cent.Af.Rep.	440.7	426.1	37.31	39.36	0.055	-14.5	-889.32	606.3	621.30	15.01	1,259.5	370.2
Congo, DR.	133.0	123.2	222.09	249.18	0.122	-9.7	-3471.17	124.4	131.22	6.83	3,462.9	-8.2
Congo, Rep.	133.0	128.6	222.09	234.30	0.055	-4.4	-1597.54	124.4	127.47	3.08	1,538.3	-59.3
Djibouti	646.1	598.8	168.76	189.35	0.122	-47.3	-12816.01	750.0	791.18	41.18	15,865.3	3049.3
	646.1	624.8	168.76	178.04	0.055	-21.3	-5898.29	750.0	768.56	18.56	7,047.5	1149.2
	64.7	60.0	189.85	213.02	0.122	-4.7	-1443.68	19.5	20.62	1.07	465.2	-978.5
	64.7	62.6	189.85	200.29	0.055	-2.1	-664.40	19.5	20.03	0.48	206.7	-457.8
	107.7	99.8	76.92	86.31	0.122	-7.9	-973.79	107.0	112.87	5.87	1,031.7	57.9
	107.7	104.2	76.92	81.15	0.055	-3.6	-448.15	107.0	109.65	2.65	458.3	10.1
	114.8	106.4	100.00	112.20	0.122	-8.4	-1349.24	105.3	111.08	5.78	1,319.9	-29.4
	114.8	111.0	100	105.50	0.055	-3.8	-620.95	105.3	107.90	2.61	586.3	-34.7
	1291.0	1,196.5	133.33	149.60	0.122	-94.5	-20231.37	1169.2	1233.38	64.19	19,540.9	-690.5
	1291.0	1,248.4	133.33	140.67	0.055	-42.6	-9310.99	1169.2	1198.13	28.94	8,680.1	-630.8
	18.0	16.7	121.21	136.00	0.122	-1.3	-256.65	6.5	6.91	0.36	99.5	-157.2
	18.0	17.4	121.21	127.88	0.055	-0.6	-118.12	6.5	6.71	0.16	44.2	-73.9
	705.7	654.0	180.00	201.96	0.122	-51.7	-14929.83	573.0	604.46	31.46	12,928.5	-2001.3
	705.7	682.4	180.00	189.90	0.055	-23.3	-6871.09	573.0	587.18	14.18	5,742.9	-1128.2
	0.3	0.2	120.00	134.64	0.122	0.0	-3.71	0.0	0.01	0.00	0.2	-3.5
	0.3	0.3	120.00	126.60	0.055	0.0	-1.71	0.0	0.01	0.00	0.1	-1.6

Net Welfare Effect of a 100% or 50% Reduction in Domestic Support, 2001

Table 2. Maize

(SEE NOTES P. 71)

COUNTRY	QC ₀	QC ₁	P ₀	P ₁	(P ₁ -P ₀)	ΔQC	ΔCONS.	QP ₀	QP ₁	ΔQP	\$ΔPROD.	NET \$Δ
	1000MT	1000MT	\$/MT	\$/MT	/P ₀	1000MT	SURPLUS	1000MT	1000MT	1000MT	SURPLUS	WELFARE
Namibia	152.0	140.9	105.36	118.22	0.122	-11.1	-1882.33	27.7	29.22	1.52	365.8	-1516.5
	152.0	147.0	105.36	111.15	0.055	-5.0	-866.28	27.7	28.39	0.69	162.5	-703.8
Niger	40.0	37.1	45.25	50.78	0.122	-2.9	-212.96	6.4	6.73	0.35	36.2	-176.8
	40.0	38.7	45.25	47.74	0.055	-1.3	-98.00	6.4	6.53	0.16	16.1	-81.9
Rwanda	127.7	118.4	413.04	463.43	0.122	-9.3	-6200.27	81.0	85.42	4.45	4,192.7	-2007.6
	127.7	123.5	413.04	435.76	0.055	-4.2	-2853.50	81.0	82.98	2.00	1,862.4	-991.1
SaoTome&P	3.7	3.5	300.00	336.60	0.122	-0.3	-131.87	2.5	2.64	0.14	94.0	-37.9
	3.7	3.6	300.00	316.50	0.055	-0.1	-60.69	2.5	2.56	0.06	41.8	-18.9
Senegal	162.5	150.6	130.30	146.19	0.122	-11.9	-2488.80	106.4	112.26	5.84	1,738.1	-750.7
	162.5	157.2	130.30	137.47	0.055	-5.4	-1145.43	106.4	109.05	2.63	772.1	-373.3
Sierra Leone	24.2	22.4	650.00	729.30	0.122	-1.8	-1847.22	10.0	10.55	0.55	814.8	-1032.5
	24.2	23.4	650.00	685.75	0.055	-0.8	-850.14	10.0	10.25	0.25	361.9	-488.2
South Africa	9327.0	8,644.3	143.40	160.89	0.122	-682.7	-157197.95	8040.0	8481.40	441.40	144,514.9	-12683.0
	9327.0	9,019.3	143.40	151.29	0.055	-307.8	-72348.66	8040.0	8238.99	198.99	64,196.2	-8152.5
Sudan	112.5	104.3	19.93	22.37	0.122	-8.2	-263.55	53.0	55.91	2.91	132.4	-131.1
	112.5	108.8	19.93	21.03	0.055	-3.7	-121.27	53.0	54.31	1.31	58.8	-62.5
Swaziland	145.2	134.6	157.67	176.91	0.122	-10.6	-2691.60	85.0	89.67	4.67	1,680.0	-1011.6
	145.2	140.4	157.67	166.34	0.055	-4.8	-1238.72	85.0	87.10	2.10	746.2	-492.5
Tanzania	2875.9	2,665.4	282.85	317.35	0.122	-210.5	-95608.66	2698.0	2846.12	148.12	95,656.6	47.9
	2875.9	2,781.0	282.85	298.41	0.055	-94.9	-44001.93	2698.0	2764.78	66.78	42,491.5	-1510.4
Togo	499.1	462.6	144.58	162.22	0.122	-36.5	-8481.13	463.9	489.40	25.47	8,407.7	-73.5
	499.1	482.6	144.58	152.53	0.055	-16.5	-3903.28	463.9	475.41	11.48	3,734.8	-168.5
Uganda	1149.4	1,065.2	316.44	355.05	0.122	-84.1	-42748.19	1174.0	1238.45	64.45	46,567.9	3819.7
	1149.4	1,111.4	316.44	333.84	0.055	-37.9	-19673.51	1174.0	1203.06	29.06	20,685.4	1011.9
Zambia	1415.7	1,312.1	256.82	288.15	0.122	-103.6	-42734.81	601.6	634.63	33.03	19,367.1	-23367.7
	1415.7	1,369.0	256.82	270.95	0.055	-46.7	-19667.48	601.6	616.50	14.89	8,602.9	-11064.6
Zimbabwe	1866.9	1,730.2	277.72	311.60	0.122	-136.7	-60938.04	1466.8	1547.27	80.52	51,059.6	-9878.4
	1866.9	1,805.3	277.72	313.26	0.055	-61.6	-65254.82	1466.8	1503.05	36.30	52,773.4	-12481.4

Table 3: Net Welfare Effect of a 100% or 50% Reduction in Domestic Support, 2001: WHEAT
(SEE NOTES P. 71)

COUNTRY	QC ₀ 1000MT	QC ₁ 1000MT	P ₀ \$/MT	P ₁ \$/MT	(P ₁ - P ₀) /P ₀	ΔQC 1000MT	ΔCONS. SURPLUS 1000MT	QP ₀ 1000MT	QP ₁ 1000MT	ΔQP 1000MT	ΔPROD. SURPLUS 1000MT	NET Δ WELFARE
Angola	322.90	299.65	126.72	141.93	0.12	-23.25	-4733.44	4.00	4.2	0.22	62.5	-4671.0
	322.90	313.39	126.72	132.94	0.0491	-9.51	-1979.47	4.00	4.1	0.09	25.2	-1954.3
Benin	51.00	47.33	156.54	175.32	0.12	-3.67	-923.51	0.00	0.0	0.00	0.0	-923.5
	51.00	49.50	156.54	164.23	0.0491	-1.50	-386.22	0.00	0.0	0.00	0.0	-386.2
Botswana	56.53	52.46	284.27	318.39	0.12	-4.07	-1858.98	0.55	0.6	0.03	19.3	-1839.7
	56.53	54.86	284.27	298.23	0.0491	-1.67	-777.40	0.55	0.6	0.01	7.8	-769.6
Burkina Faso	65.79	61.05	134.61	150.76	0.12	-4.74	-1024.44	0.00	0.0	0.00	0.0	-1024.4
	65.79	63.85	134.61	141.22	0.0491	-1.94	-428.42	0.00	0.0	0.00	0.0	-428.4
Burundi	17.16	15.92	326.98	366.21	0.12	-1.24	-649.07	8.67	9.1	0.47	349.2	-299.8
	17.16	16.65	326.98	343.03	0.0491	-0.51	-271.44	8.67	8.9	0.19	140.7	-130.7
Cameroon	303.46	281.61	222.78	249.52	0.12	-21.85	-7820.61	0.40	0.4	0.02	11.0	-7809.6
	303.46	294.52	222.78	233.72	0.0491	-8.94	-3270.50	0.40	0.4	0.01	4.4	-3266.1
Cape Verde	18.78	17.43	184.64	206.79	0.12	-1.35	-401.12	0.00	0.0	0.00	0.0	-401.1
	18.78	18.23	184.64	193.71	0.0491	-0.55	-167.75	0.00	0.0	0.00	0.0	-167.7
Cent. Afr. Rep	50.82	47.16	130.12	145.74	0.12	-3.66	-764.98	0.00	0.0	0.00	0.0	-765.0
	50.82	49.32	130.12	136.51	0.0491	-1.50	-319.90	0.00	0.0	0.00	0.0	-319.9
Chad	51.34	47.64	181.43	203.20	0.12	-3.70	-1077.52	2.80	3.0	0.15	62.6	-1014.9
	51.34	49.83	181.43	190.34	0.0491	-1.51	-450.61	2.80	2.9	0.06	25.2	-425.4
Comoros	10.25	9.51	237.26	265.73	0.12	-0.74	-281.32	0.00	0.0	0.00	0.0	-281.3
	10.25	9.95	237.26	248.91	0.0491	-0.30	-117.65	0.00	0.0	0.00	0.0	-117.6
Congo, DR	392.67	364.40	101.58	113.76	0.12	-28.27	-4613.98	8.90	9.4	0.48	111.4	-4502.6
	392.67	381.10	101.58	106.57	0.0491	-11.57	-1929.62	8.90	9.1	0.20	44.9	-1884.7
Congo, Rep.	133.34	123.74	118.87	133.14	0.12	-9.60	-1833.57	0.00	0.0	0.00	0.0	-1833.6
	133.34	129.41	118.87	124.71	0.0491	-3.93	-766.78	0.00	0.0	0.00	0.0	-766.8
Côte d'Ivoire	299.28	277.73	137.30	153.78	0.12	-21.55	-4753.52	0.00	0.0	0.00	0.0	-4753.5
	299.28	290.46	137.30	144.04	0.0491	-8.82	-1987.86	0.00	0.0	0.00	0.0	-1987.9
Djibouti	63.54	58.97	156.40	175.17	0.12	-4.57	-1149.59	0.00	0.0	0.00	0.0	-1149.6
	63.54	61.67	156.40	164.08	0.0491	-1.87	-480.75	0.00	0.0	0.00	0.0	-480.8
Eritrea	305.32	283.34	102.48	114.78	0.12	-21.98	-3619.52	25.42	26.8	1.37	321.1	-3298.4
	305.32	296.33	102.48	107.51	0.0491	-8.99	-1513.67	25.42	26.0	0.56	129.3	-1384.3

Table 3: Net Welfare Effect of a 100% or 50% Reduction in Domestic Support, 2001: WHEAT
(SEE NOTES P. 71)

COUNTRY	QC ₀ 1000MT	QC ₁ 1000MT	P ₀ \$/MT	P ₁ \$/MT	(P ₁ - P ₀) /P ₀	ΔQC 1000MT	ΔCONS. SURPLUS	QP ₀ 1000MT	QP ₁ 1000MT	ΔQP 1000MT	ΔPROD. SURPLUS	NET Δ WELFARE
Ethiopia	2813.75	2,611.16	145.45	162.91	0.12	-202.59	-47343.91	1596.02	1682.2	86.19	28609.5	-18734.4
	2813.75	2,730.86	145.45	152.59	0.0491	-82.89	-19798.67	1596.02	1631.3	35.26	11524.0	-8274.6
Gabon	77.96	72.35	145.26	162.70	0.12	-5.61	-1310.06	0.00	0.0	0.00	0.0	-1310.1
	77.96	75.66	145.26	152.39	0.0491	-2.30	-547.84	0.00	0.0	0.00	0.0	-547.8
Gambia	26.82	24.89	124.41	139.34	0.12	-1.93	-385.99	0.00	0.0	0.00	0.0	-386.0
	26.82	26.03	124.41	130.52	0.0491	-0.79	-161.42	0.00	0.0	0.00	0.0	-161.4
Ghana	208.87	193.83	292.60	327.71	0.12	-15.04	-7069.79	0.00	0.0	0.00	0.0	-7069.8
	208.87	202.72	292.60	306.97	0.0491	-6.15	-2956.56	0.00	0.0	0.00	0.0	-2956.6
Guinea	96.89	89.91	189.00	211.68	0.12	-6.98	-2118.32	0.00	0.0	0.00	0.0	-2118.3
	96.89	94.04	189.00	198.28	0.0491	-2.85	-885.89	0.00	0.0	0.00	0.0	-885.9
Guinea-Biss.	12.08	11.21	214.24	239.95	0.12	-0.87	-299.38	0.00	0.0	0.00	0.0	-299.4
	12.08	11.72	214.24	224.76	0.0491	-0.36	-125.20	0.00	0.0	0.00	0.0	-125.2
Kenya	912.94	847.21	236.95	265.39	0.12	-65.73	-25024.29	252.00	265.6	13.61	7358.9	-17665.4
	912.94	886.04	236.95	248.58	0.0491	-26.90	-10464.91	252.00	257.6	5.57	2964.2	-7500.7
Lesotho	40.77	37.83	184.88	207.07	0.12	-2.94	-871.95	18.00	19.0	0.97	410.1	-461.8
	40.77	39.57	184.88	193.96	0.0491	-1.20	-364.64	18.00	18.4	0.40	165.2	-199.4
Liberia	90.66	84.13	163.17	182.75	0.12	-6.53	-1711.23	0.00	0.0	0.00	0.0	-1711.2
	90.66	87.99	163.17	171.18	0.0491	-2.67	-715.64	0.00	0.0	0.00	0.0	-715.6
Madagascar	108.04	100.26	137.00	153.44	0.12	-7.78	-1712.28	10.00	10.5	0.54	168.8	-1543.4
	108.04	104.86	137.00	143.73	0.0491	-3.18	-716.05	10.00	10.2	0.22	68.0	-648.0
Malawi	103.03	95.61	122.49	137.19	0.12	-7.42	-1459.88	2.24	2.4	0.12	33.8	-1426.1
	103.03	99.99	122.49	128.50	0.0491	-3.04	-610.52	2.24	2.3	0.05	13.6	-596.9
Mali	96.74	89.77	185.83	208.13	0.12	-6.97	-2079.62	9.13	9.6	0.49	209.1	-1870.5
	96.74	93.89	185.83	194.95	0.0491	-2.85	-869.68	9.13	9.3	0.20	84.2	-785.5
Mauritania	317.30	294.45	155.61	174.28	0.12	-22.85	-5711.56	0.40	0.4	0.02	7.7	-5703.9
	317.30	307.95	155.61	163.25	0.0491	-9.35	-2388.60	0.40	0.4	0.01	3.1	-2385.5
Mauritius	107.92	100.15	124.21	139.11	0.12	-7.77	-1550.63	0.00	0.0	0.00	0.0	-1550.6
	107.92	104.74	124.21	130.31	0.0491	-3.18	-648.48	0.00	0.0	0.00	0.0	-648.5
Mozambique	232.18	215.46	81.41	91.18	0.12	-16.72	-2186.66	1.00	1.1	0.05	10.0	-2176.6
	232.18	225.34	81.41	85.41	0.0491	-6.84	-914.41	1.00	1.0	0.02	4.0	-910.4
Namibia	86.28	80.07	106.69	119.49	0.12	-6.21	-1064.81	6.12	6.4	0.33	80.5	-984.4

Table 3: Net Welfare Effect of a 100% or 50% Reduction in Domestic Support, 2001: WHEAT
(SEE NOTES P. 71)

COUNTRY	QC ₀ 1000MT	QC ₁ 1000MT	P ₀ \$/MT	P ₁ \$/MT	(P ₁ - P ₀) /P ₀	ΔQC 1000MT	ΔCONS. SURPLUS 1000MT	QP ₀ 1000MT	QP ₁ 1000MT	ΔQP 1000MT	ΔPROD. SURPLUS 1000MT	NET Δ WELFARE
Namibia	86.28	83.74	106.69	111.93	0.0491	-2.54	-445.32	6.12	6.3	0.14	32.4	-412.9
Niger	73.44	68.15	191.62	214.62	0.12	-5.29	-1627.94	6.30	6.6	0.34	148.8	-1479.2
	73.44	71.28	191.62	201.03	0.0491	-2.16	-680.79	6.30	6.4	0.14	59.9	-620.9
Nigeria	2257.39	2,094.86	130.74	146.42	0.12	-162.53	-34139.56	51.00	53.8	2.75	821.7	-33317.9
	2257.39	2,190.89	130.74	137.16	0.0491	-66.50	-14277.49	51.00	52.1	1.13	331.0	-13946.5
Rwanda	22.66	21.03	266.56	298.55	0.12	-1.63	-698.74	8.27	8.7	0.45	271.6	-427.1
	22.66	21.99	266.56	279.65	0.0491	-0.67	-292.21	8.27	8.5	0.18	109.4	-182.8
Sao Tome&P	7.81	7.25	143.38	160.59	0.12	-0.56	-129.54	0.00	0.0	0.00	0.0	-129.5
	7.81	7.58	143.38	150.42	0.0491	-0.23	-54.17	0.00	0.0	0.00	0.0	-54.2
Senegal	291.93	270.91	172.66	193.38	0.12	-21.02	-5830.82	0.00	0.0	0.00	0.0	-5830.8
	291.93	283.33	172.66	181.14	0.0491	-8.60	-2438.41	0.00	0.0	0.00	0.0	-2438.4
Seychelles	4.17	3.87	213.40	239.00	0.12	-0.30	-102.94	0.00	0.0	0.00	0.0	-102.9
	4.17	4.05	213.40	223.88	0.0491	-0.12	-43.05	0.00	0.0	0.00	0.0	-43.0
Sierra Leone	62.10	57.63	234.34	262.47	0.12	-4.47	-1683.47	0.00	0.0	0.00	0.0	-1683.5
	62.10	60.27	234.34	245.85	0.0491	-1.83	-704.00	0.00	0.0	0.00	0.0	-704.0
South Africa	2374.55	2,203.58	126.07	141.20	0.12	-170.97	-34630.13	2503.95	2639.2	135.21	38903.8	4273.7
	2374.55	2,304.60	126.07	132.26	0.0491	-69.95	-14482.04	2503.95	2559.3	55.32	15670.8	1188.7
Sudan	830.41	770.62	130.61	146.29	0.12	-59.79	-12547.01	303.00	319.4	16.36	4877.3	-7669.7
	830.41	805.95	130.61	137.02	0.0491	-24.46	-5246.94	303.00	309.7	6.69	1964.6	-3282.3
Swaziland	32.68	30.33	175.06	196.06	0.12	-2.35	-661.79	0.30	0.3	0.02	6.5	-655.3
	32.68	31.72	175.06	183.66	0.0491	-0.96	-276.76	0.30	0.3	0.01	2.6	-274.2
Tanzania	404.59	375.46	175.06	196.07	0.12	-29.13	-8193.26	89.00	93.8	4.81	1920.1	-6273.2
	404.59	392.67	175.06	183.66	0.0491	-11.92	-3426.41	89.00	91.0	1.97	773.4	-2653.0
Togo	87.37	81.08	178.10	199.47	0.12	-6.29	-1800.02	0.00	0.0	0.00	0.0	-1800.0
	87.37	84.80	178.10	186.84	0.0491	-2.57	-752.77	0.00	0.0	0.00	0.0	-752.8
Uganda	51.53	47.82	310.43	347.68	0.12	-3.71	-1850.47	14.00	14.8	0.76	535.6	-1314.9
	51.53	50.01	310.43	325.67	0.0491	-1.52	-773.86	14.00	14.3	0.31	215.7	-558.1
Zambia	154.33	143.22	236.93	265.37	0.12	-11.11	-4229.97	75.00	79.1	4.05	2190.0	-2040.0
	154.33	149.78	236.93	248.56	0.0491	-4.55	-1768.92	75.00	76.7	1.66	882.1	-886.8
Zimbabwe	269	249.63	208.88	233.95	0.12	-19.37	-6500.02	250.00	263.5	13.50	6435.7	-64.3
	269	261.08	208.88	219.14	0.0491	-7.92	-2718.23	250.00	255.5	5.52	2592.3	-125.9

APPENDIX B: Household Data Tables**Table 6. Summary of Household Characteristics**

		Obs.	Mean	S. Dev	Min.	Max.
Household Expenditure (birr/yr)	Urban	7826	7973.3	8562.8	350.1	219899.6
	Rural	8118	5149.7	4325.4	243.7	209222.1
Household Expenditure per capita (birr/yr)	Urban	7826	2028.7	1949.6	248.4	44890.7
	Rural	8118	1156.3	913.9	146.3	41844.4
Household Expenditure per adult equivalent (birr/yr)	Urban	7826	2332.8	2163.6	310.0	62348.1
	Rural	8118	1406.6	1041.9	209.9	43954.2
Hld Exp per cap, deflated for regional prices (birr/yr)	Urban	7826	1978.9	1883.8	235.0	47050.3
	Rural	7971	1222.9	956.7	156.3	43569.8

	Urban			Rural		
	Obs.	Mean	Std.Dev.	Obs.	Mean	Std.Dev.
Household Size	7826	4.53	2.5	8118	4.91	2.23
Own Land	7766	0.50	0.50	8112	0.97	0.17
Own Cattle	7822	12.5%	--	8116	73.5%	--
Number of Cattle	968	8.00	44.23	5958	4.88	6.86
Own Equine	7822	3.2%	--	8113	32.4%	--
Number of Equine	256	11.44	69.07	2619	2.48	20.16
Own Sheep/Goat	7822	9.7%	--	8114	45.9%	--
Number of Sheep/Goat	753	9.17	34.35	3716	7.02	15.59
Own Chicken/Poultry	7817	19.4%	--	8108	51.2%	--
Number of Chicken/Poultry	1465	9.65	40.16	4133	7.42	26.14
Own Gejera (machete)	7815	15.9%	--	8105	29.7%	--
Own Sickel	7824	27.4%	--	8112	74.0%	--
Own Axe	7822	55.4%	--	8107	78.6%	--
Own Pick-Axe	7821	27.4%	--	8108	39.4%	--
Own Plough	7818	4.7%	--	8111	56.8%	--
Own Mofer & Kenber	7821	4.0%	--	8108	53.4%	--
Own Bicycle	7820	6.0%	--	8106	0.4%	--
Own Wheelbarrow	7819	3.0%	--	8105	0.4%	--
Own Radio	7816	64.7%	--	8107	14.9%	--
Own Sprayer	7820	0.9%	--	8106	0.6%	--
Own Tractor	7817	0.2%	--	8102	0.0%	--
Own Television	7820	16.39%	--	8105	0.07%	--
Own Refrigerator	7820	6.8%	--	8104	0.0%	--
Own Stove	7814	46.6%	--	8091	3.5%	--
Own Motor Vehicle	7818	2.6%	--	8104	0.3%	--
Dist. to Food Market	7800	1.29	2.96	8104	7.23	8.68
Dist to All-Weather Road	7759	0.27	1.39	8058	11.88	17.62
Dist to Dry-Weather Road	7183	0.46	3.95	7913	7.69	12.77
Dist to Bus/Taxi Service	7787	1.63	8.65	8002	19.36	22.40
Dist to Milling House	7786	0.99	5.79	8090	5.83	8.62
Dist Drinking H2O, Dry Seas.	7765	0.15	1.05	8074	0.65	2.40
Dist Drinking H2O, Rain Seas.	7763	0.17	0.92	8089	1.12	3.30
Dist to Cooking Fuel	7762	0.85	2.52	8083	2.05	3.78

Table 7:
Percent of Households Missing Values for Cereals Income and Expenditure

	Obs	Teff	Maize	Wheat	Sorghum	Barley	All Missing	No Wht or Maize
Urban	7826	23.2%	71.8%	60.7%	78.4%	85.9%	11.0%	49.9%
Rural	8118	62.2%	40.4%	66.1%	57.7%	76.7%	3.3%	21.9%
Tigray	1169	34.6%	72.6%	49.5%	70.1%	73.8%	3.8%	31.3%
Afar	711	48.7%	34.5%	87.8%	86.4%	92.4%	4.8%	29.5%
Amhara	3117	25.5%	75.2%	69.2%	73.2%	78.9%	4.2%	49.4%
Oromiya	3529	37.9%	45.7%	51.7%	68.9%	73.8%	6.3%	24.1%
Somali	741	74.9%	54.4%	47.0%	67.6%	83.4%	10.1%	31.0%
Benshang.	818	55.9%	39.5%	85.9%	25.8%	95.0%	6.5%	35.2%
SNNPR	2474	58.9%	27.4%	62.5%	72.4%	71.2%	7.7%	16.4%
Gambela	611	68.6%	29.3%	87.4%	66.8%	97.7%	5.1%	25.9%
Harari	661	60.1%	63.1%	50.5%	31.9%	90.5%	7.4%	39.6%
Addis Ab.	1355	15.1%	90.2%	65.2%	97.1%	96.0%	12.7%	63.4%
Dire Dawa	758	65.7%	82.8%	77.7%	30.6%	93.1%	17.0%	67.4%

7b. Excluding Households With No Cereal Values

	Obs.	Teff	Maize	Wheat	Sorghum	Barley	No Wht or Maize
Urban	6966	13.7%	68.3%	55.9%	75.8%	84.1%	43.7%
Rural	7849	61.0%	38.4%	65.0%	56.2%	75.9%	19.2%
Tigray	1125	32.0%	71.6%	47.6%	69.0%	72.8%	28.7%
Afar	677	46.1%	31.2%	87.1%	85.7%	92.0%	26.0%
Amhara	2987	22.2%	74.2%	67.9%	72.0%	78.0%	47.2%
Oromiya	3308	33.8%	42.1%	48.4%	66.9%	72.0%	19.1%
Somali	666	72.1%	49.2%	41.0%	64.0%	81.5%	23.2%
Benshang.	765	52.8%	35.3%	85.0%	20.7%	94.6%	30.7%
SNNPR	2283	55.5%	21.3%	59.4%	70.1%	68.8%	9.4%
Gambela	580	66.9%	25.5%	86.7%	65.0%	97.6%	21.9%
Harari	612	56.9%	60.1%	46.6%	26.5%	89.7%	34.8%
Addis Aba.	1183	2.7%	88.8%	60.1%	96.7%	95.4%	58.1%
Dire Dawa	629	58.7%	79.3%	73.1%	16.4%	91.7%	60.7%

The percent of households missing all income and exoenditures values in these crops.

"All missing:" The percent of households that record no values for income or expenditure for any cereal.

"No Wht or Maize." The percent of households that record no values for income or expenditure for wheat or maize.

Table 8. Household Expenditure per Adult Equivalent (Birr/yr)

<i>Quintile</i>	<i>Obs</i>	<i>Min.</i>	<i>Mean</i>	<i>Max.</i>
1	3160	218.5	718.4	931.9
2	3159	931.9	1096.4	1261.1
3	3160	1261.2	1448.9	1659.4
4	3159	1659.6	1980.0	2422.8
5	3159	2422.9	4150.6	65347.6

Table 9. Household's Main Source of Income

	Urban		Rural	
	<i>Obs.</i>	<i>%</i>	<i>Obs.</i>	<i>%</i>
Subsistence Farming	364	4.7	7065	87.0
Commercial Farming	50	0.6	34	0.4
Casual Laborer, Agriculture	28	0.4	66	0.8
Employed by Private Sector	2349	30.0	165	2.0
Employed by Government	1847	23.6	149	1.8
Employed by NGO	216	2.8	27	0.3
Casual Laborer, Non-Agricultural	745	9.5	133	1.6
Family	624	8.0	67	0.8
Pension	458	5.9	11	0.1
Rent	273	3.5	7	0.1
Other	845	10.8	382	4.7
Not Stated	27	0.3	12	0.1

Table 10. Percentage of Households Recording Any Income

	Agricultural	Household	Wages	Gifts &	Rent	Pensions,	No Inc.
	Activities	Enterprise	Salaries	Remittance		Insurance	Values
<i>Urban</i>	11.4%	40.6%	46.3%	22.4%	12.6%	11.3%	0.7%
<i>Rural</i>	89.6%	23.4%	11.2%	13.5%	1.8%	0.8%	0.8%
<i>Tigray</i>	48.0%	19.2%	29.4%	25.6%	10.5%	4.8%	1.2%
<i>Afar</i>	59.4%	27.0%	28.1%	12.4%	7.6%	0.8%	0.6%
<i>Amhara</i>	51.5%	29.0%	20.6%	16.9%	6.2%	5.3%	1.0%
<i>Oromiya</i>	52.1%	35.9%	27.3%	17.1%	6.6%	7.0%	0.5%
<i>Somali</i>	41.2%	29.0%	26.6%	31.3%	7.0%	4.9%	0.7%
<i>Benshangul</i>	64.3%	38.3%	24.1%	12.0%	7.8%	2.0%	0.6%
<i>SNNPR</i>	71.9%	37.4%	23.8%	16.0%	6.2%	3.5%	0.8%
<i>Gambela</i>	52.0%	35.4%	34.9%	14.7%	6.2%	1.8%	1.0%
<i>Harari</i>	48.9%	30.7%	29.7%	17.2%	5.9%	12.3%	0.3%
<i>Addis Ababa</i>	14.8%	30.6%	55.9%	19.9%	11.1%	14.7%	0.8%
<i>Dire Dawa</i>	37.2%	26.9%	31.5%	16.9%	3.8%	6.1%	0.8%

Table 11. Percentage of Households Recording Any Income From Specific Agricultural Activities

	Livestock	Maize	Teff	Wheat	Sorghum	Barley	Coffee	Chat	Pulses	Oilseeds	Other Ag.
	<i>Urban</i>	4.7%	2.4%	2.0%	1.5%	1.2%	0.6%	0.8%	1.2%	0.9%	0.6%
<i>Rural</i>	45.7%	23.3%	20.3%	11.7%	11.0%	9.5%	13.2%	10.7%	17.4%	10.0%	37.3%
<i>Tigray</i>	26.6%	9.3%	16.9%	11.1%	7.6%	9.4%	0.4%	0.3%	12.1%	5.6%	16.1%
<i>Afar</i>	40.2%	22.6%	5.5%	0.0%	2.3%	0.3%	0.1%	2.1%	0.4%	1.5%	5.2%
<i>Amhara</i>	22.5%	9.2%	17.5%	6.6%	6.5%	8.7%	1.2%	2.0%	16.2%	8.1%	16.4%
<i>Oromiya</i>	27.0%	14.0%	12.2%	9.1%	4.9%	4.6%	8.6%	7.3%	8.6%	4.4%	19.9%
<i>Somali</i>	29.3%	7.3%	2.3%	5.5%	6.2%	3.4%	0.1%	5.9%	0.7%	1.1%	8.0%
<i>Benshangul</i>	28.5%	26.5%	8.3%	1.1%	26.2%	1.2%	5.5%	4.3%	14.3%	29.5%	31.3%
<i>SNNPR</i>	34.8%	23.1%	15.7%	10.1%	5.7%	9.7%	26.1%	10.5%	12.7%	1.7%	40.1%
<i>Gambela</i>	17.5%	29.0%	0.3%	0.0%	8.2%	0.2%	9.5%	1.3%	0.8%	3.1%	27.0%
<i>Harari</i>	12.0%	1.2%	0.2%	0.0%	1.5%	0.0%	0.5%	34.0%	0.3%	9.7%	18.8%
<i>Addis Aba.</i>	7.7%	0.1%	8.3%	7.7%	0.1%	0.1%	0.2%	0.4%	6.7%	0.1%	7.2%
<i>Dire Dawa</i>	29.9%	0.3%	0.0%	0.1%	6.1%	0.3%	5.1%	6.3%	0.1%	0.1%	13.9%

Table 12. Households Participating In Cereals (Page 1 of 2)**Notes:**

"Exp" is the number/percentage of households that recorded any monthly or weekly expenditure on the item.

"Inc" is the number/percentage of households that recorded any income from the item, in the past month or six months.

"Both" is the number/percentage of households that recorded both income and expenditure for the item.

"Neither" is the number/percentage of households that recorded neither income nor expenditure for the item.

The percentages exclude households that recorded no values for participation in any cereal.

	Urban		Rural		Tigray		Afar		Amhara		Oromiya		Somali	
	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%
Teff:														
Expend.	5987	85.9	2622	33.4	726	64.5	359	53.0	2210	74.0	2107	63.7	186	27.9
Income	155	2.2	1646	21.0	197	17.5	39	5.8	546	18.3	430	13.0	17	2.6
Both	132	1.9	1204	15.3	158	14.0	33	4.9	433	14.5	347	10.5	17	2.6
Neither	1816	26.1	5054	64.4	404	35.9	346	51.1	794	26.6	1339	40.5	555	83.3
Maize:														
Expend.	2148	30.8	4567	58.2	295	26.2	441	65.1	714	23.9	1831	55.4	334	50.2
Income	190	2.7	1891	24.1	109	9.7	161	23.8	286	9.6	494	14.9	54	8.1
Both	132	1.9	1623	20.7	84	7.5	136	20.1	228	7.6	410	12.4	50	7.5
Neither	5620	80.7	3283	41.8	849	75.5	245	36.2	2345	78.5	1614	48.8	403	60.5
Wheat:														
Expend.	3055	43.9	2587	33.0	570	50.7	87	12.9	920	30.8	1643	49.7	392	58.9
Income	116	1.7	947	12.1	130	11.6	0	0.0	207	6.9	322	9.7	41	6.2
Both	97	1.4	786	10.0	110	9.8	0	0.0	168	5.6	259	7.8	40	6.0
Neither	4752	68.2	5370	68.4	579	51.5	624	92.2	2158	72.2	1823	55.1	348	52.3
Sorghum:														
Expend.	1665	23.9	3329	42.4	337	30.0	95	14.0	808	27.1	1071	32.4	228	34.2
Income	92	1.3	896	11.4	89	7.9	16	2.4	203	6.8	173	5.2	46	6.9
Both	68	1.0	790	10.1	77	6.8	14	2.1	176	5.9	148	4.5	34	5.1
Neither	6137	88.1	4683	59.7	820	72.9	614	90.7	2282	76.4	2433	73.5	501	75.2
Barley:														
Expend.	1087	15.6	1719	21.9	280	24.9	52	7.7	588	19.7	887	26.8	112	16.8
Income	49	0.7	775	9.9	110	9.8	2	0.3	270	9.0	162	4.9	25	3.8
Both	29	0.4	600	7.6	84	7.5	0	0.0	201	6.7	124	3.7	14	2.1
Neither	6719	96.5	6224	79.3	863	76.7	657	97.0	2460	82.4	2604	78.7	618	92.8

Table 12. Households Participating In Cereals (Page 2 of 2)**Notes:**

"Exp" is the number/percentage of households that recorded any monthly or weekly expenditure on the item.

"Inc" is the number/percentage of households that recorded any income from the item, in the past month or six months.

"Both" is the number/percentage of households that recorded both income and expenditure for the item.

"Neither" is the number/percentage of households that recorded neither income nor expenditure for the item.

The percentages exclude households that recorded no values for participation in any cereal.

	Benshangul		SNNPR		Gambela		Harari		Addis Ababa		Dira Dawa	
	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%
<i>Teff:</i>												
Expend.	342	44.7	821	36.0	190	32.8	263	43.0	1145	96.8	260	41.3
Income	68	8.9	388	17.0	2	0.3	1	0.2	113	9.6	0	0.0
Both	49	6.4	192	8.4	0	0.0	0	0.0	107	9.0	0	0.0
Neither	457	59.7	1457	63.8	419	72.2	397	64.9	204	17.2	498	79.2
<i>Maize:</i>												
Expend.	462	60.4	1731	75.8	403	69.5	241	39.4	133	11.2	130	20.7
Income	217	28.4	571	25.0	177	30.5	8	1.3	2	0.2	2	0.3
Both	184	24.1	506	22.2	148	25.5	5	0.8	2	0.2	2	0.3
Neither	323	42.2	678	29.7	179	30.9	417	68.1	1222	103.3	628	99.8
<i>Wheat:</i>												
Expend.	111	14.5	885	38.8	77	13.3	327	53.4	461	39.0	169	26.9
Income	9	1.2	249	10.9	0	0.0	0	0.0	104	8.8	1	0.2
Both	5	0.7	207	9.1	0	0.0	0	0.0	93	7.9	1	0.2
Neither	703	91.9	1547	67.8	534	92.1	334	54.6	883	74.6	589	93.6
<i>Sorghum:</i>												
Expend.	585	76.5	666	29.2	194	33.4	446	72.9	38	3.2	526	83.6
Income	214	28.0	140	6.1	50	8.6	10	1.6	1	0.1	46	7.3
Both	192	25.1	124	5.4	41	7.1	6	1.0	0	0.0	46	7.3
Neither	211	27.6	1792	78.5	408	70.3	211	34.5	1316	111.2	232	36.9
<i>Barley:</i>												
Expend.	37	4.8	672	29.4	13	2.2	63	10.3	52	4.4	50	7.9
Income	10	1.3	240	10.5	1	0.2	0	0.0	2	0.2	2	0.3
Both	6	0.8	200	8.8	0	0.0	0	0.0	0	0.0	0	0.0
Neither	777	93.6	1762	77.2	597	102.9	598	97.7	1301	110.0	706	112.2

Table 13. Net Buyers and Sellers of Cereals by Expenditure Quintile, URBAN

	Lowest Expenditure			2			3			4			Highest Expenditure		
	Obs	%a	%b	Obs	%a	%b	Obs	%a	%b	Obs	%a	%b	Obs	%a	%b
Teff Buyers	639	52.2	96.4	801	63.1	98.2	958	70.6	98.1	1180	73.5	98.0	1743	73.5	99.0
Sellers	13	1.1	2.0	9	0.7	1.1	12	0.9	1.2	17	1.1	1.4	11	0.5	0.6
Even	11	0.9	1.7	6	0.5	0.7	7	0.5	0.7	7	0.4	0.6	7	0.3	0.4
Maize Buyers	288	23.5	90.9	280	22.0	86.4	282	20.8	91.6	302	18.8	93.5	307	13.0	91.6
Sellers	26	2.1	8.2	38	3.0	11.7	23	1.7	7.5	16	1.0	5.0	20	0.8	6.0
Even	3	0.2	0.9	6	0.5	1.9	3	0.2	1.0	5	0.3	1.5	8	0.3	2.4
Wheat Buyers	300	24.5	95.2	379	29.8	97.9	449	33.1	98.2	540	33.6	97.8	800	33.8	98.4
Sellers	10	0.8	3.2	5	0.4	1.3	5	0.4	1.1	11	0.7	2.0	13	0.5	1.6
Even	5	0.4	1.6	3	0.2	0.8	3	0.2	0.7	1	0.1	0.2	0	0.0	0.0
Sorg. Buyers	222	18.1	93.3	235	18.5	95.1	264	19.5	85.7	265	16.5	94.3	278	11.7	94.9
Sellers	13	1.1	5.5	6	0.5	2.4	11	0.8	3.6	9	0.6	3.2	11	0.5	3.8
Even	3	0.2	1.3	6	0.5	2.4	3	0.2	1.0	7	0.4	2.5	4	0.2	1.4
Barl. Buyers	88	7.2	83.0	109	8.6	94.8	145	10.7	96.0	248	15.4	97.3	335	14.1	99.1
Sellers	7	0.6	6.6	3	0.2	2.6	6	0.4	4.0	5	0.3	2.0	3	0.1	0.9
Even	11	0.9	10.4	3	0.2	2.6	0	0.0	0.0	2	0.1	0.8	0	0.0	0.0

%a: Percentage of all households in the region.

%b: Percentage of households in the region that are involved in this cereal.

Net Expenditures for each grain are calculated using the values for 1) income received from the sale of the item in the last six months, and 2) the monthly expenditure on the item, multiplied by six.

Net Buyers: Number of households for which Net Expenditures is positive.

Net Sellers: Number of households for which Net Expenditures is negative.

Even: Number of households for which expenditure and income are near equal.

Household Expenditure Quintiles are calculated from the household's expenditure per adult equivalent, adjusted by a regional price index (see pp. 50-51).

Table 14. Net Buyers and Sellers of Cereals by Expenditure Quintile, RURAL

	Lowest Expenditure			2			3			4			Highest Expenditure		
	Obs	%a	%b	Obs	%a	%b	Obs	%a	%b	Obs	%a	%b	Obs	%a	%b
Teff Buyers	284	14.7	58.9	408	21.6	67.9	378	21.0	63.9	380	24.5	69.5	224	28.4	74.4
Sellers	131	6.8	27.2	120	6.4	20.0	140	7.8	23.6	120	7.7	21.9	49	6.2	16.3
Even	67	3.5	13.9	73	3.9	12.1	74	4.1	12.5	47	3.0	8.6	28	3.5	9.3
Maize Buyers	569	29.4	69.6	498	26.4	65.9	442	24.5	64.3	397	25.6	64.6	191	24.2	65.4
Sellers	225	11.6	27.5	224	11.9	29.6	222	12.3	32.3	191	12.3	31.1	94	11.9	32.2
Even	23	1.2	2.8	34	1.8	4.5	23	1.3	3.3	27	1.7	4.4	7	0.9	2.4
Wheat Buyers	255	13.2	74.3	334	17.7	75.2	306	17.0	73.7	331	21.3	76.8	183	23.2	77.9
Sellers	78	4.0	22.7	94	5.0	21.2	100	5.5	24.1	84	5.4	19.5	48	6.1	20.4
Even	10	0.5	2.9	16	0.8	3.6	9	0.5	2.2	16	1.0	3.7	4	0.5	1.7
Sorg. Buyers	346	17.9	73.5	326	17.3	76.7	329	18.2	73.8	284	18.3	76.3	148	18.8	78.3
Sellers	97	5.0	20.6	81	4.3	19.1	102	5.7	22.9	76	4.9	20.4	31	3.9	16.4
Even	28	1.4	5.9	18	1.0	4.2	15	0.8	3.4	12	0.8	3.2	10	1.3	5.3
Barl. Buyers	244	12.6	72.6	268	14.2	75.7	257	14.2	70.2	220	14.2	70.5	77	9.8	62.1
Sellers	68	3.5	20.2	68	3.6	19.2	84	4.7	23.0	70	4.5	22.4	35	4.4	28.2
Even	24	1.2	7.1	18	1.0	5.1	25	1.4	6.8	22	1.4	7.1	12	1.5	9.7

%a: Percentage of all households in the region.

%b: Percentage of households in the region that are involved in this cereal.

Net Expenditures for each grain are calculated using the values for 1) income received from the sale of the item in the last six months, and 2) the monthly expenditure on the item, multiplied by six.

Net Buyers: Number of households for which Net Expenditures is positive.

Net Sellers: Number of households for which Net Expenditures is negative.

Even: Number of households for which expenditure and income are near equal.

Household Expenditure Quintiles are calculated from the household's expenditure per adult equivalent, adjusted by a regional price index (see pp. 50-51)

Table 15. Net Buyers and Sellers of Cereals
By Household's Main Income Source

	Subs. Farming		Comm. Farming		Wages & Salaries		Family		Pension		Rent	
	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%	Obs.	%
Teff:												
Buyers	1576	21.2	42	50.0	3878	67.7	460	66.6	396	84.4	219	78.2
Sellers	587	7.9	4	4.8	36	0.6	3	0.4	0	0.0	0	0.0
Even	287	3.9	3	3.6	22	0.4	4	0.6	0	0.0	3	1.1
Not Involved		67.0		41.7		31.2		32.4		15.6		20.7
Maize:												
Buyers	1945	26.2	21	25.0	1113	19.4	129	18.7	94	20.0	62	22.1
Sellers	1003	13.5	5	6.0	53	0.9	4	0.6	0	0.0	0	0.0
Even	109	1.5	0	0.0	22	0.4	1	0.1	0	0.0	0	0.0
Not Involved		58.9		69.0		79.2		80.6		80.0		77.9
Wheat:												
Buyers	1330	17.9	18	21.4	1777	31.0	224	32.4	155	33.0	107	38.2
Sellers	405	5.5	2	2.4	31	0.5	1	0.1	0	0.0	0	0.0
Even	46	0.6	1	1.2	15	0.3	3	0.4	0	0.0	0	0.0
Not Involved		76.0		75.0		68.2		67.0		67.0		61.8
Sorghum:												
Buyers	1422	19.1	21	25.0	908	15.9	129	18.7	88	18.8	43	15.4
Sellers	420	5.7	1	1.2	13	0.2	3	0.4	0	0.0	0	0.0
Even	81	1.1	0	0.0	12	0.2	4	0.6	3	0.6	2	0.7
Not Involved		74.1		73.8		83.7		80.3		80.6		83.9
Barley:												
Buyers	1019	13.7	10	11.9	699	12.2	64	9.3	56	11.9	34	12.1
Sellers	326	4.4	2	2.4	13	0.2	4	0.6	0	0.0	0	0.0
Even	95	1.3	0	0.0	14	0.2	2	0.3	1	0.2	0	0.0
Not Involved		80.6		85.7		87.3		89.9		87.8		87.9

%; The percentage of households in that income category that are net buyers(sellers, even).
This percentage includes households that are not involved in that cereal.

(64% of s.farmers that are involved w/maize are net buyers.)

(75% of s.farmers that are involved w/wheat are net buyers.)

