JRC Scientific and Technical Reports

Cereals Availability Study in Ethiopia, 2008

Development of a spatial equilibrium modelling approach to study the impact of policy intervention on cereals availability

D. Alemu, G. Ayele, B. Behute, Y. Beyone, R. Dewana, B. Fekadu, R. Vargas Hill, N. Minot, S. Rashid, A. Taffesse and N. Tefera

Edited by M. Massart

EUR 24801 EN - 2012

JRC EUROPEAN COMMISSION

Institute for Environment and Sustainability

IFPRI

EIAR

MARS Monitoring Agricultural ResourceS

The mission of the JRC-IES is to provide scientific-technical support to the European Union's policies for the protection and sustainable development of the European and global environment.

European Commission
Joint Research Centre
Institute for Environment and Sustainability

Contact information
Address: JRC/IES/MARS Unit, Via E. Fermi, 2749 – 21027 – Ispra (VA) - Italy
E-mail: olivier.leo@jrc.ec.europa.eu
Tel.: +39 (0)332 789474
Fax: +39 (0)332 787890

http://ies.jrc.ec.europa.eu/
http://www.jrc.ec.europa.eu/

JRC 64683

EUR 24801 EN
ISBN 978-92-79-20045-8 (print)
ISBN 978-92-79-20046-5 (PDF)
ISSN 1018-5593 (print)
ISSN 1831-9424 (online)

doi:10.2788/14890

Luxembourg: Publications Office of the European Union, 2012

Cover photo : Grain threshing area near Butajira (Gurage, SNNPR)

Printed in Luxembourg

Table of Contents

List of Tables

List of Figures

Acronyms

EAHM	Ethiopian Agricultural Marketing Household Survey
CSA	Central Statistics Agency
EC	European Commission
EU	European Union
JRC	Joint Research Center of EU
IFPRI	International Food Policy Research Institute
EDRI	Ethiopian Development Research Institute
EIAR	Ethiopian Institute for Agricultural Research
SNNPR	Southern Nations and Nationalities People Region
ECX	Ethiopian Commodity Exchange
WFP	World Food Program
EGTE	Ethiopia Grain Trading Enterprise
ESGMM	Ethiopian Spatial Grain Marketing Model
PSNP	Productive Safety Net Program
CAS	Cereal Availability Study
UN	United Nations
MSU	Michigan State University
ALDS	Agricultural Led Development Strategy
ETB	Ethiopian Birr
HICE	Household Income, Consumption and Expenditure Survey
EA	Enumeration Area
RMA	Rapid Market Appraisal
EASE	Ethiopian Agricultural Sample Enumeration
AgSS	Agricultural Sample Survey
GMRP	Grain Marketing Research Project

Foreword

As a result of the spatial distribution of high grain production regions versus population needs and poverty, millions of people in Ethiopia are facing food shortage each year. In the last years, the Ethiopian Government appealed for several hundred thousand tons of food assistance for people who were unable to meet their food consumption requirement.

Since 1996, European Commission and World Food Program are not only implementing food aid through imported grain but are also providing food aid through local purchase activities when possible. The objective of this approach is to limit the competition between imported food aid and domestic market in both quantities and value. It also increases the size of the market for local traders and enhances producers' conditions. Experiences have shown that even in deficit years, a certain quantity of marketable surplus could be available for local purchase.

This situation is also particularly delicate with the recent and unprecedented increase in the price of all major cereals. Changes in grain markets have been the source of major concerns for the Ethiopian Government and development agencies.

To determine whether or not local purchase is feasible, and the detailed conditions of the operation, the DG Joint Research Centre of the European Commission in collaboration with the World Food Program and the EC Delegation in Ethiopia has launched this project, extending the scope of the usual Cereals Availability Study, and accounting for the unusual developments in the Ethiopian cereals markets.

The International Food Policy Research Institute (IFPRI) with the Ethiopian Development Research Institute (EDRI) and the Ethiopian Institute of Agricultural Research (EIAR) were selected to carry out the project. They have generated quite substantial information, answering to widely held hypothesis about changes in the Ethiopian cereals markets, generating key parameters used for assessing cereal availability and assessing the impacts of various policy interventions on the market.

A nationally representative household survey, a grain traders' survey and a rapid assessment of cross border trade have been conducted in the context of the project. They represent an essential and primary source of information. They also allowed the development and the set up of a spatial equilibrium model to directly assess impact of policy interventions. Besides providing a vision on Ethiopian market behaviour, the advantage of the development is also in the potential applications of the approach and of the model in other countries.

The project results were presented to all the stakeholders in a final workshop held in the United Nations' Economic Commission for Africa Auditorium in Addis Ababa on the 5th of December 2008.

Elliot Vhurumuku
Head of Vulnerability Analysis and Mapping- WFP Ethiopia

Study Team

Dawit Alemu is the head of the socio-economic and market division at the Ethiopian Institute of Agricultural Research (EIAR). As the key EIAR contact person for the project, Dr. Alemu co-led cross border trade assessment, helped design the traders' survey, and contributed in training the survey enumerators.

Gezahegn Ayele is a senior research fellow and head of the agriculture and rural development directorate of the Ethiopian Development Research Institute (EDRI). He has held may other important positions at the national research centers and collaborated with many international research institutions, development organizations, and the UN agencies. In addition to contributing in the study design, Dr. Ayele assumed the main responsibility for all aspects of survey administration and quality control.

Befekadu Behute is a research officer at IFPRI-Addis Ababa. He was responsible for collecting and analyzing all secondary data used in this report. Mr. Behute also contributed in organizing the workshops and preparing communications materials.

Yodit Beyone is a freelance communication specialist. Prior to becoming a consultant, she worked at IFPRI-Addis Ababa as a Congressional Hunger Fellow of the United States. Ms. Yodit was responsible for communication materials and media relations for the final CAS workshop.

Reno Dewana is a research analyst at IFPRI-Washington DC. She was responsible for analyzing the household survey data.

Belay Fekadu is currently an Associate Economic Affairs Officers at the United Nations' Economic Commission for Africa. Before taking up his new position in February 2008, he was a research officer at IFPRI for about two years, primarily working on this study. Mr. Fekadu was involved in almost all aspects of the study, including survey coordination, data analyses, and logistic and administrative coordination.

Ruth Vargas Hill is a research fellow at IFPRI-Washington DC. She was responsible for preparing the report on traders' survey data. Dr. Hill has also worked on the 2002 IFPRI/ILRI traders' survey data and visited Ethiopia for this and other related studies.

Nicholas Minot is a senior research fellow at IFPRI-Washington DC. He led the designing, pretesting, and reporting of the household survey. Dr. Minot also led the work on spatial equilibrium modeling to assess various policy impacts.

Shahidur Rashid is a senior research fellow at IFPRI-Addis Ababa. He provided overall leadership in conceptualizing, managing, and coordinating among various study components. Dr. Rashid also led the earlier project reports, including descriptive report, methodology report, and the cereal availability overview report.

Alemayehu Seyoum Taffesse is research fellow at IFPRI-Addis Ababa. He was responsible for determining the sampling methodology, supervising the analyses of both secondary and primary data in Addis Ababa, as well as proving intellectual guidance to various study components. He was also co-author of the presentation on distributional consequences of rising prices in rural Ethiopia.

Nigussie Tefera is a Ph.D. student at the University of Catholic in Milan, Italy. He is now based in Addis Ababa working on his dissertation using IFPRI databases under co-supervision of professor Enrica Chiappero Marttinet at the University of Pavia and Shahidur Rashid at IFPRI. He was responsible for analyzing the distributional effects of rising food prices in rural Ethiopia

.

Summary

Unusual changes in grain markets have been the source of major concerns for the Government of Ethiopia and its development partners. Increase in cereal price presented serious challenges to the implementation of country's food security programs. Local procurement of food by the WFP declined also in the recent years. Being one of the largest donors of local procurement of food, the European Union was particularly concerned about these developments. Thus, as a General Directorate in charge of supporting EU policies, the Joint Research Centre (JRC) of the EU developed the technical specification of a project to extend the scope of the usual Cereal Availability Study (CAS) in order to account for the developments in the Ethiopian cereal markets. International Food Policy Research Institute (IFPRI) consortium with the Ethiopian Development Research Institute (EDRI) and the Ethiopian Institute of Agricultural Research (EIAR) was selected to carry out the study.

A number of preliminary analyses, undertaken by the World Bank and IFPRI had put forward a number of hypotheses to explain unusual high cereal prices. While the different hypotheses were widely debated in the country, there is limited primary information to validate or refute them. It is in this context that the current study was undertaken. The focus has been mainly on achieving the following objectives:

- To gather information regarding recent changes in cereal production, storage, and marketing patterns in order to test the hypotheses that have been proposed to explain the high price of cereals in Ethiopian markets.
- To improve the general methodology of the past cereal availability studies.
- To estimate the quantity of maize, sorghum, and wheat that can be procured from domestic markets in the 2008 for relief purposes without disturbing the local market.

Implementation of the study was carried out in three broad stages. The first stage involved an overview of cereal availability methods and a consultation for determining the survey / sampling methods. Three surveys were conducted in the second stage, namely, a household survey, a traders' survey, and a rapid assessment of cross border trade. At third stage, results from the surveys, and some secondary data, have been used to develop a spatial equilibrium multi-market model (ESGMM) to analyze policy impacts of various policy interventions. The results were presented in a final workshop held in the United Nations' Economic Commission for Africa in Addis Ababa on December 5, 2008.

PART - I

INTRODUCTION AND SYNTHESIS OF RESULTS

Chapter 1: The Strategic Context

1.1 Background

The unprecedented increase in the prices of all major cereals in Ethiopia during the past few years has been puzzling for a number of reasons. First, prices in Ethiopia started increasing long before food prices began to spike in the world market. This is evident in government's decision to ban cereal export in early 2006; and the rapid assessment of rising prices carried out by the International Food Policy Research Institute and the Ethiopian Development Research Institute (EDRI).[1] Second, prices were rising despite consecutive years of good harvest, which defied historical relationship between production and market prices. For instance, in 2002 producer prices collapsed by an average of 60 percent in response to what was then considered to be a bumper crop of 9 million tons, about 50 percent lower than the 2006-2007 cereal harvest 18.2 million tons. Finally, domestic prices of cereals have historically been within export and import parity bands. Prices of both wheat and maize, which hovered around import parity until 2006, fell significantly below import in the wake of rising food prices during 2007, making these commodity completely non-tradable.

These unusual changes in grain markets have been the source of major concerns for the Government of Ethiopia and its development partners. In addition to potential political and social consequences—as demonstrated in many occasions in developing countries—increase in cereal price presented serious challenges to the implementation of country's food security and anti-poverty programs. Local procurement of food by the WFP, which are generally used to support food security programs within the country, declined from an average of more than 150,000 tons during 2003-2004[2] to practically zero in 2008. Being one of the largest donors of local procurement of food, the European Union was particularly concerned about these unusual developments. Thus, following extensive consultation with various stakeholders, the Joint Research Centre (JRC) of the EU developed a technical specification of project to extend the scope of the usual Cereal Availability Study (CAS) and account for the unusual developments in the Ethiopian cereal markets. IFPRI consortium with the Ethiopian Development Research Institute (EDRI) and the Ethiopian Institute of Agricultural Research (EIAR) was selected to carry out the study.

A number of preliminary analyses, undertaken by the World Bank and the International Food Policy Research Institute (IFPRI), pre-dated the launching of this study that had put forward a number of proximate hypotheses in explain unusually high cereal prices. Among the widely believed hypotheses were: (i) increased overall demand relative to supply; (ii) reduced domestic cereal availability due to

[1] Getnet, K., E. Gabre-Madhin, and S. Timrat (2006)

increased cross border exports of cereals; (iii) trade disruptions due to hoarding; and (iv) reduced food availability due to reduction in food aid inflow. While these hypotheses were widely debated in the country, there is limited primary information to validate or refute them. It is in this particular context current study was undertaken. While the survey data can be used address host of different issue related to Ethiopian agriculture and household well-being, the focus has been on achieving the following main objectives:

- To gather information regarding recent changes in cereal production, storage, and marketing patterns in order to test several hypotheses that have been proposed to explain the high price of cereals in Ethiopian markets.
- To improve the general methodology of the past cereal availability studies. Achieving the first objective in a rigorous way is critical, as data collected for this purpose will constitute the building blocks for achieving the second objective.
- To estimate the quantity of maize, sorghum, and wheat that can be procured from domestic markets in the 2007/2008 agricultural year for relief purposes without disturbing the local market.

Implementation of the study was carried out in three broad stages. The first stage involved a comprehensive overview of cereal availability methods and a multi-stakeholders' consultation for determining the survey / sampling methods. Three sets of surveys were conducted—namely, a household survey (representative of the all major cereal producing regions); a traders' survey, and a rapid assessment of cross border trade of cereals and livestock. Based on the preliminary results, a preliminary findings meeting was held in Addis Ababa. Following that meeting, further analysis was carried out and the results were triangulated with a large body of secondary data. In addition results from all surveys, and some secondary data, have been used to develop a spatial equilibrium multi-market model (ESGMM) to analyze policy impacts of various policy interventions. These results were presented in the final workshop held in the United Nations' Economic Commission for Africa Auditorium on December 5, 2008. After the final workshop in December the study team has carried out further analyses and triangulated results with secondary and published sources. This report brings together all the pieces of works carried out under this project.

[2] This does not include procurement by EGTE and other NGOs.

1.2 Methodology

This section provides plain descriptions of the study methods employed for the three key surveys, namely (a) household surveys, (b) market surveys, and (c) rapid assessment of cross border trade.

The household survey methodology

The sampling of the household survey followed a three-stage stratified random sampling. In the first stage, the woredas from each region were selected randomly from a list arranged by degree of commercialization as measured by the woreda-level quantity of cereals marketed. This ensured that that woredas were uniformly distributed across the range of level of marketed cereal outputs. In the second stage, farmers' or peasants' associations (FAs or Pas) were random selected from each woreda.[3] For the third stage of selection, households are randomly selected from the list provided by the PA office.

Implementation of this sampling involved three technical considerations. The first consideration was identifying the outcome variable(s) of interest. Given the primary objective of the study, estimating cereal availability, the volume of marketed cereal the cluster (woreda) level was selected for this purpose. The information about the marketed cereal at woreda level was collected from the CSA for all four major cereal growing regions in the country—namely, Amhara, Oromiya, SNNPR, and Tigray. Samples were assumed to be clustered at the woreda level, which was dictated by the availability of data on the outcome variables. To ensure representative-ness and minimize precision errors, the study team has had a series of discussions with the CSA about the sampling frame.[4]

Two other technical considerations in drawing household samples were design effects and allowable margins of errors, respectively. The margin of errors are important for all statistical surveys, but consideration of design effect is particularly import for drawing samples from a cluster or strata, particularly determining sample size in each strata. After considering various levels of design effects and margin of errors, a sample size of 1500 was determined to adequate. Details of the sample sizes under alternative scenarios are presented in Table 1. Subsequently, sample size had to be increased to account for some idiosyncrasies in the Tigray region.

[3] The initial plan was to select Enumeration Areas (EAs) at this stage rather than Pas. In fact, EAs were randomly selected from each woreda. Our inability to obtain EA maps on time meant that we have to select PAs instead. We picked the PAs corresponding to the randomly selected EAs. This is analogous to selecting PAs randomly since the EAs were directly selected randomly from a list of EAs in each woreda and without any reference to PAs. This decision is made in consultation with CSA staff.

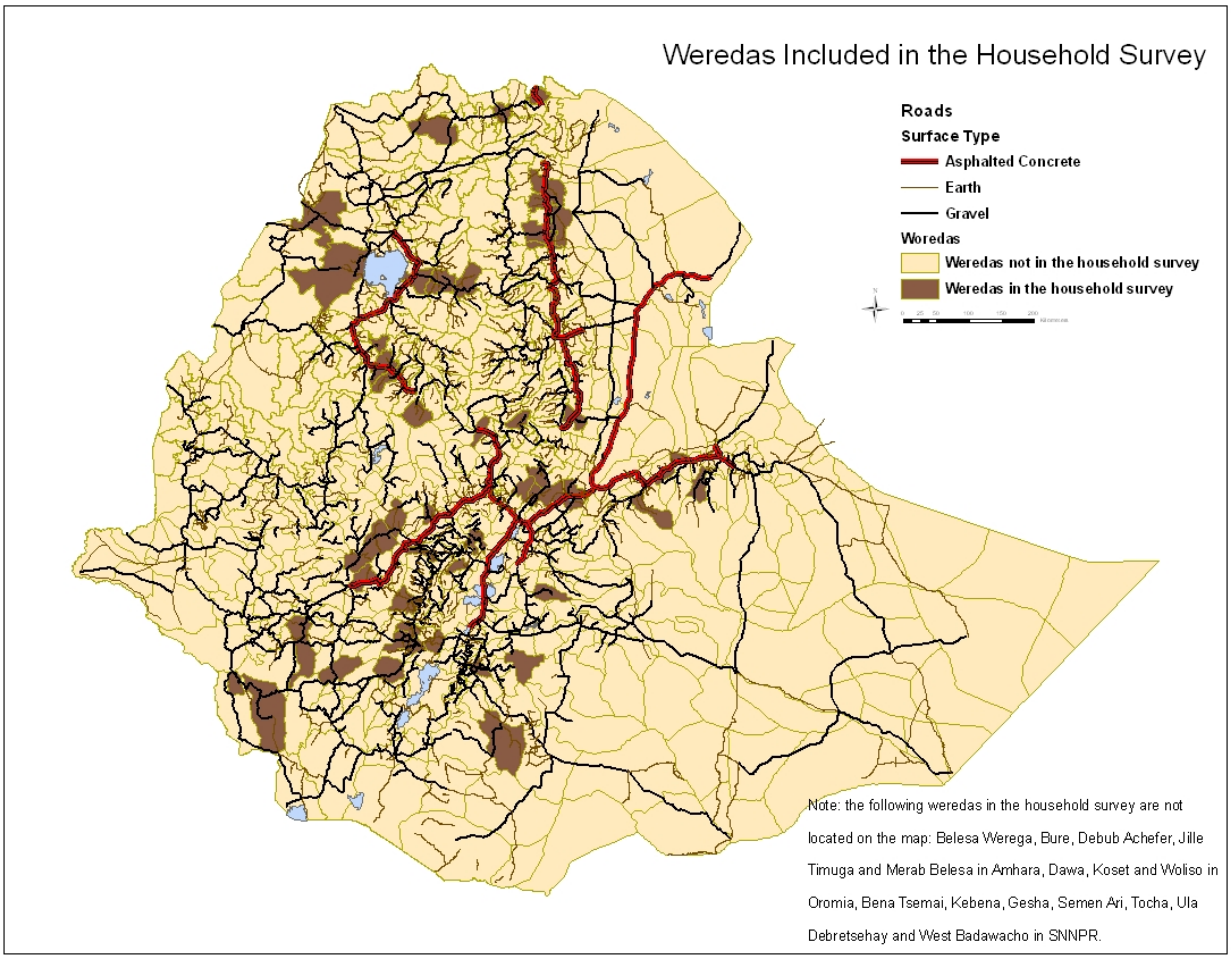
[4] The initial plan to survey a fraction of the sample of the the Ethiopian Household Income, Consumption, and Expenditure Survey 1999/2000 (HICE 1999/2000) has to be dropped. The Ethiopian Central Statistical Agency (CSA) has changed its sampling frame and insisted that the new frame has to be used.

Table 1.1 Sample size determinations

Two-sided Confidence Interval = 95%	Marketed surplus	Margins of error (M)					
Normal Deviate	Variance	0.050	0.050	0.050	0.050	0.050	0.050
		Design Effect					
		3.3	4.5	5.0	5.6	6.8	7.9
1.96	0.25	**1268**	1710	1930	2151	2593	3035
1.96	0.20	1014	***1368***	***1544***	1721	2074	2428
1.96	0.15	761	1026	***1158***	***1291***	1556	1821
1.96	0.10	507	684	772	861	***1037***	1214
1.96	0.09	456	615	695	774	934	***1093***
1.96	0.08	406	547	618	688	830	971
1.96	0.07	355	479	541	602	726	850

Source: Variances were calculated from the CSA data and the design effects are from the previous table.

Figure 1.1 Locations of the household survey samples



Traders / market survey methodology

The initial methodological plan was to follow up the 2002 IFPRI market survey samples in order to be able to compare the changes in structure-conduct-performance of the selected grain. The study team also tried to account for the traders' survey conducted by the Ethiopian Commodity Exchange (ECX). There were two problems in adequately accounting for the both issues. First, ECEX baseline survey was conducted only on the wholesalers; and hence did not capture the implications for the smaller traders for whom market operations has greater food security implications. Second, covering market locations surveyed in 2002 study, proved logistically and financially infeasible.

Through consultation with CSA, IFPRI, and other national agencies, the study team decided to draw the sample within the vicinity of the clusters from which household sample was randomly drawn. For selected households sampling sites, drawing of traders sample is illustrated in Table 1.2. Please note that this table only reflects selected sites not the entire sample. Note that the market survey methodology adopted for this study has three distinct advantages: (a) the market survey data can be matched with the household survey data with statistical validity, (b) it will enable studying the changes in structure, conduct, performance for surplus and deficit market for the same time period, and (c) it is more cost effective.

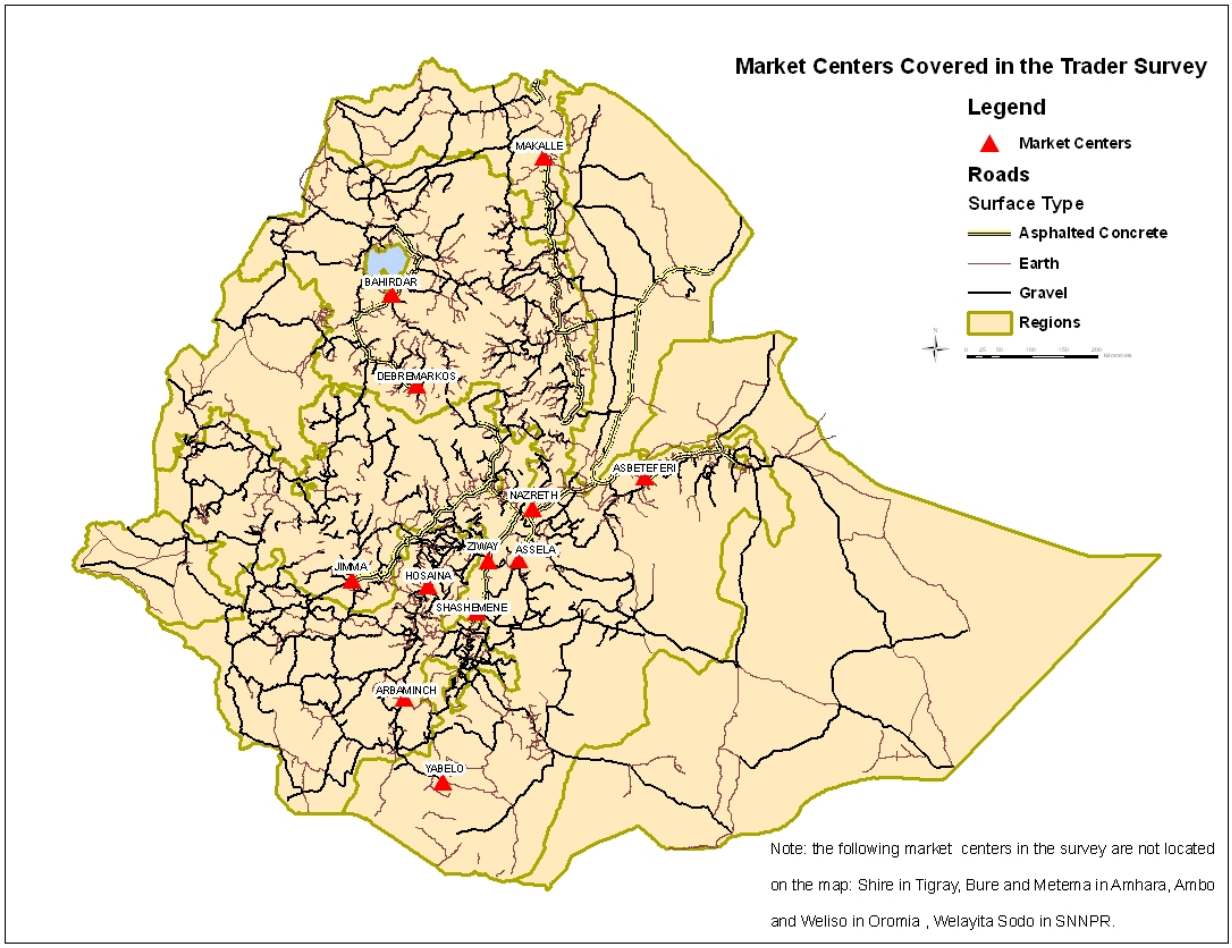
Table 1.2 Illustration of traders' survey sampling in selected woreda

Region	Zone	Woreda	Markets	# of traders
Oromiya	West Shewa	Nono	Ambo	17
Oromiya	West Shewa	Wonchi		
Oromiya	West Shewa	Woliso	Wolliso	17
SNNP	Guraghe	Qabeana		
SNNP	Guraghe	Silte		
SNNP	Guraghe	Sodo		
SNNP	Hadiya	S. Badawacho		
SNNP	Hadiya	Soro	Hossena	17
SNNP	Benchi Maji	Maji		
Oromiya	Jimma	Kersa		
Oromiya	Jimma	Limu Kosa	Jimma	17
SNNP	Kaffa	Decha		
SNNP	Kaffa	Gesha		
Total Number of Sample				**68**

Total targeted sample of at least 150 wholesalers. A total of 20 markets will be visited. Interview 50 % of the wholesaler in each market, if the # of wholesaler is >= 10; If total number of traders is less than 10, interview a minimum of five.

Total targeted number of retailer / Assemblers 200; 12 traders in each of the 9 deficit markets; 8 traders from each of the 11 surplus markets.

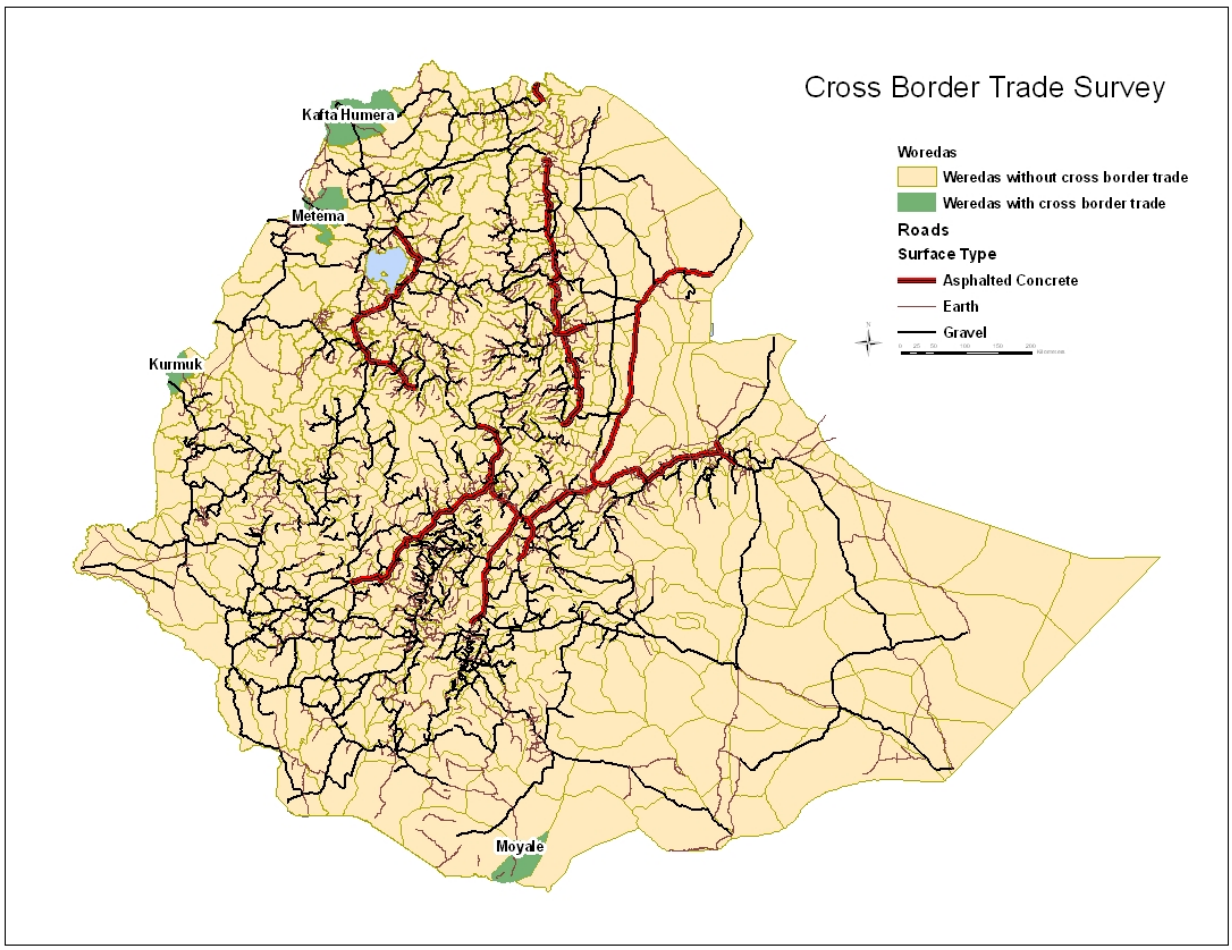
Figure 1.2 Geographic locations of market samples in the trader survey



Rapid assessment of cross border trade

This study was based on rapid assessment official and unofficial trade flows in four major cross border trade points in Ethiopia: Kumruk-Assosa in the Benshangul-Gumuz region, Metema area in Amhara region, Humera in Tigray region and Moyale in Oromiya/Somali region (Figure 1.3). Kumruk-Assosa, Metema and Humara are trading points with Sudan and Moyale is the major trade route with Kenya.

Figure 1.3 Locations of four major cross border trade points addressed in the study



Both primary and secondary data sources were employed for data analysis. The secondary data were collected from relevant government offices, including Customs Agency and Bureaus of agriculture and Rural Development at different levels (i.e., zone, region and federal level). The primary data were generated using a Rapid Market Appraisal (RMA), which is designed by the CAS study team and implemented by expert enumerators from regional offices of the Ethiopian Institute of Agricultural Research (EIAR) who has established contacts with the key players in the respective border points. The RMA employed group discussion, discussion with key informants, as well as direct observation by the researchers. In order to better guide the data collection during the discussions, checklists for the different target groups were prepared. The group discussions and discussion with key informants were conducted with experts of the Bureaus of Agriculture and Rural Development, respective offices of the Customs Agency, farmers group, and local traders. The group discussions were held particularly in the purposively selected domestic markets canters.

1.3 The study components

The stakeholders in cereal markets are many. In addition to millions of farmers and traders, both governments and donors' food security policies heavily influence grain markets in developing countries. Among the UN agencies, the WFP has played significant roles in grain markets development for decades, especially though local procurement. With supports of donor governments, WFP has spent over US$1.2 billion in food purchases in Africa alone from 2001 to 2007. In 2007, 80% of WFP's overall food purchases were made in developing countries, representing over US$612 million or 1.6 million metric tons. Of the total purchase, 56% was procured in least developed and low-income countries, while 24% was procured in middle-income developing countries. In Ethiopia, local procurement has been substantial until the operation was temporarily suspended in the face of rising food prices.

A critical factor in WFP's guideline for local purchase is that its procurement should not de-stabilize the domestic markets. In particular, one of the conditions for local purchase is that the domestic prices should not exceed to import parity prices. However, as demonstrated in Ethiopia, there are important factors that can dictate local purchase operation. For example, while real prices of maize in domestic markets was falling in 2006/07 (World Bank, 2007) local purchase could not have been carried out due high nominal prices and hence government's fear that local purchase could further increase the prices. The puzzling changes in grain markets and governments' policy actions made it clear that CAS could not have been conducted the same way that it had been conducted for years. A clear understanding of behavioral changes at household levels, grain traders' level, as we as policy actions had to be taken into account for a better assessment of cereal availability in Ethiopia.

Keeping these realities in mind, the study was Availability Study (CAS) 2008 for Ethiopia that has four major research components. Two of the fundamental components are changes in household and grain market behaviors, which are addressed by conducting two intensive sets of surveys. The third component, cross border trade, does not involve formal surveys but certainly requires very intelligent rapid assessments and review of secondary data / documents. The final component of the CAS 2008 is a spatial equilibrium model, which makes use of data generated by the three other components of the study. In particular, the model is formulated to analyze how purchase of grain in various regions likely to affect prices. In addition, the model is flexible enough to analyze other policy shocks; changes in trade policies, reduction in transactions costs, etc.

1.4 Notes on organization and contents

This report is organized with an objective to increase accessibility of the study findings to a wide range of readers. Four points about the organization are worth noting. First, each of the four core chapters (chapters 2-5) presents detail analyses based on household survey, traders' survey, cross border trade assessments, and the modeling exercises. From a value chain perspective, these chapters are interlinked and feed each other for better understanding. For example, marketable surpluses, on farm storage, consumption behaviors are all critical determinants prices; and a household survey is necessary to capture them. The information obtained from the household survey is then triangulated to ascertain whether the cross border trade and the market survey data are consistent. Finally data from all these three components are used to set up the spatial equilibrium model and carry out policy simulations. However, each of the chapters can be read as an independent piece of study without having to consult other chapters. For instance, if a reader is interested in the impacts of policy interventions (such as local food procurement or increased distribution of food under safety net programs) without worrying about how the model parameters are estimated, s/he can go directly to chapter 5. Similarly, readers interested in the results of the analysis on the changes in households' production behaviors or grain traders' storage behaviors can get the information from chapter 2 and chapter 3, respectively.

Three other aspects of the report need especial mention. First, the technical details are kept into the minimum and only core tables are included in the text, with detail tables presented in the annex. In particular, this report does not include the detail equations and assumptions in generating the statistical / econometric results presented in the respective chapters.[5] Second, the report presents a synthesized summary of the study components in chapter 6, which is envisaged to serve as snap-shot summary of the study findings. Finally, this report does not include important background papers produced for this project, which include (i) an overview report on CAS estimates and methods, (ii) a report on the sampling and survey administration, and (iii) a descriptive report on the preliminary findings. These reports are listed at the end of this report and are available from the both IFPRI and JRC.

[5] For details, please contact the authors who will be happy to answer to questions and to provide additional information

PART – II

THE KEY STUDY COMPONENTS

Chapter 2: Results from the household survey

2.1 Introduction

This chapter discusses the main results of the 2008 Ethiopian Agricultural Household Marketing Survey, carried out as part of the Cereal Availability Study. As indicated earlier, the central piece of the study has been has been a nationally representative household survey in the four main cereal growing regions namely, Amhara, Oromya, SNNPR, and Tigray. This describes methods and presents results on various aspects of household activities that are likely to influence price—such as production, marketed surplus, consumption, storage and income diversifications. Some of the estimates from this chapter serve as the basis for modelling exercises as well as triangulation of the market and cross border trade surveys.

2.2 Methods

The household survey is based on a 16-page questionnaire covering household characteristics, housing, assets, land use, crop production, agricultural input use, crop storage, crop marketing, livestock production, non-farm income, credit, consumption patterns, and perception of changes. The survey questionnaire capture the Meher season of 2007. However, the reference period for recall period was 2004/05, which is used to compare the changes.

The sample includes 1707 households in the four main regions of Ethiopia: Tigray, Amhara, Oromia, and the Southern Nations, Nationalities, and People's Region (SNNP). These four regions account for about 97% of cereal production in Ethiopia. Excluded are three urban regions (Addis Ababa, Dire Dawa, and Harari), two sparsely-populated semi-arid regions (Afar and Somali), and two relatively small regions (Gambela and Benishangul-Gumuz) with less than one million inhabitants. The sample was selected with the assistance of the Central Statistical Authority (CSA) and represents a three-stage stratified random cluster sample. In the first stage, rural woredas were randomly selected from each region; in the second, enumeration areas and peasant associations were randomly selected from these woredas; and in the third stage, households were randomly selected from household from household lists.

In February 2008, IFPRI staff trained 25 enumerators and four supervisors over a seven-day period. The training included field testing of the questionnaire and numerous revisions of the questionnaire. The data collection was carried out by four teams of enumerators over the period March-May 2008.

The data entry was done using CS-Pro, a software package designed specifically for data entry of survey and census data. The data entry program was designed to check the data for numbers that were out-of-range or inconsistent with other entered data.

The analysis was carried out using Stata, a software package used widely for analysis of household survey data. Preliminary results of the survey based on partially-cleaned and un-weighted data were presented at a workshop in Addis Ababa in June 2008. The results presented in this report cover a wider range of topics, are based on cleaned data, and make use of sampling weights.

2.3 Household characteristics

The average household in the sample has 6.5 members. This result is somewhat higher than the corresponding figure in the Population Census of 2000-01, which estimated the average household size to be 5.2 members. This difference may be related to a narrower definition of the household in the Census and/or the fact that our survey covers only the four main regions.

The age composition of household members reflects the fact that the Ethiopian population is quite young. The average age is 20 years old and half the rural population is less than 15 years old. There were no notable differences in age composition across regions.

According to the survey, rural inhabitants who are at least seven years old have an average of 2.2 years of schooling. Almost half (48%) have no schooling, and just 7% have any secondary school education. The literacy rate among this group is about 39%. Among the four regions surveyed, literacy rates are highest in Amhara (47%) and lowest in SNNP (33%) However, the results suggest that education levels are improving. Those in the 50-59 year age category received less than one year of schooling on average, and their literacy rate is just 17%. In contrast, those in the 10-19 year category have had three years of schooling on average and their literacy rate is 60%.

There is a sizable gender gap in the level of education and the literacy rates. Men have 2.7 years of schooling on average, compared to 1.6 years for women. Furthermore, the literacy rate is 48% among men and just 30% among women. However, this gender gap is much smaller among the youth than among adults. For example, among those 10-19 years old, the literacy rates are 62% for boys and 59% for girls. In contrast, among 40-49 year olds, the literacy rates are 47% for men and just 6% for women.

The main activity of household members depends on their age and sex. Among men over the age of 20, 85% reported their main activity to be crop production. The remainder said their main activity was studies (8%), raising livestock, wage employment, self-employment in non-farm enterprises, or retirement (1% each). Among adult women, 60% had a reported main activity of unpaid housework, while 26% reported crop production and 3% small business owner. The most common secondary activity for adult men was livestock production (28%), while for adult women it was crop production (39%).

Among the heads of household, the average age is 44 years, the average level of education is 2.1 years, and the literacy rate is 39-40%. According to the survey, about 8% of rural households are female-headed. This proportion is smaller than estimated in the Population Census of 2000-01 and the 2005 Ethiopian Demographic and Health Survey, both of which estimated that 20% of the rural households are headed by women (CSA and ORC Macro, 2006). Part of this difference may be related to different definitions of female-headed households and to the fact that our survey covers only the four main regions of Ethiopia.

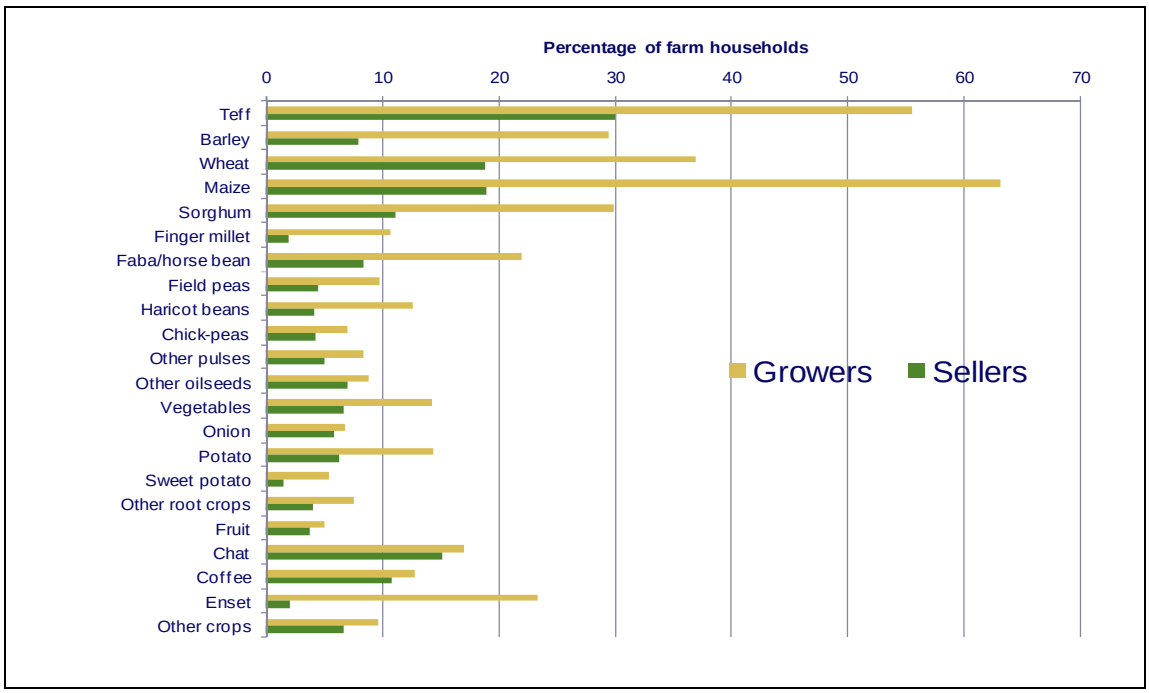
The EAHM Survey collected basic information on the characteristics of the houses occupied by rural households in the sample. About 80% of the houses have walls made of wood and mud, while the remainders have walls made of wood (7%), grass and mud (5%), and other materials. Most of the houses (48%) have floors made from cow dung or mud mixed with soil, while 41% had sand or earth floors. The roof is made of grass or thatch in 51% of the houses and of corrugated metal in 44% of them. The roof type varied markedly across regions, with Amhara having the highest percentage of metal roofs (60%) and SNNP having the lowest (25%). Almost all the houses owned by respondents in our sample have one, two, or three rooms, with an average of 1.9 rooms. Similarly, almost all the houses had zero, one, or two windows, with the average being one window. Electrification was quite rare among the rural households sampled, with less than 3% of them using electric lights. This result is comparable to that of the 2005 Ethiopia Demographic and Health Survey, which found that 1.9% of the rural households had electricity.

According to the EAMHS, the average farm size is about 1.6 hectares, though the median is just 1.1 hectares. Only 4% of the plots are irrigated. These numbers are consistent with CSA data on holding size. According to 2007-08 agricultural sample enumeration survey, almost 60 percent of the farm households in Ethiopia operate on less than two hectares of lands.

2.4 Crop production

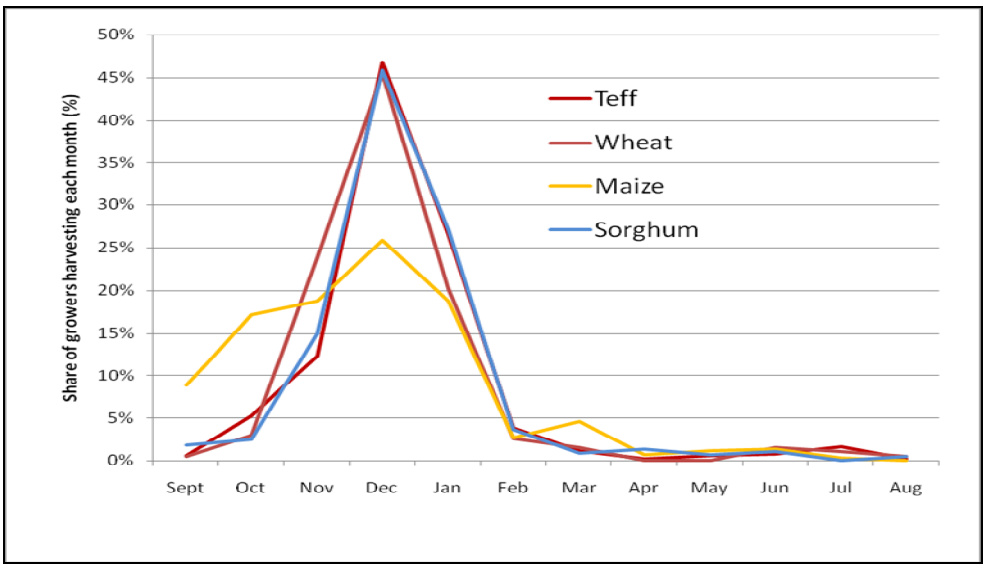
According to the Ethiopia Agricultural Marketing Household Survey (EAMHS), maize and teff are the most commonly grown crops, each being grown by more than 55% of farm households in Ethiopia. Wheat, sorghum, and barley are next, produced by 29-35% of farm households. Faba beans and enset are each grown by more than 20% of farm households (see Figure 2.1).

Figure 2.1 Percentage of households producing and selling each crop



Respondents were asked about the timing of the harvest and the area and production of each crop during both Belg and Meher seasons. Almost half the farmers reported carrying out the Meher harvest of teff, wheat, and sorghum in January, though the maize harvest starts earlier and ends later than the other cereals (see Figure 2.2).

Figure 2.2 Timing of the Meher harvest of cereals (% of households)



The estimates of land allocation by crops confirm well-known regional differences in cropping patterns (Table 2.2). In Tigray, the crops with the greatest area are teff, sorghum, and, to a lesser

extent wheat, which account for about 40% of the crop area. In Amhara, teff is the most important crop (19% of the area), followed by wheat, sorghum, and maize. In Oromia, two-thirds of the cropland is allocated to cereals, with teff alone accounting for 22%. In the SNNP region, maize accounts for the largest crop area (21% of the total), followed by teff and enset.

Table 2.2 Share of crop area allocated to each crop by region (%)

Crop	Tigray	Amhara	Oromia	SNNP	Total
Teff	15	19	22	18	20
Barley	9	7	4	6	6
Wheat	11	11	10	6	10
Maize	4	10	18	21	15
Sorghum	14	11	10	3	9
Finger millet	4	6	2	0	3
Faba bean	1	6	3	4	4
Field peas	1	1	6	5	4
Haricot beans	0	1	1	6	2
Chick-peas	1	5	1	1	2
Other pulses	2	2	2	2	2
Oilseeds	3	8	2	0	4
Vegetables	8	1	1	1	2
Onion	2	1	1	0	1
Potato	1	6	0	1	2
Sweet potato	0	0	0	3	0
Other root crops	3	0	1	2	1
Fruit	2	0	1	1	1
Chat	2	0	3	1	2
Coffee	0	0	7	2	3
Enset	4	0	6	12	5
Other crops	12	5	0	3	3

Source: Estimated from 2008 EAMHS.

Level of production

According to the EAMHS, maize is the most important crop in volume terms, with an estimated 3.6 million tons of production, most of which is grown in Oromia. Teff is second in importance, with 2.1 million tons. Amhara and Oromia are the two main teff-growing regions, accounting for 83% of the national production. Wheat and sorghum are also important crops, with 1.7 million tons and 1.5 million tons of production respectively. In both cases, Amhara and Oromia are the main producing regions. In volume terms, these four cereals are followed in importance by potatoes, barley, and enset (see Table 2.3).

Table 2.3 National production of main crops (1000 tons)

Crop	Tigray	Amhara	Oromia	SNNP	Total
Teff	197	864	892	167	2,121
Barley	172	390	213	54	829
Wheat	173	709	682	106	1,670
Maize	89	1,025	2,032	435	3,581
Sorghum	304	571	597	67	1,539
Finger millet	37	280	67	2	385
Faba bean	18	225	127	68	438
Field peas	5	32	112	51	200
Haricot beans	0	70	109	88	267
Chick-peas	7	183	58	5	253
Other pulses	15	92	105	10	222
Oilseeds	17	116	47	4	183
Vegetables	45	67	190	31	333
Onion	59	165	206	8	438
Potato	36	889	85	83	1,093
Sweet potato	0	0	10	201	211
Other root crops	1	18	134	106	259
Fruit	27	11	83	52	173
Chat	4	0	288	18	310
Coffee	1	3	259	36	299
Enset	0	0	448	371	819
Other crops	31	621	27	64	743

Source: Estimated from 2008 EAMHS.

How do EAMHS production estimates compare to other estimates? The 2001-02 Ethiopian Agricultural Sample Enumeration (EASE) was a massive data collection exercise that collected information from 450 thousand agricultural households and generated woreda-level production estimates. The EAMHS data suggest that cereal production has grown about 18% since the 2000-01 EASE survey. The growth is highest for teff (29%) and lowest for sorghum (9%). This pattern is consistent with a pattern in which production is responding to shifts in cereal demand in response to income growth, since teff is the most expensive cereal and is a preferred staple, while sorghum is less expensive and is consumed more among rural and low-income households (see Table 2.3).

The 2007-08 Agricultural Sample Survey (AgSS) collected information from over 42 thousand agricultural households, producing estimates at the zone level for the Meher season only. The EAMHS estimates for meher production are markedly lower than those of the 2007-08 AgSS. The difference ranges from 29% lower for maize to 44% lower for sorghum (see Table 2.4).

Table 2.4 Comparison of different estimates of cereal production (1000 tons)

Crop	2001-02 Ethiopian Agricultural Sample Enumeration (EASE)	EAMHS estimates for 2007-08 Belg and Meher seasons	Percentage difference between EAMHS and EASE	Agricultural Sample Survey (AgSS) for 2007-08 Meher season	EAMHS estimates for 2007-08 Meher season	Percentage difference between EAMHS and AgSS production estimates
Teff	1,644	2,121	29%	2,993	2,046	-32%
Wheat	1,435	1,670	16%	2,314	1,596	-31%
Maize	3,018	3,581	19%	3,750	2,652	-29%
Sorghum	1,538	1,670	9%	2,659	1,497	-44%
Total	7,635	9,042	18%	11,716	7,791	-34%

Sources: CSA, 2008 and estimated from 2008 EAMHS.

Given the difference between the cereal production estimates of 2007-08 Agricultural Sample Survey and the 2008 EAMHS, it is useful to examine whether this difference is related to area or yield estimates. In the case of maize and sorghum, the area estimates between the two surveys are within 5% of each other. In the case of teff and wheat, the area estimates of the EAMHS are 28% and 16% higher, respectively, compared to the AgSS area estimates.

Clearly, the sampling error from the EAMHS is greater compared to big sampled AgSS, but non-sampling error is likely to be larger than sampling error for AgSS. Several other factors suggest that the cereal yields in the AgSS may be overestimated. First, the yields for maize and sorghum in Kenya, Tanzania, and Uganda are considerably lower than the AgSS estimated yields for Ethiopia and are quite similar to EAMHS yield estimates (see Table 2.5). The best teff yields in Eritrea over the period 2000-2007 are substantially less than AgSS estimates but close to EAMHS estimates (for wheat, the AgSS yield estimates are within the range of other East African countries). Second, AgSS cereal yield estimates are significantly higher than yields estimated by the CSA crop forecast and FAO (through MoARD) estimates five years ago. This is reflected in rapid rates of yield growth in Ethiopia, several-fold higher than yield growth in other East African countries (see Table 2.6). Third, it is generally recognized that crop-cutting exercises tend to overestimate yields by 14-20% (Poate, 1988; David, 1989; Svedberg, 2000).

Table 2.5 Cereal yields in Ethiopia and nearby countries (tons/ha)

	Teff	Wheat	Maize	Sorghum	Average
Ag sample survey 2007-08	1.17	1.62	2.12	1.73	1.66
EAMHS 2007-09	0.62	0.96	1.46	0.94	1.00
% difference EAMHS vs AgSS	-46%	-41%	-31%	-46%	-40%
FAO Kenya 2007		1.77	2.03	0.75	1.52
FAO Uganda 2007		1.73	1.50	1.45	1.56
FAO Tanzania 2007		1.25	1.13	1.00	1.13
FAO Eritrea best of 2000-07	0.65	1.13	0.78	0.57	0.78
FAO Avg 5 countries	0.65	1.47	1.36	0.94	1.11
U.S. average	0.70				

Source: CSA, 2008. Estimated from 2008 EAMHS. FAO, 2008.

Table 2.6 Growth in yields (%)

Over 2004-2007	Wheat	Maize	Sorghum	Teff	Average
Kenya	-29%	5%	33%	-	3%
Tanzania	18%	5%	3%	-	9%
Uganda	18%	4%	4%	-	9%
Average Kenya/Tanzania/Uganda	2%	5%	13%	-	7%
Ethiopia	42%	69%	25%	42%	45%
Over 2000-2007					
	Wheat	Maize	Sorghum	Teff	Average
Kenya	14%	41%	13%	-	23%
Tanzania	-4%	109%	-4%	-	34%
Uganda	1%	-14%	13%	-	0%
Average Kenya/Tanzania/Uganda	4%	45%	7%	-	19%
Ethiopia	91%	68%	40%	27%	66%

Source: FAO, 2008.

In summary, for the four main cereals, the EAMHS production estimates are 9-29% higher than the 2000-01 EASE estimates but 29-44% lower than 2007-08 AgSS estimates. The real difference between the EAMHS and the AgSS estimates appears to be in the yield: the yield estimates from the EAMHS are substantially lower than those from the AgSS.

Perceived change in production

The EAMHS also included questions regarding the size of this years' harvest compared to the 2003 harvest. This reference year was chosen because it represents a fairly "normal" year in Ethiopian agriculture and one that is recent enough to expect farmers to be able to compare with the current year. For each of the four cereals, at least 70% of the growers reported that the most recent harvest was smaller than the 2003 harvest. By contrast, just 17% reported a higher harvest (see Table 2.7).

Table 2.7 Farmers' perception of cereal production this year compared to 2003

Harvest compared to 2003	Teff	Wheat	Maize	Sorghum	Total
Much higher	4	4	8	6	5
A little higher	11	14	11	10	12
Roughly the same	7	8	10	8	9
A little lower	39	38	38	46	39
Much lower	40	37	32	29	35
Total	100	100	100	100	100

Sources: Estimated from 2008 EAMHS.

We can also examine these results by region, as shown in Table 2.8. The table suggests that this negative view of the recent harvest extends to all four regions. The most negative responses came from SNNP, where 73% reported that the recent harvest was smaller than the 2003 harvest.

Table 2.8 Farmers' perception of crop production this year compared to 2003 by region

Harvest compared to 2003	Tigray	Amhara	Oromia	SNNP	Total
Much higher	3	6	10	4	7
A little higher	17	13	12	10	12
Roughly the same	11	14	16	13	14
A little lower	53	29	35	30	34
Much lower	17	38	26	43	32
Total	100	100	100	100	100

Sources: Estimated from 2008 EAMHS.

In interpreting these results, it is important to recognize that there is a tendency in many countries for farmers and other self-employed workers to emphasize the negative aspects of their business environment. In the Ethiopian context, this tendency may be strengthened if the respondents think that their responses may affect their chances of eligibility for the PSNP or other public assistance programs. Although the enumerators were trained to tell the respondents that the results would be used for research purposes only, it is possible that some respondents did not believe this.

Furthermore, the production estimates from the Ethiopian Agricultural Marketing Household Survey must be interpreted with caution. Because the sample is relatively small (1707 households), the sampling error from our estimates is higher than that of the Agricultural Sample Survey. In other words, the results may be influenced by the inclusion, by chance, of a typical farm in the sample. Alternatively, it is possible that farmers were systematically under-reporting teff, wheat, and sorghum production. On the other hand, the production estimates and the negative comparison assessments suggest that the 2007-08 harvest may not have been as large as suggested by the Agricultural Sample

Survey. If this were the case, it would help to explain the unusually high food prices observed in Ethiopian markets during late 2007 and 2008.

2.5 Crop marketing and storage

How much of the Ethiopian harvest is marketed by farmers? How, when, and where do they sell their output? And has the marketed share changed over time? The Ethiopian Agricultural Marketing Household Survey (EAMHS) has several modules designed to address these questions. The results are important for several reasons. First, the results are useful in the design of the local purchase program of the WFP, which is based on up-to-date estimates of the volume of cereals available in the market. Second, some of the hypotheses to explain the high food prices are based on changes in agricultural marketing patterns. Third, information on agricultural marketing patterns is generally not available from the annual Agricultural Sample Surveys carried out by the CSA, although the 2000-01 Agricultural Enumeration Survey collected some information on marketing patterns.

Marketed surplus

Because the EAMHS took place soon after the harvest of the 2007-08 Meher crop, it was not possible to collect information on the use of the harvest. Thus, the questionnaire collected information on the marketing of the 2006-07 Meher harvest and the 2007 Belg harvest. To estimate the marketed volume available in 2008, we apply this marketed share to the production estimates for the 2007 Belg and 2007-08 Meher harvest (see Table 2.9).

Table 2.9 Total production and sales by crop

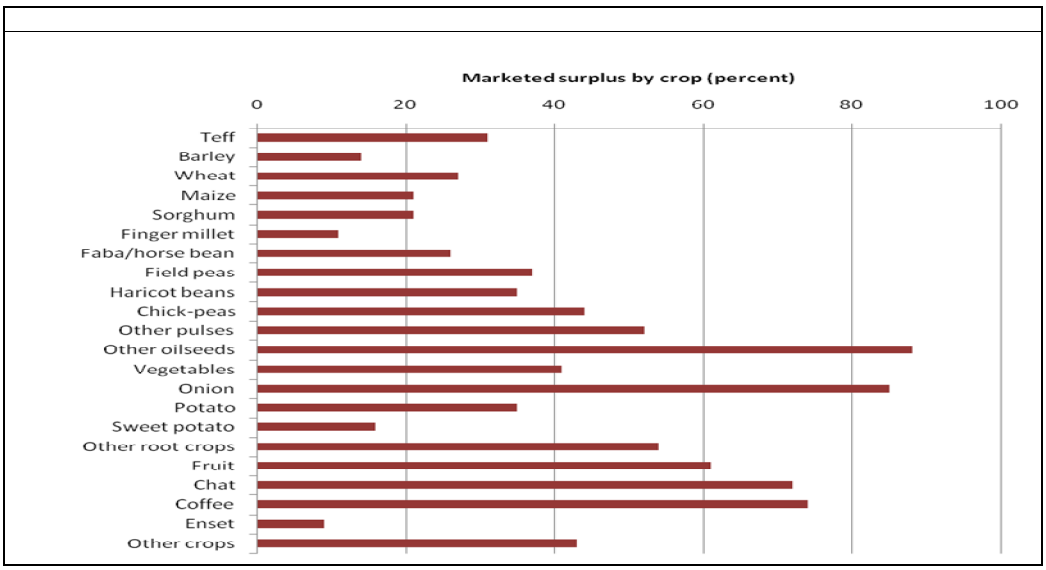
Crop	Production in 2006-07 Meher and 2007 Belg (1000 tons)	Sales in 2006-07 Meher and 2007 Belg (1000 tons)	Marketed share (%)	Production in 2007 Belg and 2007-08 Meher (1000 tons)	Sales in 2007 Belg and 2007-08 Meher (1000 tons)
Teff	2,286	714	31%	2,121	662
Barley	1,052	146	14%	829	115
Wheat	2,060	547	27%	1,670	443
Maize	3,766	802	21%	3,581	763
Sorghum	1,905	409	21%	1,539	330
Finger millet	484	52	11%	385	41
Faba bean	458	119	26%	438	114
Field peas	227	83	37%	200	73
Haricot beans	263	93	35%	267	94
Chick-peas	270	119	44%	253	112
Other pulses	200	104	52%	222	115
Oilseeds	300	268	89%	183	163
Vegetables	331	134	41%	333	137
Potato	984	346	35%	1,093	384

Sweet potato	238	37	16%	211	33
Other root crops	260	141	54%	259	140
Fruit	139	83	61%	173	106
Chat	378	262	72%	310	223
Coffee	314	234	74%	299	221
Enset	812	73	9%	819	74
Other crops	691	299	43%	743	322

Sources: Estimated from the 2008 EAMHS data.

The results indicate that a relatively small share of cereals are marketed, varying from 11% for finger millet to 31% for teff. The marketed share of pulses is somewhat higher, ranging from 26% to 52%. The percentage of production that is marketed is particularly high for oilseeds, coffee, chat, and onions (72 to 89%), implying that these crop are primarily grown for cash income. In contrast, just 9% of the enset harvest is estimated to be sold by farmers, indicating that it is primarily a subsistence crop (see Figure 2.3).

Figure 2.3 Share of production of each crop that is sold by farmers (%)



Applying the marketed surplus ratios from the previous year to this year, we estimate that the marketed volume of maize in 2008 is 763 thousand tons. Although the volume teff produced is much lower than that of maize, the volume of teff on the market is only slightly less, at 662 thousand tons. By contrast, the volumes of wheat and sorghum available on the market are significantly less; 443 thousand tons and 330 thousand tons, respectively (see Table 2.9).

How do EAMHS estimates of the marketed surplus ratio compare to those of previous studies? The IFPRI Commercialization Survey, carried out in 2005, generated markedly lower estimates of the

marketed surplus for all four commodities (see Table 2.10). On the other hand, the EAMHS produced estimates for the marketed surplus of teff and wheat that are quite close to those of both the CSA Ethiopia Agricultural Sample Enumeration of 2000-01 and the Grain Marketing Research Project (GMRP) of the late 1990s. In the case of maize, the EAMHS estimates lie in between the higher estimate from the GMRP and the lower estimates of the EASE. Finally, the market surplus estimate for sorghum is somewhat higher than the EASE estimate. Of course, the marketed surplus will vary from year to year depending on the size of the harvest and other factors.

Table 2.10 Comparison of estimates of marketed surplus of cereals

Crop	MSU Grain Marketing Research Project (1995-96)	CSA Agricultural Enumeration Survey (2000-01)	IFPRI Commercialization Survey (2005)	IFPRI EAHMS estimate (2007-08)
Teff	31%	30%	24%	31%
Wheat	28%	24%	17%	27%
Maize	30%	16%	8%	21%
Sorghum	n.a.	15%	9%	21%

Source: Negassa and Jayne, 1997; Pender and Alemu. 2007; Analysis of data from the 2008 EAMHS.

Characteristics of sales transactions

The EAMHS also collected information on the characteristics of crop sales, such as the location of the transaction and the type of buyer. The results indicate that a large majority of crop sales transactions (88%) occur at the local market place (Table 2.11). This percentage is somewhat higher in Tigray and Amhara (95%) and somewhat lower in Oromia (83%). Most of the remainder of the sales transactions took place at the home or farm of the respondent. Sales at a roadside, at the cooperative center, or at other locations were quite rare (1-6% of all sales). The location of sale is partly dependent on the crop being sold. For example, over half of the on-farm/home sales were sales of chat. This suggests that, apart from chat, it is quite rare for farmers to sell their produce at their home or farm.

Table 2.11 Location and type of buyer for crop sales by region

	Tigray	Amhara	Oromia	SNNP	Total
Location of sale					
On farm/home	4	2	14	7	8
Local market	95	95	83	88	88
Roadside	0	1	1	4	1
Cooperative	1	2	1	1	1
Other	0	1	1	1	1
Total	100	100	100	100	100

	Tigray	Amhara	Oromia	SNNP	Total
Type of buyer					
Farmer	0	2	1	1	1
Trader	59	75	82	76	77
Processor	22	1	0	1	2
Cooperative	2	2	1	1	1
EGTE/Govt	0	0	0	0	0
Consumer	16	20	15	22	18
Other	0	0	0	0	0
Total	100	100	100	100	100

Source: Estimated from the 2008 EAMHS data.

Who is the buyer? In more than three-quarters of the sales recorded in the EAMHS (77%), a trader is the buyer of the crop (see Table 2.11). Sales directly to consumers are the second-most common type of transaction. Respondents in Tigray reported that 22% of their sales were to processors. More than two-thirds of the sales to processors were cereals, so this presumably refers to grain millers who purchase grain directly from farmers. In general, however, sales to cooperatives, processors, the Ethiopia Grain Trading Enterprise (EGTE), and others were rare.

Role of cooperatives

It should be noted, however, that cooperatives may be involved in sales transaction even if they are not considered the buyer; often cooperatives act as brokers, facilitating sales by their members to a trader or processor. For this reason, a separate section of the questionnaire asks directly about cooperative membership and what services of the cooperative are used by the household. These results indicate that somewhat more than one-third of farm households are members of an agricultural cooperative, the share being highest in Amhara (54%) and lowest in SNNP (21%) (see Table 2.12).

Table 2.12 Cooperative membership and use of cooperative for grain sales

Region	Share of households are members of agricultural cooperatives	Share of cooperative members that sell grains through a cooperative	Share of households that sell grain through a cooperative
Tigray	33%	8%	3%
Amhara	54%	38%	21%
Oromia	31%	25%	8%
SNNP	21%	19%	4%
Total	36%	28%	10%

Source: Estimated from the 2008 EAMHS data.

Of the cooperative members, about 28% of them sell grain through the cooperative. Thus, across all farm households (including cooperative members and others), about 10% sell grain through an

agricultural cooperative. This percentage is somewhat higher in Amhara (21%), both because of the large number of cooperative members and because a relatively large share of members market their grain through the cooperative.

Crop storage

The EAMHS asked about the types of crop storage used by farmers and the storage capacity. Almost all (97%) farmers reported having some storage capacity. The most common ways of storing grains were in a gotera (39% of households), in the house in a container (34%), and in the house without a container (24%). The percentages sum to 130%, indicating that most farm households use just one form of storage, but about 30 percent have more than one (see Table 2.13).

Table 2.13 Types of storage used by farmers

Type of storage	Percentage of farms using this type
Gotera (Grainery)	39.1
Gudegade (pit in ground)	14.8
In house in a container	34.2
In house not in container	23.7
Other	18.8

Source: Estimated from the 2008 EAMHS data

The average storage capacity is about 1.7 tons, but the median capacity indicates that half the farmers have less than one ton. As shown in Table 2.14, average storage capacity varies by region, being greatest in Oromia (2.1 tons) and least in SNNP (1.1 tons).

Table 2. 14 Storage capacity by region

Region	Average storage capacity	Median storage capacity
Tigray	1,294	1,000
Amhara	1,474	1,000
Oromiya	2,107	1,300
SNNP	1,085	500
Total	1,656	1,000

Source: Estimated from the 2008 EAMHS data

The average quantity of cereals in storage one month after the Meher harvest is about one ton, though the regional variation is quite wide. The average ranges from 1.4 tons in Amhara to less than 300 kg in SNNP (see Table 2.15). At the national level, these figures imply that farmers hold 9.6 million tons of cereals in storage one month after the Meher harvest. This implies that on-farm storage dwarfs the

quantities stored by the government and private traders. It also means that farmer storage behaviour has a large effect on the seasonal availability of marketed grain and on seasonal price patterns.

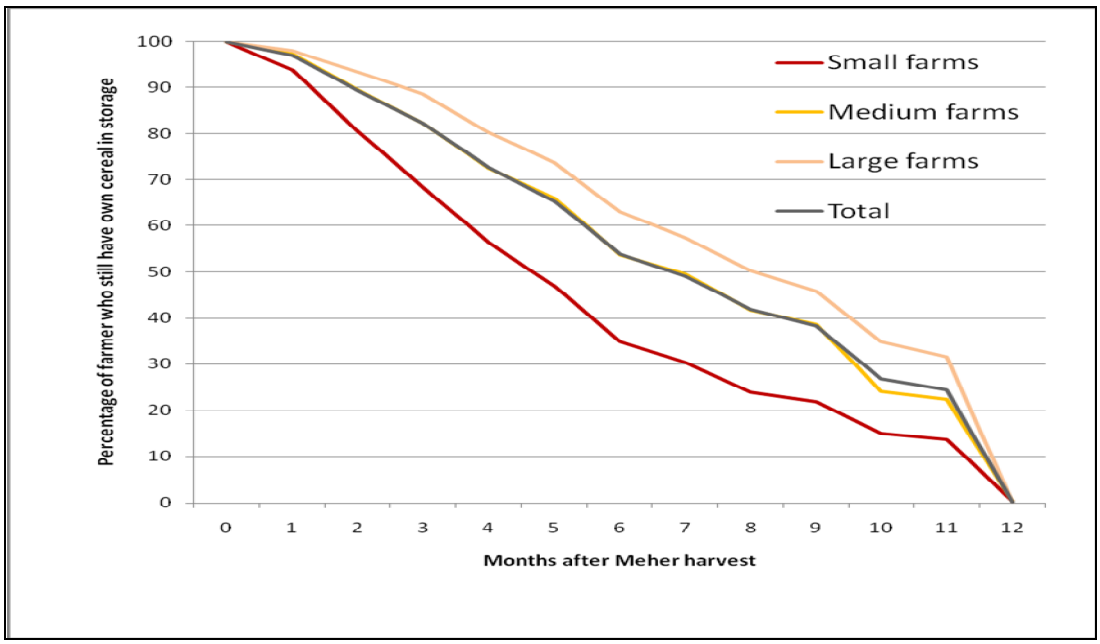
Table 2.15 Volume of cereals in storage one month after the Meher harvest

Region	Average volume of cereals in storage one month after meher harvest	Median volume of cereals in storage one month after meher harvest
Tigray	1,193	950
Amhara	1,370	1,100
Oromiya	942	600
SNNP	297	150
Total	1,001	700

Source: Estimated from the 2008 EAMHS data

Farmers were also asked how long their cereal stocks from the Meher season last. Slightly more than one-half of the respondents reported that their stocks last six months. Not surprisingly, the duration of stocks depends on the size of the farm: just 35% -third of the smallest tercile of farms had stocks lasting six months, while more than 60% of the largest tercile of farms did (see Figure 2.4).

Figure 2.4 Duration of cereal stocks by size of farm



Respondents say that almost all cereal storage is for later consumption (88%) or seed (2%). Just 10% of respondents say they plan to sell their stocks later to get a better price or to meet cash needs later.

Changes in marketing and storage patterns

The EAMHS also collected information on changes in marketing patterns over time. Respondents were asked whether the share of cereal production that is marketed has increased or decreased since 2003. The upper part of the table shows the percentage of households reporting each type of response. Overall, 62% report smaller shares of cereal production being sold and 23% report larger shares. The decline seems sharper in Tigray according to the regional breakdown of the figures (Table 2.16). The results do not change even when the sample is weighted by volume of production, although the pattern becomes somewhat weaker (as shown in the Bottom panel of Table 2.16). The most common explanation given by respondents for the reduction in the marketed share of production is a decline in the level of production. This is consistent with the production trends reported above, but surprising in light of the growth in cereal production estimated in official statistics.

Table 2.16 Perceived change in share of cereal production that is marketed since 2003

Responses	Tigray	Amhara	Oromia	SNNP	Total
	Percentage of households				
Smaller share	83	60	59	58	62
Same	9	15	18	15	16
Larger share	8	25	23	27	23
Total	100	100	100	100	100
	Percentage of households weighted by production				
Smaller share	78	48	39	39	46
Same	11	16	18	11	16
Larger share	11	37	44	50	38
Total	100	100	100	100	100

Source: Estimated from the 2008 EAMHS data.

Finally, respondents were asked whether the timing of crop sales had changed since 2003. The percentage of household reporting selling later (33%) is somewhat higher than the percentage reporting selling earlier in the season (28%). These differences are magnified when the percentages are calculated using weights to represent the volume of cereals marketed (see Table 2.17). However, it should be noted that a delay in the timing of cereal sales would have the effect of reducing seasonality in cereal prices, but it would not, by itself, help to explain the increase in cereal prices since 2005.

Table 2.17 Perceived change in timing of cereal sales since 2003

	Tigray	Amhara	Oromia	SNNP	Total
	Percentage of households				
Selling earlier	45	28	20	38	28
No change	33	41	44	30	39
Selling later	22	32	36	32	33
Total	100	100	100	100	100
	Percentage of households weighted by sales				
Selling earlier	44	23	18	29	23
No change	40	39	35	29	36
Selling later	16	38	48	42	41
Total	100	100	100	100	100

Source: Estimated from the 2008 EAMHS data.

2.6 Income diversification

As part of the Agriculture-Led Development Strategy (ALDS), the government of Ethiopia has used a variety of policies and programs to promote diversification from low-value staple crops into higher-value commercial crops, livestock, and non-farm activities. Thus, one hypothesis to explain the unusually high food prices over the past 18 months is that this is a side-effect of the process of diversification. In other words, if large numbers of farmers shifted from staple crop production to high-value crops and activities, this might be reflected in a relative decline in cereal production, resulting in higher prices for basic cereals. And in addition to its implications for food prices, we are interested to know whether there is evidence of a shift in rural livelihoods toward higher-value crops and activities.

In order to address this question, the EAMHS asked farmers several questions regarding changes in the income-generating activities they were involved in and changes in the importance of these activities in household income. Again, we use 2003 as the reference period, based on the idea that it is long enough ago that we can observe changes but recent enough to allow farmers to their economic activities. Because it is difficult to remember the percentage contribution to income of different activities from four years before, the questionnaire merely asks whether or not the household was involved in each activity and whether it has become more or less important in household income since 2003.

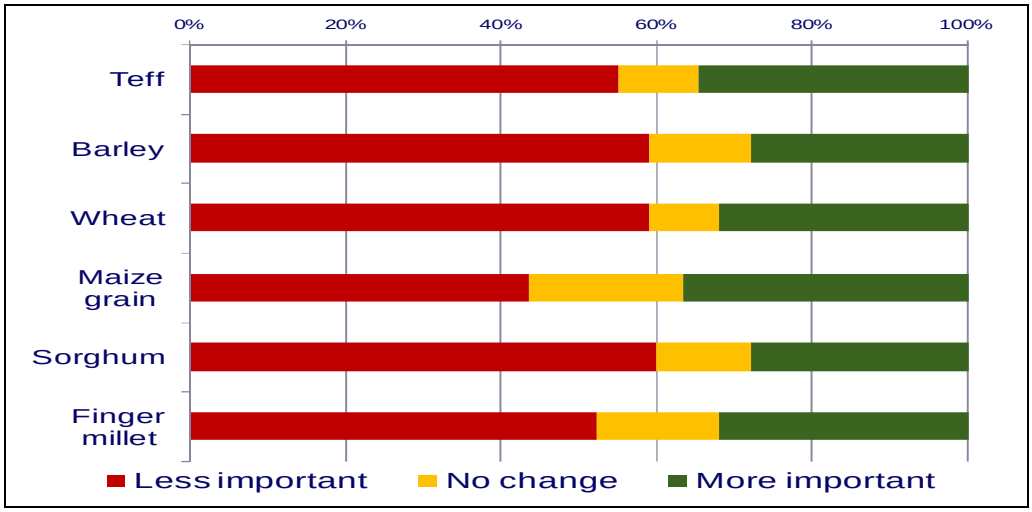
The results provide clear evidence of diversification away from grain crops. For almost all the cereals and pulses, more households report a declining importance than an increasing importance as a source of income. Maize, finger millet, chick peas, and faba beans are the only grains showing no downward trend. Similarly, oilseeds show no trend in either direction (see Table 2.18 and Figure 2.5).

Table 2.18 Change in importance of crops as a source of income compared to 2003

Crop	Not a grower	Less important	Same	More important
Teff	36	31	7	26
Barley	64	18	5	12
Wheat	58	21	4	17
Maize	32	27	17	24
Sorghum	66	17	6	12
Finger millet	87	5	2	5
Faba bean	74	11	3	12
Field peas	87	7	1	5
Haricot beans	88	5	4	4
Chick-peas	91	4	1	4
Lentils	94	3	1	2
Grass peas/vetch	95	2	1	2
Neug	95	2	0	3
Linseed	96	2	0	2
Sesame	98	1	0	1
Cabbage	90	4	3	3
Tomatoes	97	1	0	1
Green peppers	95	2	1	1
Red peppers	92	3	1	5
Other vegetables	99	0	0	0
Onion	90	3	1	5
Potato	85	4	5	6
Garlic	95	1	1	2
Taro/godere	94	3	1	2
Sweet potato	93	3	1	2
Avocado	97	1	0	2
Banana	93	2	1	4
Orange	99	0	0	0
Papaya	99	0	0	1
Chat	81	7	2	10
Coffee	81	6	2	11
Hops	97	1	1	2
Enset	72	8	5	14
Other crops	92	1	1	5

Source: Estimated from the 2008 EAMHS data.

Figure 2.5 Changes in the importance of each crop in income (% of farm households)



A few vegetable crops appear to be rising in importance, namely red peppers, onions, potatoes, and garlic. On the other hand, other vegetables, fruit, and several root crops appear to be stable or declining in importance. Finally, coffee, chat, and enset show some of the strongest tendencies of rising importance, with at least 50% of the growers reporting that it has become more important as a source of income since 2003 (Table 2.18).

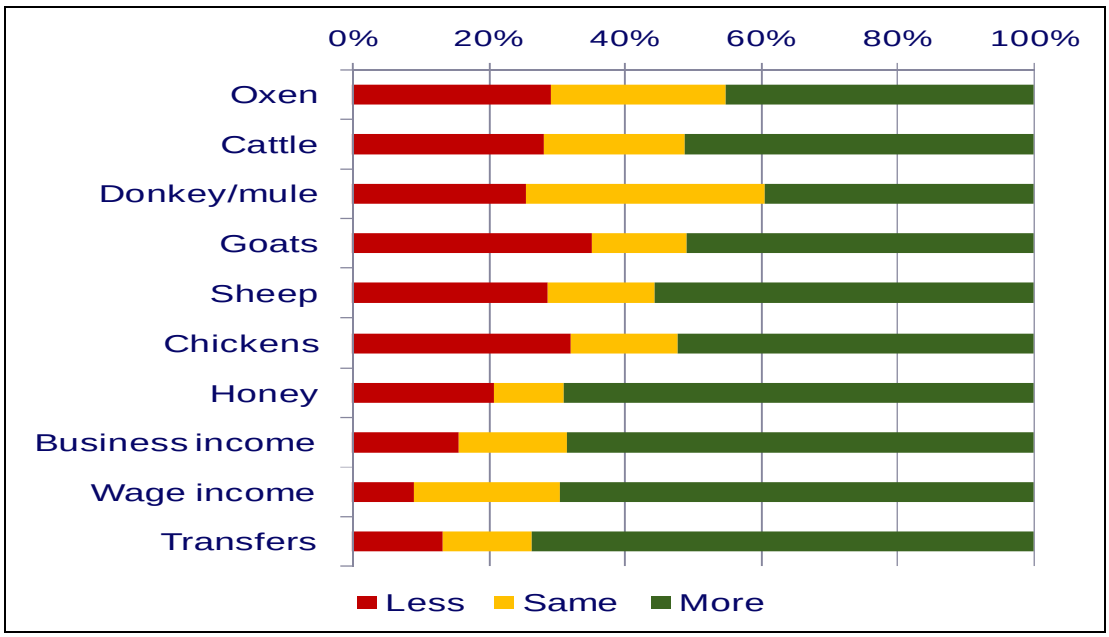
This question about changes in the importance of different economic activities was also asked with regard to various types of livestock and animal products. In almost every case, 50-60% of the producers reported that production of this animal was a more important source of income than four years before. Finally, there is strong evidence that agricultural wage labor, non-farm self-employment, and transfers are become more importance source of income compared to the situation in 2003 (Table 2.19).

Table 2.19 Change in importance of livestock income compared to 2003

Livestock type	Not a producer	Less important	Same	More important
Oxen	41	15	11	33
Cattle	35	18	11	37
Horse	92	2	2	5
Donkey/mule	74	6	7	13
Goats	74	9	3	14
Sheep	61	11	5	23
Chickens	55	12	6	27
Honey	89	3	1	7

Source: Estimated from the 2008 EAMHS data.

Figure 2. 6 Changes in the importance of non-crop income sources (% of households)



In summary, the results of the 2008 Ethiopian Agricultural Marketing Household Survey suggest that farmers have diversified from low-value staple crops to higher-value crops and activities. In particular, staple grains crops are becoming less important as a source of income and vegetables, perennial commercial crops, livestock, and non-farm activities are becoming more relatively important. Nonetheless, in an absolute sense, staple grain crop production remains more widespread and important than any of these other individual crops or activities and will probably remain so for the foreseeable future.

2.7 Perceptions of changes

Perceived changes in input markets and public services

The EAMHS asked farm households whether access to inputs and public services has improved, remained unchanged, or worsened over the past four years. More specifically, households were asked about their perceptions about input markets, credit, extension, marketing information, the quality of local roads, and the number of crop buyers.

In every category, more respondent reported improvement than deterioration. The universal positive assessments, even in areas that do not seem to have changed much according to objective measures, raises the possibility that respondents were answering "strategically," giving responses that they thought the enumerators (or local officials) would want to hear. However, this does not explain the variation across questions, with the proportion of household reporting improvement ranging from 40%

(for availability of cereal seed) to 77% (for number of crop buyers). Thus, we will interpret the results in relative terms.

The highest proportion of respondents found improvements in the number of crop buyers (77%), the availability of advisory services (70%), the availability of market information (68%), and the quality of roads in the woredas (61%). The improvements in the local roads and advisory services may reflect efforts on the part of the government as part of its Agriculture-Led Development Strategy. The improved number of crop buyers probably refers to greater competition among traders to purchase surplus grain since traders account for the vast majority of crop buyers. This trend and the increased availability of market information may well be associated with the increased use of mobile phones by traders, as documented in the trader survey conducted at the same time as the EAMHS. Although less than 2% of farmers own mobile telephones according to the EAMHS, they may have access to market information through traders and other villagers who do have mobile phones.

The lowest proportion of respondents reporting improvements was in the area of input marketing: availability of cereal seed (40%), quality of cereal seed (42%), timing of fertilizer availability (44%), and the availability of fertilizer (47%) (Table 2.20)

Table 2.20 Perceived changes in input markets & public services since 2004

	Improved	No change	Worse	Total
Availability of cereal seed	40%	40%	21%	100%
Quality of cereal seed	42%	40%	18%	100%
Availability of fertilizer	47%	29%	24%	100%
Timing of fertilizer availability	44%	32%	24%	100%
Availability of credit	52%	32%	16%	100%
Availability of advisory services	70%	22%	8%	100%
Number of crop buyers	77%	20%	3%	100%
Availability of market information	68%	25%	7%	100%
Quality of roads in woreda	61%	34%	5%	100%

Source: Estimated from the 2008 EAMHS.

Perceived changes in household well-being

Respondents were asked "How has the well-being of your household changed since 2003-04?" In general, the responses were quite positive, with 48% reporting either some improvement or big improvement. Less than one-third of the respondents (32%) reported some deterioration or big deterioration (Table 2.21).

Table 2.21 Perceived changes in household standard of living compared to 2004

	Change in standard of living of household					
	Big improve-ment	Some improve-ment	No change	Some deterio-ration	Big deterio-ration	Total
Region						
Tigray	1	34	21	42	2	100
Amhara	17	39	21	15	8	100
Oromia	15	35	24	21	5	100
SNNP	7	26	15	34	18	100
Farm size						
Small	6	22	24	34	14	100
Medium	8	35	20	27	9	100
Large	21	42	19	14	4	100
Total	13	35	21	24	8	100

There were marked differences in perceived changes in household well-being across regions. Respondents in SNNP were generally negative, with a majority of households (52%) reporting deterioration and just one-third reporting improvement. This is not surprising given that the harvest was very poor in parts of SNNP in 2007-08. Households in Tigray were also negative, on average, though less so than in SNNP. In contrast, households in Amhara and Oromia were much more positive than average, with 56% and 50%, respectively, reporting improvement in their household well-being.

There were also substantial differences between the perceived changes in well-being by farm size. The categories were defined by terciles of farm size, so "large" farms refer to those with more than 1.12 hectares and small farm refer to those with less than 0.83 hectares. Among the larger farms, 63% reported improved well-being, while among the smallest farms just 28% did.

Finally, respondents were asked for the reasons behind the changes in household well-being. Among those reporting improved well-being, the most common explanations given were the increase in crop prices (81%), followed by increased livestock income, increased yields, and improved health of family members (47-53% each). Among those reporting deterioration in household well-being, the most common reasons given were lower crop yields (81%), followed by higher food prices (45%). These results confirm the importance of agricultural income in influencing household well-being, for better or for worse. They also highlight the mixed effect of higher crop prices on rural well-being. The higher prices brought significant benefits to many farmers (four-fifths of those whose well-being rose), and, at the same time, was a significant factor in adversely affecting other households (almost half of those reporting lower well-being).

2.8 Summary and conclusion

We can summarize the main results of the 2008 Ethiopian Agricultural Marketing Household Survey as follows:

- The EAMHS cereal production estimates are lower than those of the CSA Agricultural Sample Survey, mainly because of lower yield estimates. Other sources point to an overestimation of cereal yields in Ethiopia, including lower yields for maize, sorghum, and teff in neighboring countries and the surprisingly rapid growth in Ethiopian yield estimates in recent years. Lower cereal production would also help explain the rise in real cereal prices.
- The estimated portion of marketed surplus of cereals is 21-31%, roughly similar to estimates from the 2000-01 Ethiopian Agricultural Sample Enumeration and estimates from the Grain Marketing Research Project in the 1990s.
- There do not appear to be any major changes in agricultural marketing behavior over the past five years that would explain the higher cereal prices. Farmers report selling a smaller percentage of the harvest than before, but this is due to the size of the harvest rather than increases in consumption. There is some evidence of farmers, particularly larger farmers, selling later in the season, but this would affect the seasonality of prices rather than causing a trend of rising prices.
- Farm households have, on average, about one tons of cereals in storage a month after the harvest. This represents about 9.6 million tons at the national level, dwarfing quantities stored by private traders and the government.
- Almost all farmers sell crops at local markets (rather than at home) and to traders (rather than processors or government agencies). The role of agricultural cooperatives in cereal crop marketing is relatively minor, with just 10% of farmers selling any cereal through cooperatives.
- The EAMHS does provide evidence of gradual diversification away from low-value crops such as cereals and pulses toward higher-value crops including some vegetables, coffee, and chat and toward livestock production, wage income, and non-farm business income. However, cereals and other staple crops continue to account for a large share of cropped area and rural income.
- Farm households report improvements in a number of dimensions of the rural economy, particularly advisory services, marketing information, the number of crop buyers, and rural roads.
- The EAMHS results suggest that more rural households are reporting improved well-being over the past four years than are reporting deterioration. Nonetheless, the gains appear to be concentrated among larger farmers, who benefit from higher prices, and among those in Amhara and Oromia.

2. 9 References

CSA (Central Statistical Agency) and ORC Macro. 2006. *Ethiopia Demographic and Health Survey 2005*. Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Agency and ORC Macro.

CSA (Central Statistical Agency). 2008. *Report on Area and Production of Crops.* Agricultural Sample Survey 2007-2008. Volume I. Addis Ababa, Ethiopia.

David, I.P. 1989. The state of agricultural statistics in Southeast Asia. Asian Development Bank. Manila. http://www.adb.org/Documents/EDRC/Stat_Reps/report12.pdf.

FAO (Food and Agriculture Organization). 2008. Crop production database. Rome. http://faostat.fao.org/site/567/default.aspx#ancor

Negassa, A. and T.S. Jayne, 1997. "The Response of Ethiopian Grain Markets to Liberalization," Working Paper #6, Grain Market Research Project, Ministry of Economic Development and Cooperation, Addis Ababa.

Pender, J. and D. Alemu. 2007. "Determinants of small-holder commercialization in Ethiopia: Theory and evidence." Discussion Paper 745. International Food Policy Research Institute. Washington, DC.

Poate, D. 1988. "A review of methods for measuring crop production from smallholder producers." Experimental Agriculture 24: 1-14. http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=1618808

Svedberg, Peter. 2000. Poverty and Undernutrition: Theory, Measurement, and Policy. World Institute for Development Economics Research. Oxford University Press. http://books.google.com/books?id=mjSIb1cGaB4C&pg=PA91&lpg=PA91&dq=crop+cutting+yield+bias&source=web&ots=Kt9GMHoe7&sig=ct5gyoPFW3XzVY9F9sSMo2K1CII&hl=en&sa=X&oi=book_result&resnum=5&ct=result

Chapter 3: Results from Grain Trader's Survey[6]

High transaction costs in crop marketing simultaneously contribute to high urban food prices and low producer prices. High transaction costs also create a price range in which an agricultural household (or a region) will choose to neither buy nor sell a good, causing households (or regions) not to be integrated in trade (Key et al 2000). In these cases food markets that exist are very thin, and the subsistence strategies of farming households are reinforced by the price volatility that results from thin markets (Fafchamps 1992). Investments in crop marketing to reduce the size of transaction costs allows efficiency gains to be realized from higher and less volatile prices, as well as relatively higher farm-gate and lower consumer prices.

A number of studies have indicated that the spatial integration of markets in Ethiopia (at least for cereal crops) improved during the 1990s (Dercon, 1995; Negassa and Jayne, 1997; Gabre-Madhin and Mezgebou 2006). Although there may still be some markets that are not integrated (as suggested in Gabre-Madhin and Mezgebou 2006, and Negassa and Myers 2007), prices tend to move together and local supply shocks (in the form of food aid) do not have an impact on local prices as one would expect in segmented markets (Rashid, Dorosh, and Seyoum Taffesse 2008). However, the cost of transacting remains substantial which is reflected in relatively low producer price shares. Estimates from 2007 suggest farmers receive 50-60% of Addis retail prices, and other estimates put this as even lower at 30% (Gabre-Madhin and Mezgebou 2006). As a point of comparison, in Vietnam the share of the retail price farmers received remained constant throughout the late eighties and the nineties, at 71% in the South and 83% in North (Goletti and Minot 1997).[7]

In recent years, as part of a strategy to realize growth in smallholder agriculture, the Government of Ethiopia has undertaken substantial market reforms and accelerated investments in road and communication networks. These investments have been made in order to reduce the magnitude of transacting and thereby improve the efficiency of cereal markets.

It is likely that the cost and nature of trading in Ethiopian grain markets has evolved as a result of these infrastructural and institutional changes. For example, one could hypothesize that increased ownership of mobile telephones has changed the way in which traders search for price information, buyers and sellers. In particular we might expect that traders have increased knowledge about prices and trade volumes in other markets, increased the efficiency with which trading partners can be identified, and perhaps improved the integration of prices between markets. The commensurate increases in fuel

[6] This chapter is prepared by Ruth Vargas Hill .
[7] Even taking the farmer price in the surplus south as a share of the retail price in the deficit north, the share of the price received by Vietnamese farmers is still much higher than that received by farmers in Ethiopia at 55%.

prices and investments in road infrastructure do not allow for clear ex-ante predictions about what has happened to transportation costs during this time, but it may be the case that substantial road investments reduced the cost of transporting. More recently, large increases in cereal prices may have increased the cost of financing faced by cereal wholesalers, or perhaps increased incentives for storage.

To assess changes in the cost and nature of cereal trading over the last seven years, a survey of 316 grain traders was conducted in 20 fixed, permanent markets in the four regions of Amhara, Oromia, SNNP and Tigray. Markets were chosen to include the main terminal markets in these four regions and to represent both surplus and deficit markets. This data was compared with data from a similar survey undertaken in 2001-2 by IFPRI-ILRI to determine changes in returns to trade, transaction costs, search patterns and storage behavior.

In the following sections we briefly describe the 2002 and 2008 surveys (Section 3.1), present some basic descriptive statistics on the nature of cereal traders (Section 3.2), assess changes in the behavior of grain traders (Section 3.3) and provide some analysis on areas of continued constraints to efficiency (Section 3.4). Section 3.5 concludes.

3.1 The 2002 and 2008 trader surveys

The 2008 trader survey

Fixed, permanent markets were visited in 20 woredas in the four regions of Amhara, Oromia, SNNP and Tigray. Markets were chosen to include the main terminal markets in these four regions and to represent surplus and deficit markets. The markets chosen are listed in Table 1. In each market wholesalers and retailers of grains (teff, wheat, maize, barley, sorghum and finger millet) were sampled proportional to the total number of wholesalers and retailers found in the market.[8] On average 18 traders were sampled in each market.

[8] The following sampling rules were used to select traders: (i) when the total number of wholesalers in the market was more than 10, 50% were interviewed. If 10 or fewer wholesalers were found, a minimum of 5 wholesalers were interviewed. (ii) The targeted number of retailers and assemblers to be interviewed depended on the type of market sampled. In deficit markets 12 retailers / assemblers were targeted, in surplus markets 8 retailers / assemblers were targeted.

Table 3.1 Markets included in the 2008 trader survey

Amhara		Oromia		SNNP		Tigray	
Markets included in survey	**No. of traders**	**Markets included in survey**	**No. of traders**	**Markets included in survey**	**No. of traders**	**Markets included in survey**	**No. of traders**
Bahirdar	17	Ambo	15	Hosena	20	Shire	17
Deberemarkos	18	Welisso	22	Arbaminch	17	Mekele	16
Metemma	17	Jimma	33	Wolayita Soddo	18		
Bure	17	Yabello	14				
Dessie	21	Shashemene	17				
Deberberihan	17	Nazerate	20				

Source: 2008 trader survey

The majority of traders included in the survey are retailers: 69% of traders sampled identified themselves as retailers, compared with 29% that identified themselves as wholesalers (we return to these definitions later on in the analysis). Although retailers are more numerous in both the market and the survey, the small number of wholesalers account for larger traded volumes. We present some results for the average trader, and some results for the average quintal traded to control for this where important. Traders without permanent stores in a permanent market are difficult to survey, and this survey was no exception, not including these. As a result the proportion of traders involved in transportation or in touring the countryside to aggregate quantities from farmers may be under-sampled. This is taken into account in the presentation and interpretation of results where necessary.

The 2002 trader survey

At various points in the subsequent analysis the 2008 trader survey data is compared with data from a similar trader survey conducted by IFPRI/ILRI in 2001-2002. The 2001-2002 trader survey interviewed grain coffee and livestock traders in 45 markets in the country in 3 regions (Amhara, Oromia and Tigray) and 2 urban centers (Addis Ababa and Dire Dawa). There were a total of 692 private traders interviewed of which 514 were grain traders. It is the grain traders in Amhara, Oromia and Tigray that are compared with grain traders interviewed in these three regions in 2008 (the comparison of these two surveys is discussed further in Section 3.3).

In order to facilitate comparison across these two surveys the structure and questions included in the two surveys were, to the extent possible, kept identical. Some sections were omitted in the 2008 survey to ensure the survey fielded was short, and some sections of particular interest (such as perceptions in the changes in the structure of markets) were added. However the sections that are compared in this analysis were kept identical.

Comparing the 2002 and 2008 trader surveys

Cereal traders interviewed in 2008 were compared with cereal traders interviewed in the same markets in 2002. The list of markets that were included in the surveys in both years, and the number of traders interviewed in each market, is presented in Table 3.2 In total 178 traders interviewed in 9 markets in Amhara, Oromia and Tigray 2002 are compared with 163 traders interviewed in 2008.

Table 3.2 Markets included in both surveys

Market Locations	Number of traders interviewed in 2002	Number of traders interviewed in 2008
Amhara		
Bahirdar	29	17
Deberemarkos	20	18
Bure	10	17
Dessie	35	21
Oromia		
Nazarete/Nazareth	25	20
Assela	14	17
Asebteferi	10	18
Tigray		
Shire	8	17
Mekele	27	16
Total	178	163

Source: 2008 trader survey

Differences in storage, transaction costs and search behavior between traders in these two years was examined. Extreme cases of measurement error were checked and cleaned, but given the measurement error often associated with trader survey data (Fafchamps, Gabre-Madhin and Minten 2005) a number of outliers remain and differences in medians may be a better test of changes. Additionally, given trader behavior varies with the trading functions undertaken, differences in the composition of trader types sampled (i.e. the number of retailers or wholesalers sampled) in each market should also be controlled for assessing what real changes are present.

3.2 Characteristics of cereal traders

Before moving to the analysis of how cereal markets have changed in recent years, we use data collected in the 2008 trader survey to present some simple descriptive statistics on trader characteristics. As noted in an earlier section, the majority of traders sampled were retailers, buying from other traders and selling to consumers. Only a third of traders sampled are buying from farmers (Table 3.3). Thus it would appear that this sample of traders over-represents transactions at the end of the marketing chain. However, retail traders trade much smaller quantities than other traders and when we weight the results by the amount of crop traded and consider the average quintal traded we see that each end of the marketing chain is equally well represented in the sample with farmers comprising

22% of the suppliers, and consumers comprising 26% of buyers (Table 3.3). Based on this data we categorize traders sampled into three types: (i) assemblers collecting quantities and selling to wholesalers (14%), (ii) wholesalers selling to retailers or flour mills and factories (10%), and (iii) retailers selling to consumers (74%). These categories are used at various points in the analysis.

Table 3.3 Location of traders sampled in marketing chain

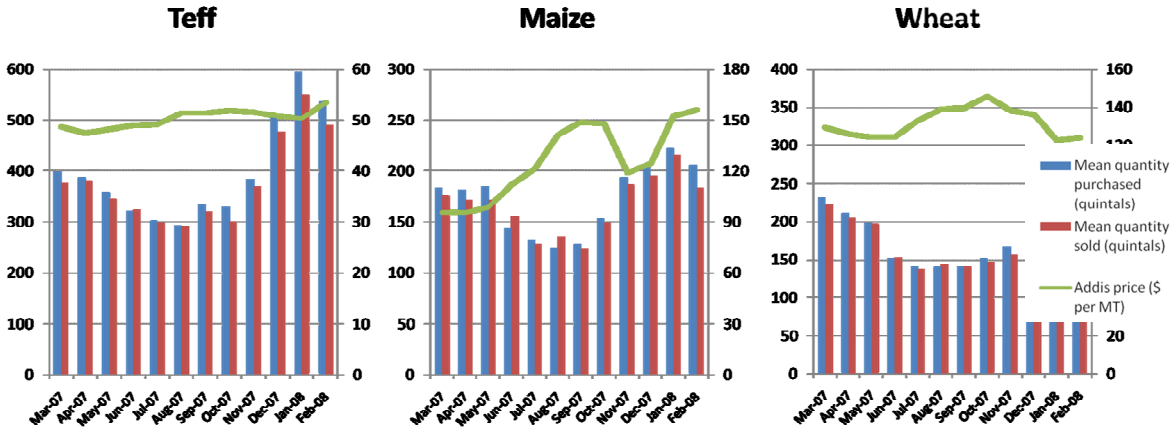
	Average trader	**Average quintal traded**
Main supplier is (%):		
Farmer	34	22
Assembler	10	24
Wholesaler	48	48
Main buyer is (%):		
Consumer	74	26
Retailer	7	23
Wholesaler	14	38
Flour mill or factory	3	11
EGTE	1	1

Source : 2008 trader survey

If the selected sample is representative this evidence suggests that the market chain is quite long: comprising 4 traders on average, compared to 2 or 3 in other countries in sub-Saharan Africa (Fafchamps, Gabre-Madhin and Minten 2005). When weighting by quantity, the market share of processors (flour mills or factories) also increases showing that larger traders are more likely to sell to processors. Before continuing, it is important to note that this survey did not include the major cereal market of Addis Ababa, it thus does not represent retailers in the city, or very large wholesalers that operate there. The results provide information on traders and volumes traded in regional and rural markets.

Weighting by quantity we find that 50% of crop purchased is transported. Although a high proportion of farmers report travelling to the market to make a sale, 64% of quantities bought from farmers is immediately transported. The proportion of crop transported increases after this stage: 84% of the crop sourced from assemblers is transported and 90% of crop sold to retailers is transported. Retailers transport very small quantities, only 27% of crop sold by retailers was transported by the retailer. When transportation is undertaken, it tends to be with a transporter (of those that transport, 88% transport only with a transporter).

Figure 3.1 Seasonal patterns in purchases and sales



Source: 2008 trader survey and EGTE prices

Trader activity is somewhat seasonal, with more traders actively trading from November to May. However a high proportion of traders reported trading throughout the year, on average above 80% for each crop. Stronger patterns of seasonality are observed when considering the size of purchases and sales made in each month (Figure 3.1), which suggests that despite an increasing trend in prices during the year for which this data was collected, there does not appear to be much of an increase in storage among traders. This is considered further in Section 3.3.

Most traders are male and are sole owners of an enterprise that has been in business for 8 years (see Table 3.4). Only 8% of traders own a vehicle and a third of traders own a store. Nearly all traders own a phone, 66% reporting ownership of a landline and 84% ownership of a mobile phone. The median working capital is 30,000 Birr allowing for the purchase of 6 tons of maize at average 2008 prices. Median total asset value is smaller at 7,809 Birr. These numbers can be compared with summary statistics on traders surveyed in 2002 (see Table 3.5)

Table 3.4 Profile of traders (2008)

	Measurement unit	All traders
Proportion female	%	12
Proportion sole owners	%	96
Years of business	Mean	11
	Median	8
Average working capital (Birr)	Mean	83,647
	Median	30,000
Proportion owning a transport vehicle	%	8
Proportion owning a store	%	32
Proportion owning a telephone	%	66
Proportion owning a mobile	%	84
Total asset value (Birr)	Mean	53,047
	Median	7,809

Source : 2008 trader survey

Table 3.5 Profile of traders (2002)

	Unit	All traders
Proportion female	%	5
Proportion operating as a broker or agent in addition to trading	%	6
Proportion with a non-trading occupation	%	20
Proportion of trading revenue as a share of total revenue (%)	Mean	90 (22)
Proportion of grain trade revenue as a share of total trade revenue (%)	Mean	83 (22)
Proportion who are a sole owner	%	91
Years of business	Mean	9 (9)
Working capital (Birr)	Mean	27,627
	Std dev	63,062
Proportion owning a transport vehicle	%	9
Proportion owning a store	%	28
Proportion owning a telephone	%	36
Proportion owning a mobile	%	5
Total asset value (Birr)	Mean	23,044
	Std dev	84,995

Source: Gabre-Madhin and Amha 2004. *Numbers in parenthesis are standard deviations.

An interesting picture emerges when key asset holdings are disaggregated by regions and by gender, as presented in Table 3.6. Notice that while there are some variations across regions, most significant changes are observed when the phone ownerships are disaggregated by gender. In all regions, phone ownerships by female traders are remarkably lower than their male counterparts. The highest proportions of female traders who owned a cell phone is 17.58 percent in Amhara and the lowest is only 4 % in Tigray.

Table 3.6 Geographic and gender variation in access to information

Ownership by gender	Regions				Total
	Tigray	Amhara	Oromia	SNNP	
Traders with land line phone (%)	60.61	67.31	68.02	63.64	66.48
Male	90.00	81.43	87.18	91.43	86.36
Female	10.00	18.57	12.82	8.57	13.64
Traders with cellular phones (%)	75.76	85.85	81.29	90.91	83.56
Male	96.00	82.42	88.49	94.00	88.20
Female	4.00	17.58	11.51	6.00	11.80
Proportion of Bank account holders	78.79	60.38	32.56	71.43	50.68

3.3 Changes in the behavior of grain traders between 2002 and 2008

A key question is the extent to which trader behavior and the costs of transacting have changed in recent years. In particular, how investments in road infrastructure and growth in the use of mobile phones has changed trading behavior, collection of information on prices, suppliers and buyers. The

following sub-sections compare responses in the 2002 and 2008 surveys to assess some of these changes.

Marketing margins

We first consider whether absolute price differentials and marketing margins have changed (Table 3.7) by comparing data on prices and costs incurred in the last transaction. All 2002 nominal prices were converted into 2008 prices to determine whether real changes have taken place. The average absolute difference between the sales and purchase price (the price differential) did not change between 2002 and 2008. However, given the rise in real prices between these two years, the constant price differential represents a reduction in gross margin rate.[9] Traders' total out of pocket transaction costs[10] have not changed much between 2002 and 2008. An increase of 1 Birr per quintal is reported in the mean, but the difference is not significant. Combined with a constant price differential, this suggests that unobservable costs (such as the costs of labor involved in search) have not changed much during these two periods. This is evidenced by the fact that net margins (the price difference less the total transaction costs) did not change much.

Table 3.7 Comparisons of margins between 2002 and 2008

	2002		2008		Difference	
	Mean	**Median**	**Mean**	**Median**	**Mean**	**Median**
Price difference (Birr per quintal)	14	10	14	10	No significant difference	No significant difference
Gross margin rate	1.07	1.04	1.04	1.03	Significant negative difference	Significant negative difference (although not within assemblers)
Net margin (Birr per quintal)	4	5	5	6	No significant difference	No significant difference
Total out of pocket transaction costs (Birr per quintal)	8	3	9	3	No significant difference	No significant difference

Source: 2002 and 2008 trader survey

The structure of transaction costs

Although it does not appear that the magnitude of overall transaction costs has changed much, it is instructive to examine whether there have been any significant changes in the structure of transaction costs. Again using data from traders' last transactions, changes in the structure of transaction costs between 2002 and 2008 are presented in Table 3.8.

[9] The gross margin rate is defined as the sales price divided by the purchase price.

[10] Out of pocket transaction costs include costs of bags, handling, transport, road payments, taxes, storage, personal travel, intermediaries, telephone costs and financial capital (using the average interest rate as the opportunity cost of finance if it is not borrowed) incurred during the last transaction undertaken by the trader.

Table 3.8 Comparisons of out of pocket transaction costs between 2002 and 2008

	2002		2008		Difference	
	Mean	**Median**	**Mean**	**Median**	**Mean**	**Median**
Total transaction costs per quintal (Birr)	8	3	9	3	No significant difference	Significant positive difference
Proportion spent on:						
Sacks	0.46	0.50	0.32	0.10	Significant negative difference	Significant negative difference
Handling	0.20	0.06	0.27	0.08	Significant positive difference	Significant positive difference
Intermediaries	0.09	0	0.03	0	Significant negative difference	Significant negative difference
Transport	0.13	0	0.15	0	No significant difference	No significant difference
Road payments	0.01	0	0.003	0	No significant difference	No significant difference
Storage	0.001	0	0.01	0	Significant positive difference	Significant positive difference (although only among retailers)
Personal travel	0.01	0	0.01	0	No significant difference	No significant difference
Taxes	0.03	0	0.01	0	Significant negative difference	Significant negative difference
Telephone	0.01	0	0.07	0	Significant positive difference	Significant positive difference
Financing	0.06	0	0.11	0	Significant positive difference	Significant positive difference

Source: 2002 and 2008 trader survey

The proportion of the total cost of transacting that is spent on each item is presented. Given proportions are constrained to fall between 0 and 1; analysis of differences in the mean should be adequate. However median values are also reported (although they appear as zero whenever a majority of farmers did not report spending on a certain item). A number of differences are noted:

- The proportion of spending on bags fell between the two surveys and the proportion of spending on handling increased. This could be due to the way costs were recorded between bags and handling (the main difference in sacks is not the cost of them but the much lower proportion of traders reporting spending on this item in 2008) or differences in the structure of payments to handlers. Considering spending and handling together there has not been much change.
- The proportion of transaction costs spent on taxes has fallen indicating a reduction in the burden of taxes on marketing.
- Financing costs now account for a much larger share of the costs of transacting, most likely on account of higher relative prices of cereals. Financing costs could also increase if traders were

taking more days to complete purchases, but data presented in Table 3.8 below suggests this is not the case.

- A significant difference in the structure of transaction costs is the reduction in the payments of intermediaries and the increase in the costs of telephone calls. Intermediary costs fell from 9% to 3% of transaction costs and the proportion of costs coming from telephone calls increased from 1% to 7%. This suggests there has been some substitution between the use of intermediaries and the use of telephones to source suppliers and/or buyers.
- There has also been an increase in the proportion of transaction costs that are spent on storage, apparently driven by increased spending on storage by retailers.

Interestingly, there was no evidence of a difference in the proportion of transaction costs spent on transportation, suggesting that perhaps investments in road infrastructure have offset increasing costs of fuel. To further test this, the cost of transporting one quintal was regressed on distance, distance squared (in case there are decreasing costs of transporting with distance) and a year dummy. Results are presented in Table 3.9. The year dummy was insignificant suggesting that the cost of transporting has not changed. This is perhaps as a result of commensurate improvements in transportation infrastructure and increases in fuel prices: the real price of fuel increased by 25% between the two surveys. When transportation costs are deflated by the price of fuel[11], the year dummy is negative and significant; suggesting that had fuel prices been constant, some increased efficiency in transportation as a result of improvements in infrastructure or other factors would have been observed.

Table 3.9 Testing for differences in transportation costs between 2002 and 2008

Regression on …	**Transport costs per quintal**		**Transport costs per quintal deflated by fuel increase**	
	Coefficient	**P-value**	**Coefficient**	**P-value**
Distance (km)	0.05	0.000	0.04	0.001
Distance squared (km^2)	0.00002	0.090	0.00002	0.167
Year	-0.21	0.878	-2.70	0.070
Constant	8.27	0.000	9.67	0.000
Number of observations	104		104	
Pseudo R-squared	0.36		0.35	

Source: Median regressions using 2002 and 2008 trader survey

[11] Teravaninthorn, and Raballand (2008) present data suggesting that the median proportion of fuel costs in total transaction costs in major transport corridors in Africa is 0.54. This proportion of transport costs is deflated by 25% to determine whether transport costs would have fallen had fuel prices remained constant throughout this period.

Search behavior

We further consider the impact mobile phones may have had on trader search behavior by comparing information on the collection of price information and search behavior of traders between the two surveys. The results are presented in Table 3.10. There has been a substantial increase in the number of telephone conversations between traders in one market and another over the six years between 2002 and 2008 with the median number of phone calls increasing from 12 to 104. This is perhaps not surprising given only 5% of traders owned a mobile phone in 2002 compared to 84% in 2008.

Table 3.10 Changes in search behavior

	2002		2008		Difference	
	Mean	**Median**	**Mean**	**Median**	**Mean**	**Median**
Number of telephone conversations with traders for business purposes on other markets	125	12	568	104	Significant positive difference	Significant positive difference
Search for price information						
Number of grain products followed	3.9	3.5	4.2	3	No significant difference	No significant difference
Number of supply markets followed	1.6	1	2.2	1.5	Significant positive difference	Significant positive difference
Number of sales markets followed	1.1	1	1.4	1	Significant positive difference	Significant positive difference
Number of people in main market consulted on prices	3.8	3	2.8	2	Significant negative difference	Significant negative difference
Number of people in other markets consulted on prices	1.7	0	1.9	1	Significant positive difference (not when controlling for trader type)	No significant difference
Number of people in enterprise collecting price information	2.3	1	1.3	1	Significant negative difference	No significant difference
Proportion reporting receiving accurate information without visiting markets personally	0.55	-	0.68	-	Significant positive difference	-
Other search behavior						
Number of trips made to purchase markets (for any purpose)	4.4	0	12.9	0	Significant positive difference	No significant difference
Number of trips made to sales markets (for any purpose)	2.8	0	4.1	0	No significant difference	No significant difference
Time taken to find a buyer (days)	49	14	21	15	Significant negative difference	No significant difference
Time take to find a supplier (days)	33	14	14	7	Significant negative difference	Significant negative difference

Source: 2002 and 2008 trader survey

This has resulted in both a change in the nature of price discovery, and the way other buyers are found. In sum:

- Traders were able to follow more markets in 2008 than in 2002: the number of products followed has not changed, but the number of markets followed has increased.
- Traders are consulting more traders in other markets on prices: although traders reported consulting fewer people on prices in their main market, they reported a significant increase in the number of traders consulted in other markets on prices.
- Collection of price information was taking less time: fewer people in the business were engaged in the business of collecting price information, and a higher proportion of traders reported receiving accurate price information without visiting other markets.
- The number of trips made to other markets by traders did not change: putting this finding together with the above, it suggests that traders are now privy to better quality price information than in 2002.
- The amount of time taken to find a buyer and seller has fallen: Disaggregating these number by trader type indicates that this has had a particularly large effect on wholesalers and retailers, perhaps contributing to the finding above that these traders have a shorter transaction completion time in 2008 than they did in 2002.

To really determine whether these changes are as a result of the presence of mobile phones information on exogenous variations in access to phones and networks would be needed (such as the quality of network coverage in the area where they operate). Traders with and without mobile phones could then be compared, using the exogenous variation to instrument for a trader's decision to own a mobile phone. In the absence of this information we examine how these indicators vary for traders without and without mobile phones, controlling for trader type. Results are presented in Table 3.11. Given so many traders in the survey have a mobile phone it is difficult to have powerful tests of significant differences between traders with mobiles and those without. All the differences have the sign as expected: traders make more calls, follow more markets, consult more people on other markets, have fewer people employed in the collection of price information, make fewer trips to other markets, spend less time finding buyers and supplies, and receive better quality information without visiting markets personally. These differences are significant when it comes to the number of phone calls made to other traders, the number of supply markets followed, the quality of the price information received and the number of days taken to find a seller. These results suggest that mobile phones have had an impact on search behavior in Ethiopian cereal markets. Further work should also determine whether this has increased the quality of market integration, one would expect it has.

Table 3.11 Differences in search behavior between traders with and without cell phone

	With phone		Without		Difference	
	Mean	**Median**	**Mean**	**Median**	**Mean**	**Median**
# of telephone conversations with traders for purposes on other markets	901	208	190	6	Significant positive difference	Significant positive difference
Search for price information						
Number of grain products followed	4	3	4	3	No significant difference	No significant difference
Number of supply markets followed	2.4	2	1.8	1	Significant positive difference	No significant difference
Number of sales markets followed	1.8	1	1.5	1	No significant difference	No significant difference
Number of people in main market consulted on prices	2.9	2	3.3	3	No significant difference	No significant difference
Number of people in other markets consulted on prices	2.3	2	1.6	1	No significant difference	No significant difference
Number of people in enterprise collecting price information	1.3	1	1.4	1	No significant difference	No significant difference
Proportion reporting receiving accurate information without visiting markets personally	0.64	-	0.47	-	Significant positive difference	-
Other search behavior						
Number of trips made to purchase markets (for any purpose)	30	0	60	0	No significant difference	No significant difference
Number of trips made to sales markets (for any purpose)	13	0	22	0	No significant difference	No significant difference
Time taken to find a buyer (days)	35	15	42	15	No significant difference	No significant difference
Time take to find a supplier (days)	15	4	28	7	Significant negative difference	Significant negative difference

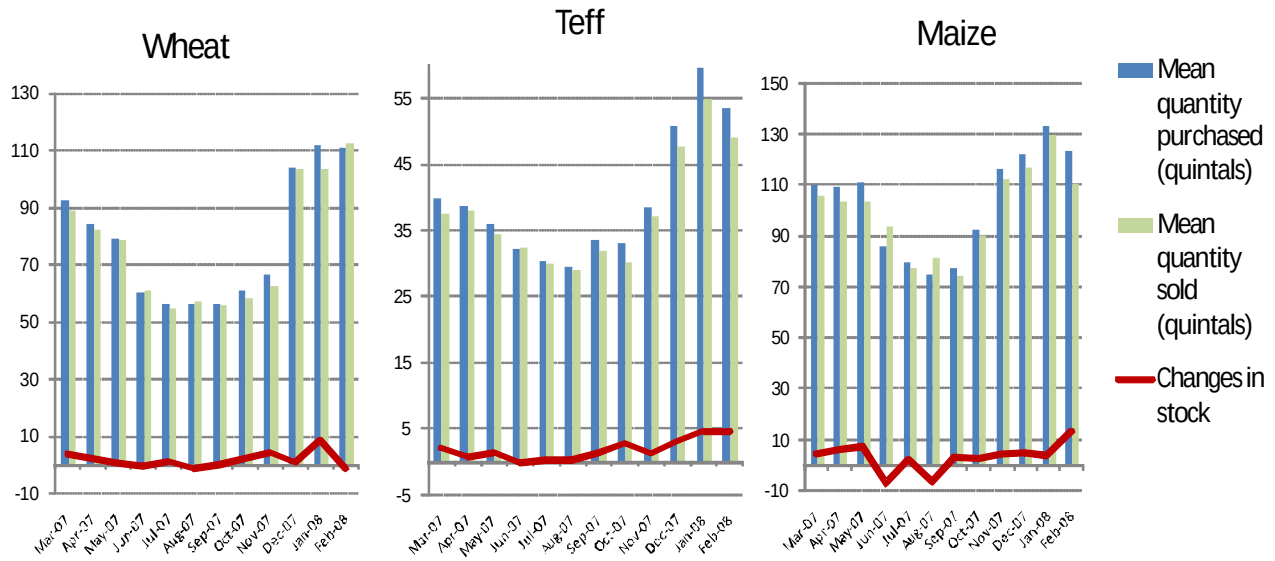
Source: 2008 trader survey

Storage behavior

One factor hypothesized to contribute to the rise in food prices experienced in 2008 was an increase in speculative storage among traders. As noted in Section 3.2 although price increases in teff and maize were occurring during the 2008 trader survey recall period, it did not appear that large changes in stocks were taking place. This is confirmed in Figure 3.2 which shows that although there was some increase in stock towards the end of this time, the increase was quite limited, and very small in comparison to the average quantities traded by these traders. To further test this hypothesis, we

examine a number of indicators of storage behavior. In each case indicators are disaggregated by trader type, so that the results are not dominated by the large number of small retailers in the sample. It also allows us to control for differences in the composition of traders between the 2002 and 2008 sample.

Figure 3.2 Volume of trade and changes in stock, March 2007 to February 2008



Source: 2008 trader survey

First we consider two indicators of increased storage from the 2008 trader survey: whether the number of days between their purchase and sale was reported to be more or less than usual, and quantities of stock held in January 2004 and January 2008. Assemblers and retailers did not report a clear trend in the amount of time taken to complete a transaction nor much change in the amount held in storage (Table 3.12 and Figure 3.3).

Table 3.12 Number of days between purchase and sale, 2008

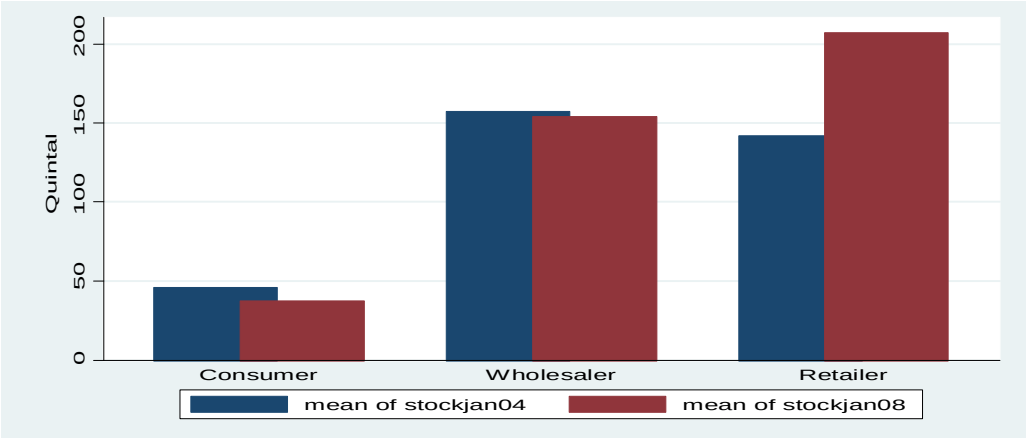
Is the number of days between purchase and sale more or less than usual?	Assemblers (n=52)	Wholesalers (n=22)	Retailers (n=221)
Less (%)	19	41	24
Same (%)	56	50	49
More (%)	25	9	27

Source: 2008 trader survey

However wholesalers were found to be holding significantly more stock in January 2008 than they had in January 2004, and they were also found to be more likely to converge on reporting a shorter duration of transaction (perhaps consistent with trying to hide speculative behavior, given the survey

was undertaken during a time in which there was considerable public suspicion and frustration that traders may be hoarding).[12]

Figure 3.3 Comparing storage in January 2004 and January 2008



Source: 2008 trader survey

To further examine changes, survey responses in 2002 were compared with survey responses in 2008. We find that there is no significant difference in the quantity held in stock in January 2008 and January 2002, however some difference does remain in the number of days taken between purchase and sale, with both wholesalers and retailers reporting quicker completion in 2008 than in 2002 (Table 3.13). The results do not indicate that there were large increases in storage by traders in regional markets during 2007 and early 2008, although recall data suggests stocks held by wholesalers may have been higher.

Table 3.13 Comparing storage in 2002 and 2008

	Assemblers	Wholesalers	Retailers
Time between purchase and sale (days, median)			
2002	14	15	15
2008	10	10	12.5
Significance of difference (p-	0.486	0.087*	0.796
Amount in store (quintals, median)			
2002	100	93	57
2008	575	90	56
Significance of difference (p-	0.201	0.774	0.796

Source: 2002 and 2008 trader survey

[12] Disaggregation of traders along other lines were also tried—such as disaggregating traders with and without access to credit on the basis that traders without access to finance would find it harder to store—however no differences were found in storage behavior and so the results are not reported here.

3.4 Evidence of increasing returns to scale

In this final section we explore whether there are increasing returns to scale to be found in cereal trading in Ethiopia. Evidence that increasing returns to scale are present indicates the presence of constraints or bottlenecks to increased efficiency and reduced transaction costs. There are two types of test that can be undertaken to explore increasing returns to scale: (i) examine aggregate returns to trade for all quantities traded by one trader throughout the year and determine whether the per unit return received increases with the scale of the trading enterprise, (ii) examine individual transactions to determine whether the per unit return to the transaction increases with the quantity traded. In both cases a significant positive coefficient on quantity or measures of scale indicates that increasing returns to scale are present. In this case easing constraints to capital accumulation experienced by traders would result in increased efficiency in grain markets.

Using the 2002 trader survey data Gabre-Madhin and Negassa (2004) found evidence of increasing returns to scale for traders in Ethiopia, suggesting that some traders are limited in the scale which they operate and their ability to exploit opportunities for spatial or temporal arbitrage. The estimation method they used was the first one outlined above, namely assessing whether the annual per unit return to trading increased with the scale of the trading enterprise. Both tests have been carried out on similar trader survey data from a number of Sub-Saharan African countries (Benin, Madagascar and Malawi) and have indicated that although some aspects of trading experienced increasing returns to scale (such as search costs), overall few returns to scale (either at the aggregate level or at the transaction level) are found (Fafchamps, Gabre-Madhin and Minten 2005). It is important to note that this evidence only suggests there are few returns to scale *given* current market institutions. Other work suggests that the structure of such crop markets limits the extent to which branding can develop (given the absence of grades and standards or vertical integration through contracting) causing reputation effects to be constrained to the size of a trader's personal trading network (Fafchamps and Minten 2002). This in turn causes few returns to scale to be observed. This is consistent with many examples that suggest returns to scale are present when branding does exist and can assure quality (e.g. supermarkets).

It is only possible to look at increasing returns to scale at the transaction level with the 2008 trader data, as information on two crucial factors of production— labor and trader networks — needed for the aggregate analysis was not collected. It is argued, however, that this is an appropriate level of analysis as it is the level at which the difference between the buying and selling price, the ultimate measure of efficiency, can be compared, and it is also the level at which marketing costs and their impact on this price differential can best be examined (Fafchamps, Gabre-Madhin and Minten 2005).

The conceptual framework and estimation method used was that used in Fafchamps, Gabre-Madhin and Minten (2005). Gross margin rates were regressed on characteristics of the sale that may affect the size of the cost, namely the distance travelled, the duration of the sale, and the type of crop being transacted. The gross margin rate was also regressed on quantity, and the significance of the measure of quantity was taken as a test for the presence of increasing returns. This was done for all traders together and by type of trader. When all traders were pooled the marketing functions performed by the trader (assembly, wholesale and/or retail trade) were controlled for through the inclusion of trader type dummies. Given the measurement error present in the data, the log of the gross margin rate was used as the dependent variable and a quantile regression estimation procedure was used. Similarly, for each type of marketing cost incurred the unit cost was regressed on the same variables and the significance of quantity was taken as a test for increasing returns. However, as there is self-selection into whether or not each type of marketing cost is incurred, in these estimations a Heckman estimation procedure was used using trader characteristics (such as gender, number of vehicles owned, working capital and storage capacity) as instruments in the selection equation. In each equation the dependent variable was the log of per unit costs to reduce the impact of outliers on the estimation.

The coefficient these regressions are summarized in Table 3.14. Considering all traders together, there appears to be little indication of increasing returns to scale from undertaking larger transactions. Total per quintal transaction costs and the gross margin rate do not appear to exhibit increasing returns to scale. However, there are a number of trading activities that do show evidence of the presence of high fixed costs, particularly costs associated with search of suppliers, buyers and prices. Personal transportation costs, telephone costs and handling costs all exhibited decreasing unit costs, and thus increasing returns to scale were found among traders—traders whose primary activity was that of purchasing quantities from farmers and aggregating them for sale to wholesalers—who focused on these activities.

Table 3.14 Testing increasing returns to scale

	Coefficient on quantity*	Test of significance (t-or z-test)	Interpretation
Gross margin rate			
All	*-0.0001*	*-0.16*	Constant returns to scale
Assemblers	*0.09*	*2.97***	Increasing returns to scale
Wholesalers	*-0.002*	*-0.91*	Constant returns to scale
Retailers	*0.0004*	*0.34*	Constant returns to scale
Cost of transporting per quintal	*0.06*	*0.72*	Constant unit costs with scale
Cost of road payments per quintal	-0.33	-1.25	Constant unit costs with scale
Cost of handling per quintal	*-0.06*	*-1.46'*	Decreasing unit costs with scale
Cost of personal travel per quintal	-0.75	-6.92***	Decreasing unit costs with scale
Cost of telephone calls per quintal	-0.80	-9.82***	Decreasing unit costs with scale
Cost of bags per quintal	0.01	0.44	Constant unit costs with scale
Cost of intermediaries per quintal	**0.25**	**1.65**	**Increasing unit costs with scale**

Source: 2008 trader survey

*The result from a regression which included appropriate controls.

These results suggest that the fixed costs (costs that are incurred regardless of the amount being bought or sold) that are associated with search in markets with non-standard qualities of goods do result in increasing returns to scale, and that assembly traders are limited in the scale to which they can operate. Increased access to credit may allow these traders to operate at increased scale and become more efficient. Increased quantities of transactions at the first stage of marketing such as through farmer specialization or cooperatives aggregating quantities for sale may also help.

In looking at these results and assessing their implications for Ethiopia it is important to bear in mind that they assess the returns to scale given the structure of market institutions as they currently are. For example if all retailers operate on a small scale (as is generally true for grain retailers), it is only possible to determine whether, for the range of sizes observed, there are increasing returns to scale. It is becoming evident from studies in other countries that a move to "modern" market structures—i.e. supermarkets—allows increasing returns to scale to be realized at the wholesale and retail levels.

3.5 Conclusions

This chapter has assessed changes in the cost and nature of cereal trade in Ethiopia using survey data on cereal traders from a unique panel of regional markets. Despite substantial infrastructural investments and rising fuel and cereal prices between 2002 and 2008, little change in the magnitude of margins or total out of pocket costs of transacting was observed. However, this stability in aggregate margins and costs masks substantial changes in the structure of transaction costs and the nature of search for prices and buyers. Whilst transportation costs were constant during this time, it appears improvements in transport efficiency helped offset a 25% increase in fuel prices.

Further reductions in transaction costs will improve the quality of Ethiopia's domestic cereal market and offers the opportunity to reduce urban consumer prices without reducing returns to rural producers. The results of this analysis suggest that reducing the fixed costs of search at the first stage of the marketing chain (such as reducing mobile telephone costs and improving feeder roads) or enabling traders and farmers to increase the scale at which they operate at this first stage (such as through increasing access to credit to assembly traders, farmer specialization or the development of farmer groups that can aggregate quantities for sale) are some means by which transaction costs can be reduced.

3.6 References

Dercon, S. 1995. "On Market Integration and Liberalization: Method and Application to Ethiopia." *Journal of Development Studies* 32(1):112-143.

Fafchamps, M. 1992. Cash crop production, food price volatility and rural market integration in the third world. *American Journal of Agricultural Economics* 74 (1), 90-99.

Fafchamps, Marcel, Eleni Gabre-Madhin and Bart Minten. 2005. Increasing Returns and Market Efficiency in Agricultural Trade. *Journal of Development Economics*

Fafchamps, Marcel & Bart Minten. 2002. Returns to Social Network Capital among Traders. *Oxford Economic Papers* 54:173-206.

Gabre-Madhin, Eleni and Amha, Wolday. 2004. "Micro-economic Behavior and Constraints of Grain Traders in Ethiopia" Mimeo

Gabre-Madhin, Eleni and Negassa, Asfaw. 2004. "Linking trading practices and arbitrage behavior in the Ethiopian grain market" MTID Discussion Paper.

Gabre-Madhin, E. and Mezgebou, T. 2006. "Prices and Volatility in the Ethiopian Grain Market" Paper submitted for ESSP Policy Conference 2006 "Bridging, Balancing, and Scaling up: Advancing the Rural Growth Agenda in Ethiopia" 6-8 June 2006, Addis Ababa, Ethiopia.

Goletti, F. and Minot, N. 1997. "Rice markets, agricultural growth, and policy options in Vietnam" International Food Policy Research Institute, Market and Structural Studies Division Discussion Paper No. 14.

Key, N., Sadoulet, E. and de Janvry, A. 2000. "Transaction costs and agricultural household supply response." *American Journal of Agricultural Economics* 82 (2), 245.259.

Negassa, A. and Jayne, T.S. 1997. "The Response of Ethiopian Grain Markets to Liberalization." Working Paper No. 6, Grain Marketing Research Project, Addis Ababa, Ethiopia.

Negassa, A. and Myer, R.J., 2007. Estimating policy effects on spatial market efficiency: An extension to the parity bound model. *American Journal of Agricultural Economics*

Rashid, S., P. Dorosh, and Seyoum Taffesse, A. 2008. "Grain Markets and Social Transfers: An Analysis of Ethiopian PSNP" Report submitted to WFP, December 2008.

Teravaninthorn, S. and Raballand, G. 2008. *Transport Prices and Costs in Africa: A Review of the Main International Corridors*. World Bank Publications

Chapter 4: Assessment of Cross Border Trade Cereals and Livestock

4.1 Introduction

This component of the study has examined the possibility of whether cross border trade might have contributed towards price hikes. The study has monitored both formal and informal trade flows in four major cross border trade points, namely Humera, Metema, Assosa/Kumruk and Moyale (Figure 1.3). The study has employed both primary and secondary data. The primary data were collected using Rapid Market Appraisal (RMA) method. Expert field researchers from the regional offices of the Ethiopian Institute of Agricultural Research interviewed officials of the Bureaus of Agriculture and Rural Development and experts of Customs Agency at different level. In addition, the team also conducted interviews with farmers group, local traders, and community leaders. This section provides a summary of that exercise.

4.2 Structure of cross border trade

There are both official and unofficial cross border trade between Ethiopia and its' neighbors. The official trade is governed by two types of regulations—that is, formal procedure of import-export and by the small-scale cross border trade regulation (Franco-valuta arrangement). The illegal cross border trading, on the other hand, is carried out by various market actors, including: (a) licensed small traders engaged in cross border trade legally (franco-valuta), (b) licensed small traders renting out their licenses to other non licensed traders, (c) large traders engaged in legal import export trade, (d) large import–export traders engaged in an illegal border trade by renting the border trade license from the small traders, and (e) commercial farms nearby the cross-border areas.

The major commodities traded are cereals, pulses, and oil seeds in cereal category and cattle, shoats, camel, horse and mule in livestock. The types of commodity, however, seem to vary across border points. In Metema, sorghum among the cereal crops, faba beans among pulses are major traded commodities across the border. In Humera areas sorghum and teff among cereals, faba beans, field pea, lentil and chickpeas among pulses and sesame among oil crops are frequently traded across the border. Sorghum and maize among the cereals, faba beans, field pea, lentil and chickpeas among pulses are traded across the Kumruk-Sudan border areas. Along the Ethio-Kenya border of Moyale area, maize, wheat and teff among cereals and haricot beans among pulses are traded. Cattle are traded in all cross border areas, whereas sheep and goats are traded across the Moyale and Kumruk-Assosa cross border areas.

4.3 Estimated trade volumes

The estimated value of cross border trade is presented in Table 4.1. The trend shows that both legal and illegal trade values have increased over the years in nominal terms, although the legal trade has increased faster than the illegal trade values. The overall trend in both illegal and legal cross border trade of agricultural commodities in the four cross border areas is increasing. The estimated value of illegal export has jumped from ETB 14.4 million in 2003/04 to ETB 69 million in 2006/07 cropping season. Similarly, the value of agricultural commodities exported formally through the cross border has made quantum jump from ETB 0.31 million in 2003/04 to ETB 421 million in 2006/07.

Table 4.1 Estimated value of cross border exports, 2003/04 – 2007/08

		Crops		Livestock		
	Year	Value in birr	% of total	Value in birr	% of total	Total
Illegal	2003/04	7,528,136.00	52	6,892,104.56	48	14,420,240.56
	2004/05	15,437,107.00	62	9,307,749.00	38	24,744,856.00
	2005/06	18,145,767.00	55	15,133,148.00	45	33,278,915.00
	2006/07	32,053,559.00	46	36,993,927.00	54	69,047,486.00
	2007/08	30,657,662.00	53	27,639,895.00	47	58,297,557.00
Legal	2003/04	134,088.00	43	176,314.00	57	310,402.00
	2004/05	544,944.00	37	937,860.00	63	1,482,804.00
	2005/06	231,548,030.00	94	15,820,396.00	6	247,368,426.00
	2006/07	336,447,680.00	80	84,812,866.50	20	421,260,546.50
	2007/08	4,135,601.00	24	13,270,060.00	76	17,405,661.00
Total	2003/04	7,662,224.00	52	7,068,418.56	48	14,730,642.56
	2004/05	15,982,051.00	61	10,245,609.00	39	26,227,660.00
	2005/06	249,693,797.00	89	30,953,544.00	11	280,647,341.00
	2006/07	368,501,239.00	75	121,806,793.50	25	490,308,032.50
	2007/08	34,793,263.00	46	40,909,955.00	54	75,703,218.00

Source: Cross border Rapid Market Appraisal, 2008 and Customs Office, respective border area

Table 4.2 and 4.3 summarize the estimated cross border trade of the different crops through legal and illegal means. The types of crops exported legally with significant volume are sorghum, faba beans and sesame. There was an increasing trend in the volume of export till 2005/06 for the three commodities. Sorghum was exported mainly through Metema and Kumruk and to lesser extent

through Humera borders. Faba bean is exported solely through Metema border and sesame through Humera.

Over the stated period the maximum export value of sorghum was in 2005/06 with the estimated value of about 20 million ETB. The export of faba bean to Sudan shows an increasing trend following the normalization of the trade relation between the two countries. In 2006/07, the value of faba bean export reached 17.3 million ETB. Similarly, the export of sesame to Sudan through Humera is showing increasing trend and reached about 316.9 million ETB in 2006/07 production season.

The Rapid Market Assessment (RMA) team gathered that a significant proportion of the illegal transaction of teff is taking place through Humera and Metema via Sudan to Eritrea and Moyale to Kenya. Illegal trade transaction for Haricot beans have also shown increasing trend in Moyale and Humera border areas. Wheat is important for Metema and Moyale area. This shows that overall Moyale cross border trade is an important area and has implication for the domestic market of the stated commodities. Sesame illegal cross border takes place in Humera areas; where about 10.5 million birr value of sesame is estimated to enter Sudan in 2006/07 production season. Due to the recent price parity difference, where the domestic price of sesame is getting higher as compared to Sudan price, the volume of the illegal export has been sharply declined and hence estimated to be negligible.

Table 4.2 Volume of legal cross border exports in quintals (2003/04 – 2007/08)

Commodity	Year	Metema		Humera		Kurmuk		Total	
		Quintal	Value in Birr	Quintal	Value in Birr	Quintal	Value in	Quintal	Value in Birr
Sorghum	2003/04	NS	--	NS	--	480.00	72,000.00	480.00	72,000.00
	2004/05	NS	--	NS	--	624.00	96,720.00	624.00	96,720.00
	2005/06	135,669.00	20,214,681.00	NS	--	960.00	134,400.00	136,629.00	20,349,081.00
	2006/07	4,729.00	945,800.00	5,900.00	1,115,100.00	672.00	110,880.00	11,301.00	2,171,780.00
	2007/08*	NS	--	NS	--	720.00	215,280.00	720.00	215,280.00
Faba Beans	2003/04	398.00	62,088.00	NS	--	NS	--	398.00	62,088.00
	2004/05	2,436.00	448,224.00	NS	--	NS	--	2,436.00	448,224.00
	2005/06	11,868.00	2,409,204.00	NS	--	NS	--	11,868.00	2,409,204.00
	2006/07	54,156.00	17,329,920.00	NS	--	NS	--	54,156.00	17,329,920.00
	2007/08*	11,633.00	3,920,321.00	NS	--	NS	--	11,633.00	3,920,321.00
Sesame	2003/04	NS	--	NS	--	NS	--	-	0.00
	2004/05	NS	--	NS	--	NS	--	-	0.00
	2005/06	NS	--	444,233.50	208,789,745.00	NS	--	444,233.50	208,789,745.00
	2006/07	NS	--	530,010.00	316,945,980.00	NS	--	530,010.00	316,945,980.00
	2007/08**	NS	--	392,850.00	363,779,100.00	NS	--	392,850.00	363,779,100.0

Source: Customs Office at respective border area. * covers the first 6 months of the year, ** annual estimate, NS = non significant, meaning less than 100 quintals.

Table 4.3 Estimated volume of illegal cross border trade of cereals (2003/04 – 2007/08)

Crop	Year	Volume in quintals					Total value in birr	National Supply in Quintals	% of total supply
		Metema	Humera	Kumuruk	Moyale	Total			
Maize	2003/04	822		576		1,398.00	143,418.00		
	2004/05	1,185.00		768	16,880.00	18,833.00	1,480,539.00	24,067,000	0.08%
	2005/06	2,117.00		720	11,116.00	13,953.00	1,636,637.00	33,368,000	0.04%
	2006/07	2,350.00		864	17,040.00	20,254.00	3,001,264.00	37,764,000	0.05%
	2007/08	2,167.00		480	8,800.00	11,447.00	1,297,836.00	37,497,000	0.03%
Wheat	2003/04	493.00		-		493.00	116,348.00		
	2004/05	711.00		-	16,575.00	17,286.00	2,401,110.00	21,766,000	0.08%
	2005/06	1,270.00		-	13,000.00	14,270.00	1,697,670.00	22,191,000	0.06%
	2006/07	1,410.00		-	17,500.00	18,910.00	4,034,220.00	24,630,000	0.08%
	2007/08	1,300.00			23,590.00	24,890.00	6,676,070.00	23,144,000	0.11%
Teff	2003/04	4,934.00	2,500.00			7,434.00	1,597,196.00		
	2004/05	7,109.00	5,000.00		14,980.00	27,089.00	5,344,798.00	20,255,000	0.13%
	2005/06	12,700.00	7,000.00		16,100.00	35,800.00	8,037,800.00	21,756,000	0.16%
	2006/07	14,100.00	7,000.00		18,375.00	39,475.00	14,178,250.00	24,377,000	0.16%
	2007/08	12,999.00	8,500.00		19,370.00	40,869.00	15,702,165.00	29,929,000	0.14%
Haricot Beans	2003/04	411.00				411.00	96,174.00		
	2004/05	592.00			8,960.00	9,552.00	1,298,160.00		
	2005/06	1,058.00			10,160.00	11,218.00	3,013,660.00		
	2006/07	1,175.00			13,800.00	14,975.00	374,825.00		
	2007/08	1,083.00			19,200.00	20,283.00	6,981,591.00		
Sesame	2003/04		12,500.00			12,500.00	5,575,000.00		
	2004/05		12,500.00			12,500.00	4,912,500.00		
	2005/06		8,000.00			8,000.00	3,760,000.00		
	2006/07		17,500.00			17,500.00	10,465,000.00		
	2007/08								

Source: Cross border Rapid Market Appraisal, 2008

Implications of the cross border trade to domestic market

The general trend for cross border trade shows that major cereals enter into both legal and illegal markets. Nevertheless, the illegal form of market has major share in total cross-border trade for cereals. Similar trend exists for livestock nearly in all the four cross-border areas under study. However, the current share of the total cross border trade (legal and illegal) is not that significant from the total domestic production or supply. As a result, it may not bring significant effect on the domestic markets for grain in general. Some policy measures such as export ban might have elicited the illegal trade although this needs further assessment of the issue at hand. While some measures of export ban may help to contain pressures on domestic prices, but may also serve as disincentive to farmers. Export restrictions exacerbate the price spiral and instability in regional markets, with high distortional effects on cross-border trade, especially when they are implemented in uncoordinated manner by different countries. It may be possible that economic boom in Sudan might have increased the purchasing power and the demand for cereals and this has to be supplied from Ethiopia. It appears that given such scenarios the overall trend of cross-border trade for cereals seems to increase in the future mainly through the legal routes. This is due to the fact that there is strong GOE move towards regulating and controlling cross border trade.

4.4 References

Mulat Demeke, Atlaw Alemu, Bilisuma Bushie, Saba Yifredew, and Tadele Ferede. 2007. Exploring demand and supply factors behind the new developments in grain prices in Ethiopia: key issues and hypotheses. A report submitted to DFID-ETHIPIA. April 2007.

Dorosh Paul A. and Ludovic Subran. 2007. Food Markets and Food Price Inflation in Ethiopia. A background paper for the "just-in-time" policy note, "Explaining Sources of Food Price Inflation in Ethiopia" prepared by World Bank staff in collaboration with researchers and analysts from the Ethiopian Development Research Institute, University of Addis Ababa, World Food Programme, and IFPRI.

Rashid, S., Meron Assefa and Gezahegn Ayele. 2007. Distortions to agricultural incentives in Ethiopia. World Bank Discussion paper (Forthcoming)

CSA, 2006. Report on area and production of crops (Private peasant Holding, Meher season). Vol. I, Statistical Bulletin No. 388. FDE, Agricultural Sample Survey 2005

ILRI (International Livestock Research Institute). 2003. Benefits and Costs of compliance of SPS rules: the Case of Rift Valley Fever in Ethiopia . A draft report submitted to the World Bank.

Shank, R. 1997. Livestock marketing and cross border trade in the Southeast of Ethiopia. UNDP-Emergencies Unit for Ethiopia. Internal Report.

Little, P. 2001. Cross-border livestock trade and food security in the Somalia and Northeastern Kenya borderlands. A summary prepared for the OSSREA/BASIS seminar on cross-border trade, Addis Ababa , Ethiopia , 2-3 April, 2001.

Teka, Tegegne , Azeze, Alemayehu , and Gebremariam., Ayele. 1999. Cross-border livestock trade and food security in the Southern and Southeastern Ethiopia borderlands. Organization for Social Science Research in Eastern and Southern Africa (OSSREA) Development Research Report Series no. 1, Addis Ababa . 74pp.

Ayele Solomon, Assegid Workalemahu, Jabbar, M A, Ahmed, M M and Belachew Hurissa. 2003. Livestock marketing in Ethiopia : a review of structure, performance and development initiatives. Socio-economics and Policy Research Working paper no 52. ILRI, Nairobi , Kenya .

Chapter 5: Spatial Equilibrium Modeling Results on the Impacts of Policy Interventions[13]

5.1 Introduction

Over the past two years, interest in the operation of grain markets in Ethiopia has increased as a result of the dramatic increase in the price of staple foods since early 2007. Various hypotheses have been proposed to explain the rise in food prices: diversification from cereals into high-value crops by Ethiopian farmers, increased demand for grain by rural consumers, changes in the timing of grain sales by farmers, general inflation, and the impact of higher grain prices on world markets.

The higher food prices have highlighted the impact of various food assistance programs in Ethiopia on food markets. Ethiopia is a major recipient of food aid, though food aid imports have declined from a peak of 1.6 million tons in 2003 to less than 400 thousand tons in 2006. In addition, since 1996 the World Food Program (WFP) has had a local procurement program, under which it purchases grain within Ethiopia for distribution as food aid within the country. The volumes ranged from 51 to 248 thousand tons per year, but were suspended in 2007 and 2008 in response to the high food prices (WFP, 2008). Finally, the Productive Safety Net Program (PSNP) has provided labor-intensive public works and food and cash transfers to eligible households in selected districts since 2005-06. The PSNP and the local procurement program are, in part, a response to the concern that imported food aid was depressing food prices. More recently, the concern is that the PSNP and local procurement programs may contribute to higher food prices.

In order to address these issues, we have developed a model of grain markets in Ethiopia to simulate the impact of various "shocks" on prices, production, consumption, and the internal trade of grain. This chapter describes the structure of the Ethiopian Spatial Grain Marketing Model (ESGMM) and the results of simulations using the model.

More specifically, the model is used to examine the following questions:

- What is the effect of local grain procurement by the WFP on domestic grain markets?
- How does the distribution of imported food aid influence domestic grain markets?
- What is the impact of the Productive Safety Nets Programme (PSNP) on domestic grain markets?
- To what degree can the increase in domestic food prices be attributed to the spike in global food prices?

[13] This chapter is prepared by Nicholas Minot.

In section 2, we describe the Ethiopian Spatial Grain Marketing Model (ESGMM). Then in section 3, we provide some results of simulations using the model. Section 4 concludes and discusses possible extensions.

5.2 Description of the ESGMM

General characteristics

The ESGMM is a partial-equilibrium spatial-equilibrium model of cereals markets in Ethiopia. It is a partial-equilibrium model in that it simulates the markets of several closely-related commodities, but does not attempt to represent all sectors in the economy. General equilibrium models, which represent all sectors of the economy and make all income endogenous, are useful for simulating the effects of economy-wide policies such as broad trade reform and exchange rate policy. To simulate the impact of sector-level policies and shocks, however, a partial-equilibrium model is often a lower-cost, more transparent alternative.

The ESGMM is a spatial-equilibrium model in that it simulates the markets in different regions, taking into account the cost of transporting goods from one market to another. More specifically, a spatial equilibrium model allows the direction of trade between two markets to be endogenous (determined conditions in the model), rather exogenous (fixed in the design of the model). This feature is particularly important in Ethiopian cereals markets for two reasons. First, cereals have low value-bulk ratios[14] and Ethiopia is a vast country, so the prices of cereals vary substantially across the regions of the country. Second, the geographic distribution of surplus and deficit zones in the country is such that direction of flow of cereals changes from year to year, depending on the rainfall and size of the harvest in each region. A non-spatial model cannot capture this because the direction of flow between each pair of markets must be fixed in such a model.

[14] The value-bulk ratio refers to the monetary value of the commodity per unit of weight or volume. A low value-bulk ratio implies that the cost of transportation is a large share of the total cost of delivering it to the final consumer, which implies that the price will vary considerably between surplus and deficit zones.

Table 5.1 Description of market regions in the Ethiopian Spatial Grain Markets Model

	Market regions	Population	Characteristics
1	Addis Ababa	2,973	Largest city, largest terminal market and transit point, deficit region, particularly in wheat and teff
2	Desse	3,707	Amhara region, northern Ethiopia, deficit in maize and wheat, surplus in sorghum
3	Mekele	9,514	Tigray region, northern Ethiopia, terminal market, deficit in all cereals
4	Dire Dawa	6,619	Eastern Ethiopia, second-largest city, deficit in maize, teff, and wheat, surplus in sorghum
5	Bale	12,890	Oromia region, southwest of Addis, wheat surplus zone, self-sufficient in maize, deficit in sorghum
6	Hossana	13,411	SNNP region, south of Addis, teff and wheat surplus zone, self-sufficient in maize and sorghum
7	Jimma	9,446	Oromia region, southwest of Addis, maize & teff surplus zone, deficit in wheat, self-sufficient in sorghum
8	Bahir Dar	8,826	Amhara region, northwest of Addis, maize and teff surplus zone, deficit in wheat and sorghum
9	Gonder	3,907	Amhara region, northwest of Addis, sorghum surplus zone, deficit in maize, teff, and wheat

Structure of the ESGMM

The Ethiopian Spatial Grain Marketing Model (ESGMM) simulates the markets for four commodities: maize, teff, wheat, and sorghum. These four cereals account for 61% of the caloric intake of the Ethiopian population (FAO, 2008a). In addition, they account for over half of the cultivated crop area in Ethiopia, according to both the FAO (2008b) and the 2008 Ethiopian Agricultural Household Marketing Survey (EAMHS). These crops are also among the most widely grown crops: maize and teff are each grown by over half of Ethiopian farmers, while wheat and sorghum are each grown by more than a quarter of them.

The ESGMM divides the country into nine market regions, each one represented by at least one large market town: Addis Ababa, Desse, Mekele, Dire Dawa, Bale, Hossana, Jimma, Bahir Dar, and Gonder. Each administrative zone in Ethiopia has been allocated to one of the nine market regions. The market regions are listed in

Table 5.1 and illustrated in Figure 5.1. For each commodity and each market region, the model ensures that demand equals supply plus net imports and net inflows from other market regions.

Figure 5.1 Map of nine market regions used in the ESGMM

The supply of each commodity in each market is a function of the prices of all four commodities in the same market region. Similarly, the demand for each commodity is a function of the prices of all four commodities in that region. In other words, the four commodities are linked to each other by substitution in production and consumption. For example, if the price of wheat increases, this will decrease the supply of the other three commodities as land is diverted to wheat production, and it will increase the demand for the other three commodities as consumers scale back wheat consumption and increase demand for the other commodities.

The prices of commodities in different market regions are linked through spatial arbitrage: if the price of maize in one region rises enough so that the price gap between two markets exceeds the cost of shipping goods between the two markets, this will induce a flow of maize toward the high-priced market, thus maintaining the price differential to be no greater than the cost of marketing between the two markets (including loading, transport, unloading, risk premium, and profit). Thus, when there is a flow of commodities between two markets, the prices in the two markets will move together. But if there is no trade between markets, their prices will not necessarily move together.

Table 5.2 Supply and demand elasticity assumptions in the ESGMM

Crop	Price elasticity of demand	Income elasticity of demand	Price elasticity of supply
Maize	-0.5	0.6	0.51
Teff	-0.7	1.0	0.28
Wheat	-0.7	1.0	0.28
Sorghum	-0.5	0.4	0.43

Calibration of the model

The ESGM model is calibrated to represent the year 2006, a year of "normal" production before the rapid increase in commodity prices[15]. Production in each market region is based on zone-level production data from the 2005 Agricultural Census, aggregated to the level of the nine market regions. The production figures are scaled up to make the national production of each crop equal to the 2006 level, as estimated by the Central Statistical Agency.

Per capita consumption of the four main cereals is based on the 2008 Ethiopia Agricultural Marketing Household Survey, which estimated per capita consumption for each of the four largest regions: Tigray, Amhara, Oromia, and the Southern Nations, Nationalities, and Peoples (SNNP) region. Consumption in other rural regions (Afar, Somali, Benishangul-Gumuz, and Gambella) is assume to resemble that in Tigray. Per capita consumption in Addis Ababa, Dire Dawa, and Harari are based on the urban consumption patterns estimated in the 1999-2000 Household Income Consumption and Expenditure (HICE) survey. In both urban and rural areas, consumption is rescaled to be consistent with national trade statistics.

Prices are based on the average wholesale price in 2006 for the main market, as reported by the Ethiopian Grain Trading Enterprise (EGTE). The own-price elasticities of demand are based previous estimates of cereal demand in low-income countries (see Seale and Regmi, 2006), which found elasticities of around -0.6. We use a slightly higher elasticity (-0.7) for wheat and teff, which are the "luxury" cereals whose demand is presumably somewhat more price sensitive and a slightly lower elasticity (-0.5) for maize and sorghum. These elasticities are confirmed by the observed impact of production shocks on prices in Ethiopian grain markets. The cross-price elasticities of demand describe the effect of the price of one cereal on the demand for another. They are calculated by assuming that 1) 60% of the reduction in caloric intake from one crop whose price increases is offset

[15] The base year for the simulations is different than the reference year for the household and trader surveys because the criteria for selecting the two are different. The surveys compare the current situation with 2003 because five years was considered long enough to observe trends but short enough to allow reliable recall. For the model, we use 2006 as the base year for the simulations because it is the most recent "normal" year. In selecting a base year for simulations, there is no need to choose a year that is long enough ago to observe trend since then.

by increased consumption of the other three crops and 2) the other three crops increase in equal proportions[16].

The income elasticities for the four commodities are based on those estimated by Washimo and Yu (2007) for rural areas, using the 1999-2000 HICE data. We revise the rural income elasticity for teff downward from 1.65 to 1.00 based on international experience (income elasticities for grains are usually less than 1.0).

The own-price supply elasticities are based on those estimated by Alemu et al (2003) using time-series data for Ethiopia: 0.51 for maize, 0.28 for teff, 0.28 for wheat, and 0.43 for sorghum. Traditional production of staple food crops is relatively unresponsive to market prices, partly because many farmers are relatively isolated from the market and partly because farmers are constrained from using inputs more intensively when price increases. Cross-price elasticities of supply describe the effect of the price of one commodity on the supply of another. These elasticities are generated by assuming that 1) change in supply are mainly driven by reallocation of land among cereal crops, 2) 55% of the reduction in area for one crop in response to a price decrease is offset by increases in the area allocated to the other three cereals, and 3) the area allocated to the other three crops increase in equal proportions.

The cost of shipping grains between market region is based on Desallegne et al (1998), who estimate costs at 2.5 birr/quintal for handling, 0.05 birr/quintal-km for transport, and 20 birr/quintal profit. For example, the distance between Addis Ababa and Mekele is 783 kilometers, so the cost of transporting grain from one to the other is estimated to be 2.5+39.1+20=61.6 birr/quintal. This is roughly consistent with observed price differences between markets in 2006.

With regard to international trade, Ethiopia is assumed to be a "small country" in that it cannot influence the international grain prices. In the base scenario, maize, teff, and sorghum are not traded, but there are 400 thousand tons of imported wheat, accounting for about 13% of domestic use. The model includes import and export parity prices for all four commodities, and the volume and direction of international trade is endogenous. For example, if we simulate a negative shock to maize production and domestic prices rise high enough, the model will start to import maize. Similarly, if we simulate a dramatic increase in world prices, the export parity price may rise enough to induce grain exports.

[16] Cross-elasticities of demand are notoriously difficult to estimate with cross-section data, so it is difficult to confirm this assumption empirically. Nonetheless, intuition and economic theory indicate that the percentage offset must be greater than zero but less than one.

The model is written in the General Algebraic Modelling Software (GAMS), the standard software for economic modelling. Spatial equilibrium models are characterized by spatial arbitrage constraints, in which the gap in prices between two markets may be less than or equal to the cost of transporting goods between them. Solving economic models with inequality constraints is called mixed complementarity programming (MCP). The Ethiopian Grain Market Spatial model includes 476 endogenous variables (Table 5.3) and an equal number of equations and inequalities.

Table 5.3 List of endogenous variables in the Ethiopia Spatial Grain Market Model

Category of variable	Dimensions	Number of variables
Price	4 commodities x 9 regions	36
Quantity consumed	4 commodities x 9 regions	36
Quantity produced	4 commodities x 9 regions	36
Quantity transported	4 commodities x 72 region-pairs	288
Implicit export tax	4 commodities	4
Implicit import tax	4 commodities	4
Exports	4 commodities x 9 regions	36
Imports	4 commodities x 9 regions	36
Total		476

Use of the model

The simulations are run by changing one of the exogenous variables, running the model, and comparing the results to the original base scenario. The exogenous variables include:

- Supply shifts
- Demand shifts
- Income shifts
- International prices
- Transportation costs
- Trade policy

Supply shifts can be used to simulate weather-related shocks such as droughts as well as the distribution of food aid. Demand shifts can be used to represent the effect of local procurement of grains for redistribution as food aid. Income shifts can be used to simulate the impact of cash transfer programs such as the Productive Safety Net Programme (PSNP). The effect of the world food crisis can be simulated by increasing the international prices, which raises both import and export parity prices in the country. Improvement in the road network can be simulated by reducing the

transportation cost between selected pairs of markets. The model also can be used to simulate import and export taxes and quantitative restrictions on trade.

Of course, any economic model is only as good as the assumptions that go into it. The main value of an economic model is that it demonstrates the logical consequence of the assumptions that are built into the model. Refining the model is an iterative process, in which unrealistic or implausible results reveal the need to modify parameter assumptions or revise the structure of the model.

5.3 Base scenario and overview of simulations

Base scenario

Constructing the base scenario involves developing an internally consistent set of production, consumption, and flow estimates for each of the four main cereals in each of the nine market regions used in the model. Table A-5.1 shows the food balance sheet for each commodity and each region. The columns are defined as follows:

- Production refers to the harvested volume in thousand metric tons in the base year. This is based primarily on the 2005 Agricultural Census, but the model makes some revisions to maintain consistency with consumption and price data.
- Net inflow refers to the annual commercial movement of grain into the region (or out of the region if the number is negative). The national total net inflows for each commodity are zero.
- Net import refers to grain imports minus grain exports, but in the base scenario there is no commercial trade in the four commodities.
- Net aid inflow is estimated food aid distribution minus local procurement. The food aid distribution is based on the percentage of PSNP resources distributed to each woreda, aggregated up to the market region. The negative numbers for Addis Ababa reflect the assumption that local procurement occurs in Addis Ababa. In the base scenario, there are 400 thousand tons of imported food aid in the form of wheat and 180 thousand tons of locally procured food aid in the form of maize, wheat, and sorghum.
- Consumption refers to the total utilization of the grain in thousand metric tons. The estimates are based on household survey data, as discussed above, but the model makes some adjustments for consistency.
- Consumption per capita is the utilization per inhabitant, expressed in kilograms per person.

It is worth briefly describing the marketing patterns for each commodity as described in the base scenario:

- *Maize.* The table shows that the two main maize surplus regions are Jimma and Bahir Dar. It is useful to keep in mind that each market region includes an average of six zones. Thus, Bale *zone* may have a maize surplus, but this may be off-set by maize deficits in other zones of the Bale market *region*. The main maize deficit region is Desse. It is initially surprising that Addis Ababa is not a major deficit region. However, with a population of about 3 million and per capita maize consumption of just 18 kg/person (according to the 1999-2000 HICE), total maize consumption (and the maize deficit) is 54 thousand tons. By comparison, the Desse region consumes 58 kg/person and has over 9 million inhabitants, so total consumption is 553 thousand tons. After taking into account production, the deficit for this region is close to 500 thousand tons, dwarfing the deficit in Addis Ababa.
- *Teff.* Hossana and Bahir Dar are the main surplus regions, generating 440 thousand tons for the rest of the country, although Jimma also generates a small surplus. The main deficit regions are Dire Dawa and Addis Ababa. Although the population in Addis is smaller than in many market regions, per capita teff consumption in urban areas is much higher than in rural areas.
- *Wheat.* The main surplus regions are Bale, which generates 714 thousand tons of surplus, and Hossana, which supplies 258 thousand tons. The net aid inflow of 400 thousand tons of wheat for the country reflects imported food aid.
- *Sorghum.* Surpluses are produced by Gonder, Desse, and Dire Dawa. The main deficit region is Bale, not because per capita consumption is particularly high but because of the low level of production and the large population.

The volumes of cereals traded between regions are 20-23% of production for maize, teff, and sorghum and 35% for wheat. These percentages are somewhat higher than would be expected based on the results of the Ethiopian Agricultural Marketing Household Survey, which found that 21-31% of the production of the four main cereals is marketed by farmers. The percentage of production traded between regions should be no larger than the percentage of production sold by farmers.

Overview of simulations

We use the model to carry out four types of simulations: 1) the impact of the local procurement food aid program, 2) the impact of the imported food aid program, 3) the impact of the Productive Safety Net Program (PSNP), and 4) the impact of the recent spike in world grain prices. The summary results for the key policy simulations are shown in Table 5.4 and details are included in the appendix.

Table 5.4 Summary results from key policy simulations

Policy Simulations	Changes in the prices of:			
	Maize	Teff	Wheat	Sorghum
A. Impacts of changes in local procurement and food aid				
Eliminating locally procured food aid with no displacement	-9%	-3%	-6%	-6%
Eliminating locally procured food aid with full displacement	-2%	-1%	-1%	-1%
Doubling locally procured food aid with no displacement	8%	2%	5%	1%
Doubling locally procured food aid with full displacement	2%	1%	1%	1%
Eliminating imported food aid in the short run	8%	4%	20%	7%
Impact of eliminating imported food aid in the long run	4%	3%	15%	3%
B. Impacts of changes in PSNP				
Impact of eliminating the PSNP in the short run	-5%	-4%	-4%	-4%
Impact of eliminating the PSNP in the long run	-2%	-2%	-2%	-2%

In the first simulation, the model is used to simulate the impact of changing the size of the local procurement food aid program on grain markets and grain consumption in different regions of Ethiopia. In the base year of 2006, the World Food Program local procurement program purchased 180 thousand tons of maize, wheat, and sorghum for redistribution in the country. We simulate the effect of eliminating the local procurement program and the effect of doubling the size from 180 thousand tons to 360 thousand tons. For each of these two variations, we make two alternative assumptions:

- that the distribution of food aid displaces commercial purchases of grain so the distribution acts like an injection of additional grain into the local market, in addition to its effect on surplus zones through the local procurement, and

- that the impact of the distribution does not displace any commercial purchases, so that the distribution of food aid no effect on local grain markets and the program only affects markets through the procurement of grains.

In the second simulation, we use the model to examine the impact of the imported food aid program. In the base scenario, food aid imports consist of 400 thousand tons of wheat , reflecting the situation in 2006. We simulate the impact of eliminating the imported food aid in the short and long run. In the short run, consumers respond to the higher price of grains, but farmers do not. In the long run, farmers respond by increasing grain output in response to the higher prices.

In the third simulation, the model is used to simulate the impact of the Productive Safety Net Program (PSNP) on cereal markets. In 2006, the PSNP distributed about 1300 million birr to selected households in 203 woredas. Since the PSNP is already part of the base scenario, we simulate the impact of eliminating the PSNP transfers in each market region. As in the second simulation, we simulate the impact in the short run (before farmers can respond to the new prices) and the long run (after they respond).

In the fourth simulation, we use the Ethiopia Spatial Grain Markets Model to simulate the impact of the global food crisis of 2007-08 on Ethiopian grain markets. More specifically, we simulate the effect of a doubling of the world prices of wheat and maize, reflecting the approximate increase in prices between August 2006 (the period used to calibrate the ESGMM) and the average price over January-November 2008. We do not simulate any increase in the international price of teff and sorghum because teff is not traded in international markets and sorghum is not traded by Ethiopia.

5.4 Impact of local procurement of cereals

Since 1996, the Ethiopian government, non-government organizations, and the World Food Program have purchased 1.6 million tons of cereals from within Ethiopia for redistribution as food aid in the country. The annual volume has varied from 51 thousand tons to 248 thousand tons and is composed of maize and smaller quantities of wheat and sorghum. Local procurement provides food aid in the form of locally preferred grains at a lower cost than imported food aid and is intended to promote the development of local grain markets with minimal impact on local prices (WFP, 2008). However, it is difficult to empirically evaluate the impact of local procurement on domestic prices because prices are simultaneously being influenced by other factors, particularly weather-related variations in production.

The Ethiopia Spatial Grain Market Model (ESGMM) can be used to simulate changes in the level of local procurement of food aid. In the base scenario, 180 thousand tons of grain, composed of 100 thousand tons of maize, 60 thousand tons of wheat, and 20 thousand tons of sorghum. In the model, the additional grain purchases occur in Addis Ababa reflecting the fact that the tenders for local procurement are issued in the capital city. However, the model determines the lowest-cost source of supply taking into account local prices and the cost of transportation to Addis. The grain is distributed among the regions in the same proportion as PSNP allocations. We simulate the effect of a) eliminating local procurement program and b) doubling it to 360 thousand tons.

The distribution of the food aid is modeled in two ways because there is some uncertainty regarding how much food aid displaces commercial food purchases. There are two extremes:

- *No displacement* means that the food aid distribution does not affect commercial transactions by recipients so food consumption increases by the full quantity donated. In this case, food

distribution has no effect in suppressing grain prices in beneficiary regions, though the procurement does raise prices in supply regions.

- *Full displacement* means that recipient households either reduce food purchases or increase sales so that food distribution suppresses prices in the beneficiary regions, at the same time that procurement raises prices in the supply regions. In this case, the food aid distribution is modeled as the "sale" of additional food in the beneficiary region combined with a cash transfer of the value of the food aid.

In practice, the truth is probably between these two extremes: food aid increases food consumption, but not by the full amount of the aid, implying partial displacement. However, by modeling the two extremes, we can establish upper and lower boundaries on the likely impact. Finally, the simulation represents that short-term impact of the procurement before farmers are able to respond, reflecting the fact that farmers do not know how much will be procured when they make planting decisions.

Impact of eliminating local procurement with no displacement

As described above, we model the elimination of local procurement for food aid with no displacement by assuming that the program affects food markets only through the procurement program. Thus, eliminating the program entails stopping the purchase of 180 thousand tons of maize, wheat, and sorghum in Addis Ababa. This, of course, has indirect effects on surplus regions that would face reduced demand for their grain.

There is no change in grain production because this is a short-run simulation and farmers have not had time to respond to new prices. Since there is no trade (other than a fixed level of imported food aid) and no change in production, national consumption of each cereal is also unchanged. However, the elimination of the local procurement program does reduce the demand for grain, so national average grain prices fall 3-9%. Maize prices fall 9% on average because the elimination of the local procurement program ends the purchase of 100 thousand tons of maize, more than the amounts of other grains purchased under the program. Wheat and sorghum prices fall 6% as a result of the end of purchases of those commodities under the program. Teff prices decline by 3%. Although teff is not purchased under the local procurement program, its price falls as well, though to a lesser degree, simply because they are partial substitutes. In other words, the lower price of maize, wheat, and sorghum reduce the demand for, and the price of, teff.

Looking at the regional results, the elimination of the local procurement program causes maize prices to fall 5-12%, teff prices decline about 3%, wheat drop 3-8%, and sorghum prices decrease 5-7%. Ending the local procurement program has a uniformly negative effect on prices because we are assuming that the program only affects prices on the procurement side. Since the program raises

prices, ending it lowers them. The largest price decreases are in those regions that are in surplus for that cereal: Jimma and Bahir Dar for maize, Bale and Hossana for wheat, and Gonder, Desse, and Dire Dawa for sorghum. This is partly because these regions had the lowest prices in the base scenario, so a given price reduction is a larger percentage of the original price in these regions.

Although national grain consumption is unchanged in this short-run simulation, the local procurement program does result in some modest changes in grain consumption across regions. In particular, eliminating the local procurement program, reduces grain consumption in Mekele, Hossana, and Dessie. These are the regions that rely most heavily on food aid, with food aid contributing 9-13% of the consumption of these four cereals. As important beneficiaries of the local procurement program, it is not surprising that their grain consumption declines when the program is eliminated. In contrast, the elimination of the program causes grain consumption to rise in Jimma (2%) and Bahir Dar (1%). These are the regions that supply maize for the program, so the elimination of the program causes grain prices to decline and consumption to rise.

Impact of eliminating local procurement with full displacement

The simulations in section 5.1 assume that food aid distribution has no effect on local prices. In this section, we simulate the elimination of the local procurement program with full displacement, meaning that the distribution of food aid is treated as additional sales combined with cash transfers in the beneficiary regions. This means that food aid distribution does suppress local prices.

The results of the simulation are shown in Table A-5.3. Once again, national production is unaffected by the elimination of the local procurement program because this is a short-run simulation. National consumption is unchanged because there is no trade (other than the fixed level of imported food aid) and no change in production.

The elimination of the local procurement program causes maize prices to decline 2% and other prices to decline 1% on average. The effect on prices is much smaller than in the previous section because of different assumptions about the impact of food aid distribution. In section 5.1, we assumed that the program only affected prices by raising them through procurement. In this simulation, we assume the program also lower prices in the beneficiary region. Because the program has mixed effects on prices, ending the program has a smaller net effect on prices than in the previous simulation.

Looking at the regional results, maize prices fall 0-3%, teff and sorghum prices decline 1%, and wheat decrease 2% (although they rise 3% in Desse). Again, the effect on prices is roughly proportional to the volume of grain handled by the local procurement program: greatest for maize, followed by wheat,

and then sorghum and teff. Although the local procurement program does not handle teff, teff prices are indirectly influenced by the lower prices for maize, wheat, and sorghum prices.

As mentioned above, the net effect of eliminating the program on grain prices is smaller than in the previous simulation. This explains why the effect of eliminating the local procurement program on grain consumption is marginal (0% to -1%).

Although the effect of eliminating the local procurement program on overall grain consumption is quite small, this does not mean the program is not achieving its objectives. The program is not designed to increase overall grain consumption in the country, but to provide assistance to the poorest and most vulnerable households, thus reducing hunger and malnutrition.

Impact of doubling local procurement with no displacement

We now turn to the short-run impact of doubling the local procurement program from 180 thousand tons of grain per year to 360 thousand tons, maintaining the same proportions of 56% maize, 33% wheat, and 11% sorghum. In this section, we assume no displacement so that the program has no effect on the beneficiary regions; its only effect is through the procurement.

The results of this simulation are shown in Table A-5.4. Grain production is unchanged because this is a short-run simulation so there is no supply response. Grain production is practically unchanged, though the price of sorghum raises high enough to justify small quantities of sorghum imports.

The expanded local procurement increases grain prices. Maize prices rise the most (8% on average) because of the additional procurement of 100 thousand tons of maize. Wheat prices rise an average of 5%, as a result the additional purchase of 60 thousand tons of wheat. The price of sorghum rises the least (1% on average) because only 20 thousand tons of additional sorghum is purchased and because the domestic price reaches the "ceiling" of the import parity price. Although teff is not part of the local procurement program, its price rises 2% as a result of consumers shifting away from more expensive grains toward teff.

The results of the simulation show some regional variation. For example, maize prices rise only 3% in Bale but 10-12% in Jimma, Hossana, and Bahir Dar. The explanation is that Bale is self-sufficient in maize in the base scenario, so its prices are partially insulated from the rise in maize demand. In contrast, the three regions with large price increases are surplus regions, so their initial prices are lowest. Thus, a given absolute increase in prices is a larger percentage increase in these regions. The increase in wheat prices is between 2% in Desse and 7% in Bale. The price increase in Desse is small

because Desse is self-sufficient in wheat in the base scenario, while Bale is the main surplus region and has the lowest initial wheat price.

Although national grain consumption is mostly unchanged by the expansion of the local procurement program, there are some changes at the regional level. Mekele, Desse, Hossana, and Gonder experience somewhat higher grain consumption, largely because they are beneficiary regions under the program. In contrast, Jimma and Addis Ababa experience small decreases in grain consumption (1-2%) because of large price increases in those regions and the fact that they are not major beneficiaries of the program. In the other regions, the positive effect of larger food aid distribution is offset by the negative effect of higher food prices, leaving grain consumption unchanged.

Impact of doubling local procurement with full displacement

In this section, we again simulate the doubling of the local procurement food aid program, but in this case we assume full displacement, meaning that the distribution of food in beneficiary region will displace commercial purchases and suppress local prices. The results of this simulation are shown in Table A-5.5. As this is a short-term simulation, there is no impact on grain production. Since there is no commercial trade in grains in this simulation, national grain consumption is also unchanged.

The expanded local procurement program raises grain prices in supply regions, but, unlike the previous simulation, the distribution of food aid displaces commercial food purchases and thus suppresses prices in beneficiary regions. As a result, the average increase in prices across the country is 2% for maize and 1% for the other three cereals. The effect on prices is more muted than in the previous simulation where we assumed no displacement, meaning that the expanded program only affects grain markets through the procurement side.

The change in grain prices does not show much regional variation. Almost all commodities in all regions experience a 1-2% increase in prices, as the procurement effect of the expanded program dominates the distribution effect. The two exceptions are maize in Bale and wheat in Desse, which decline somewhat. Bale is autarkic in maize (neither buying from nor selling to neighboring regions) so the maize price is insulated from small changes in maize prices in other regions. Thus, Bale is unaffected by the expanded procurement but still affected by the expanded distribution of locally procured maize food aid. Similarly, Desse is autarkic in wheat, so prices are unaffected by the larger procurement but they are suppressed by the increased distribution of wheat food aid.

Regional changes in grain consumption are negligible, In most regions, the effect of increased distribution of food aid is offset by the slightly higher grain prices, leaving grain consumption

essentially unchanged (from -0.4% to +0.4%). Only in Desse does the change in grain consumption reach +0.6%. The model is not designed to simulate the changes in grain consumption for different types of households within each region, but the negligible effects at the regional level probably mask increases in grain consumption among food-aid beneficiaries and decreases among non-beneficiaries.

5.5 Impact of imported food aid

Traditionally, food aid has taken the form of imports of cereals (primarily wheat) from donor countries. Some of this is distributed directly to beneficiaries, while the remainder is sold on the local market and the proceeds are used by non-governmental organizations to fund development projects. Over the period 1994-2003, Ethiopia imported an average of 715 thousand tons of food aid, almost all of which was in the form of wheat or wheat flour. This represented about 27% of cereal consumption in the country. Imported food aid peaked during the 2003 drought, when 1.6 million tons of wheat and wheat flour were imported under these terms. Since then, the amount of imported food aid has declined. In the base scenario, food aid imports consist of 400 thousand tons of wheat, reflecting the situation in 2006 (World Bank, 2007).

Previous studies have examined the impact of food aid imports on local markets. For example, Negessa and Jayne (1997) studied Ethiopian price data and found that local wheat prices fell 2-5 birr/quintal (roughly 2-4%) for each 30 thousand tons of imported wheat sold in the regional market. Levinsohn and McMillan (2007) use data from 1999 and a simple one-market, one-commodity model to predict that eliminating imported food aid, which was then 663 thousand tons, would increase wheat prices by 53%. More recently, Rashid et al (2006) estimate that the effect of imported food aid in Ethiopia has been to suppress domestic wheat prices by 2-26%, depending on the year. On the other hand, Abdulai et al (2005) question whether food aid has a disincentive effect. They use Ethiopian household survey data to show that food aid recipients behave no differently than non-recipients, after controlling for household characteristics that may influence the probability of being a beneficiary. Furthermore, an econometric analysis of national panel data reveals no negative effect of food aid on food production. Finally, Kirwan and McMillan (2007) found that, over the period 1984-2003, Ethiopian imported food aid was uncorrelated with domestic wheat production, but rather was negatively correlated with international wheat prices (the correlation coefficient was -0.76). The probable explanation is that food aid budgets are generally fixed by donor nations at the beginning of their fiscal year, so that any subsequent change in wheat prices will result in an opposite change in the volume of food aid. In emergencies, donor may provide supplemental funding, but bureaucratic inertia works against this.

In this section, we use the Ethiopia Spatial Grain Market Model (ESGMM) to simulate the elimination of imported food aid. The simulation assumes that the food aid is distributed in the same proportions as the PSNP cash disbursements. Under these assumptions, Mekele, Hossana, and Desse rely on imported food aid wheat for more than 23% of wheat consumption, while Addis Ababa, Jimma, Bahir Dar, and Bale rely on it for less than 10% of their wheat consumption. We assume full displacement, meaning that either a) the wheat is monetized (sold on local markets by the government), b) it sold by beneficiaries, or c) it displaces commercial purchases that beneficiaries would have made[17]. Food aid is simulated as an increase in grain sales in the beneficiary regions combined with a cash transfer of the equivalent value. In each case, we look at both short-term impact (before farmers respond to the new prices) and long-term impact (after they respond).

Elimination of imported food aid in the short run

Table A-5.6 summarizes the results of the simulation of the short-term impact of eliminating imported food aid, which consist of 400 thousand tons of wheat in the base scenario. Eliminating these imports reduces the availability of wheat, causing consumption to fall by 11% and the price of wheat to rise 20% on average.

Production is unchanged because, by definition, farmers are unable to respond in the short run. The price of the other three cereals rises 4-8% as consumers attempt to switch from wheat into the other cereals.

The increase in wheat prices is enough to induce 45 thousand tons of commercial wheat imports. Thus, although food aid imports are cut by 400 thousand tons, wheat consumption declines by "only" 355 thousand tons, because the commercial imports partially offset the elimination of imported food aid.

Looking at the regional results, the price of wheat in Bale, Desse, and Hossana rises the greatest in percentage terms (24-25%). Bale and Hossana are surplus regions that have low initial prices, and Desse moves from autarky to net inflows. The wheat prices in other regions rise 18-20%, while other cereal prices rise 4-11% depending on the commodity and region.

Most surplus regions expand their outflows in response to the higher prices, which suppress internal demand. An important exception is Hossana, which benefits from imported food aid flows in the base scenario. With the elimination of this imported food aid, Hossana reduces its outflows of wheat and sorghum in order to replace the lost food aid.

[17] Alternatively, if we assumed zero displacement, imported food aid would have no effect on Ethiopian grain markets

Similarly, wheat inflows in deficit regions contract in regions that received little food aid (Addis Ababa, Jimma, and Bahir Dar) because of the higher price. However, in regions where imported food aid was important (Mekele and Desse), inflows increase to fill the gap.

All regions see total cereal consumption decline by 2-4%, largely due to higher wheat prices and the resulting reduction in wheat consumption. The decreases are largest in regions that were major beneficiaries of the imported food aid, including Desse and Mekele.

Elimination of imported food aid in the long run

As shown in Table A-5.7, the elimination of imported food aid has somewhat more moderate effects in the long run than in the short run. The higher prices, particularly for wheat, stimulate an expansion in production and moderate the increase in prices. Wheat output rises 4% compared to the base scenario, while maize and sorghum output expands marginally.

As a result, wheat consumption falls 9% (rather than 11% in the short run). In other words, the elimination of 400 thousand tons of imported food aid in the form of wheat causes wheat consumption to fall "only" 293 thousand tons, because wheat supply response partially offsets the loss in imported food aid. Consumption of all four cereals falls even less, 250 thousand tons, because of the supply response in the other three commodities. The decline in cereal consumption ranges from 1% in Jimma to 3% in Desse and Mekele, the national average being a 2% decline.

The supply response also moderates the increase in food prices associated with the elimination of imported food aid. Wheat prices increase 15%, on average, in the long run, compared to 20% in the short run. The average prices of the other three grains rise 3-4% in the long run, compared to 4-8% in the short run. Because the wheat price is lower in the long-run than in the short-run, commercial wheat imports become unprofitable and disappear. In other words, in the short run, commercial imports partially fill the gap from the elimination of the imported food aid, but in the longer run wheat production expands and commercial wheat imports return to zero.

The results presented here from the ESGMM show a smaller impact of eliminating imported food aid on wheat prices (-15%) than the study of Levinsohn and McMillan (-58%). However, the discrepancy is not due to different assumptions in the model, but rather different base scenarios. Levinsohn and McMillan simulate the elimination of food aid in 1999, when food aid was 663 thousand tons and represented 37% of wheat consumption. In contrast, we are simulating the situation in 2006, when imported food aid was 400 thousand and accounted for just 13% of wheat consumption. According to

---

and prices would be unchanged, though grain consumption would be increased in the beneficiary regions.

their model and elasticities, eliminating 400 thousand tons of imported food aid in 2006 would result in a 14% increase in wheat prices, somewhat less than our estimate. Finally, we note that our results are well within the range of wheat price impact (between 2 and 26%) estimated by Rashid et al (2006).

In summary, according to the Ethiopia Spatial Grain Marketing Model eliminating 400 thousand tons of imported wheat food aid would increase the price of wheat by 15% and other cereals by 3-4% in the long run. The elimination of imported food aid does reduce cereal consumption in the country, but only by 250 thousand tons because increased production partially offsets the loss of food aid. This is equivalent to 2% of cereal consumption and 62% of the loss in food aid.

5.6 Impact of the Productive Safety Net Programme

The Productive Safety Net Program (PSNP) is an attempt to replace ad hoc emergency relief assistance with a stable program to help improve the well-being of poor households. Covering 7 million people at a cost of almost US$ 500 million, it is one of the largest safety net programs in sub-Saharan Africa. It targets poor households in two ways. First, it operates in 203 woredas identified as poor and vulnerable. Second, it involves some self-targeting in its public works program, under which individuals in the selected woredas are given the opportunity to work on labor-intensive community projects for a wage rate of 6 Ethiopian birr per day (US$ 0.75/day). In addition, there is a direct support program, under which cash or food is distributed to labor-scarce households, including those with elderly or disabled members (Gilligan et al, 2008).

A recent evaluation of the PSNP found that many households were receiving transfers below the planned amount, but among beneficiaries receiving at least half the intended amount, experienced improved food security. Furthermore, those receiving both transfers and packages of agricultural support were significantly more food secure and more likely to use improved agricultural technologies.

A separate question is whether the cash transfers under the PSNP may have increased rural demand for food, thus contributing to the recent increases in food prices. There is little doubt that the program increases the demand for cereals in rural areas and that this results in higher prices. The real question is whether the impact is large enough to be a factor in the rise in food prices in Ethiopia.

In this section, we address this question by using the Ethiopian Spatial Grain Market Model (ESGMM) to simulate the effect of the PSNP on cereal prices. In 2006, the PSNP distributed about 1300 million birr to selected households in 203 woredas. We have aggregated the woredas-level disbursements to the nine market regions defined in the ESGMM, giving us the total amount of money allocated to each market regions. Since the PSNP is already part of the base scenario, we simulate the impact of

eliminating the PSNP transfers in each market region. As before, we simulate the impact in the short run (before farmers can respond to the new prices) and the long run (after they respond).

Short-run impact of eliminating the PSNP

The elimination of the PSNP would have two types of effects on households in Ethiopia. First, it results in a loss of income and reduced food consumption for beneficiary households. Second, the lower income among former beneficiaries would reduce the demand for, and the price of, cereals and other non-tradable goods. The lower prices could actually increase cereal consumption among some non-beneficiary households.

Table A-5.8 shows the short-run impact of eliminating the PSNP. In the short-run, agricultural production is unaffected and, in the absence of international trade in the basic cereals, this implies that national consumption is also unchanged. However, the reduced income leads to lower food prices: the national average prices of maize, teff, wheat, and sorghum decline by 4-5%. There is not much difference in the price declines across regions, with prices falling 3-6% for all four commodities and in all nine regions.

The elimination of the PSNP causes short-run changes in total cereal consumption across regions that are small, but they include both increases and decreases. Cereal consumption increases slightly (1%) in Addis Ababa, Jimma, and Bahir Dar. These are regions where the PSNP allocations are relatively small, so the dominant effect is through the lower price of cereals. In contrast, the elimination of the PSNP causes cereal consumption to fall slightly (1-2%) in Mekele and Desse, which have larger numbers of PSNP beneficiaries.

Long-run impact of eliminating the PSNP

In the long run, the lower prices resulting from the elimination of the PSNP cause cereal production to decline slightly, as shown in Table A-5.9. Maize and sorghum production decline 1% and wheat and teff production decline even less. The slight decrease in cereal production partially offsets the original decline in price. In the long run, national average cereal prices decline just 2% compared to 4-5% in the short run. The variation across regions is between -1% and -3%.

The impact of the loss in PSNP income and the lower cereal prices on cereal consumption ranges from -3% in Mekele to +1% in Addis Ababa. Cereal consumption rises in Addis Ababa because households are not directly affected by the elimination of the PSNP, but they benefit from the (slightly) lower food prices. On the other hand, the effect of the loss of PSNP income is greater than the effect of lower prices in Mekele, Desse, Dire Dawa, Hossana, and Gonder, resulting in lower cereal consumption.

In summary, the impact of the PSNP on food prices is quite small. In the long run (after one year), eliminating the PSNP causes cereal prices to fall just 2%. This implies that the PSNP, as currently designed, raises cereal prices just 2% above what they would be without the PSNP. As such, the PSNP cannot be considered a significant contributor to the rise in food prices in Ethiopia since 2006.

5.7 Impact of higher global food prices

Since 2006, the world prices of most agricultural commodities has increased dramatically, peaking in 2008, and then fallen back almost to 2006 levels. For example, the benchmark price for maize is the FOB price of US No. 2 yellow maize in the Gulf of Mexico. According to the FAO (2008c), this maize price rose from US$114/ton in August 2006 to US$311/ton in late June 2008, before falling to US$ 158/ton in February 2009. Similarly, a frequently cited "world" price of wheat is the FOB price of US No 2 hard red winter wheat in the Gulf of Mexico. This price increased from US$ 201 in August 2006 to US$ 510/ton in late February 2008, but has since fallen to US$ 238/ton in February 2009.

We simulate the spike in the global food prices with a doubling of the world prices of wheat and maize, reflecting the approximate increase in prices between August 2006 (the period used to calibrate the ESGMM) and the average price over January-November 2008. We exclude teff and sorghum because teff is not traded in international markets and sorghum is not traded by Ethiopia. The results of this simulation, shown in Table A-5.10 are easy to summarize: there is no impact on domestic grain markets in Ethiopia. There are separate explanations for the maize and wheat markets. In maize markets, if the world price doubles from US$ 114/ton to US$ 228/ton, it still costs US$ 120/ton to get maize from Ethiopia to the Gulf. Thus, the export parity price rises to US$ 108/ton or roughly 100 birr/quintal, which is still substantially below the market price of maize in Ethiopia. In the case of wheat, food aid imports of wheat are assumed to be fixed and therefore unaffected by the increase in the world price of wheat.

In practice, each of these explanations is subject to some qualification. Although it may not be profitable for Ethiopia to export to world markets, even at the high world prices of 2008, it may be profitable to export maize to Kenya. A study by the World Bank (2007) shows that in Ethiopia the export parity price for export to Kenya is generally higher than the export parity price based on world markets. Kenya is a consistent maize importer, so Kenyan maize prices are higher than, but correlated with, world prices. Thus, if Kenyan and world prices rose in parallel, Ethiopia would begin to export to Kenya before exporting to the world market. On the other hand, the government recently implemented a food export ban in response to high food prices.

With regard to wheat, although the simulation assumes that food aid is unaffected by world prices, in fact food aid tends to be negatively correlated with international wheat prices, as discussed above (Kirwan and McMillan, 2007). Thus, the doubling of international wheat prices could affect Ethiopia through reduced food aid. As discussed in Section 5, even the elimination of imported food aid would only increase wheat prices by 17% and other cereal prices by 4-5%, so this cannot be a major factor behind the increase in food prices in Ethiopia.

In summary, we find that the doubling of wheat and maize prices that occurred between 2006 and 2008 would not induce maize exports to the world market, nor would it affect wheat imports, which are almost exclusively in the form of food aid. Although not represented in the model, these price increases could result in maize exports to Kenya (if allowed) and they might affect the volume of imported food aid imports.

5.8 Summary and conclusions

Interest in the operations of Ethiopian grain markets has been stimulated by the dramatic increase in the price of staple foods since early 2007. This paper explores the impact of various policies and other "shocks" on grain markets using the Ethiopian Spatial Grain Market Model (ESGMM), a spatial partial-equilibrium model of four staple grains (maize, teff, wheat, and sorghum) in nine market regions of the country. The model is used to examine the likely impact of the local procurement food aid program, the imported food aid program, the Productive Safety Net Program (PSNP), and the recent spike in world grain prices.

In the base year of 2006, the World Food Program local procurement program purchased 180 thousand tons of maize, wheat, and sorghum for redistribution in the country. The model is used to simulate the impact of eliminating this program on grain markets and grain consumption in different regions. If we assume that food aid distribution does *not* affect local prices, but local procurement does, then the model indicates that eliminating the program will have the following effects:

- maize prices fall 5-12%, depending on the region, averaging 9%.
- wheat prices fall 6% on average and sorghum and teff prices fall just 3%, reflecting the importance of each commodity in the local procurement program.
- grain consumption falls somewhat in regions that rely heavily on food aid while rising in Addis Ababa and surplus regions.

If we assume that food aid fully displaces commercial transactions, thus affecting prices in beneficiary regions as well as in procurement regions, then we get the following results:

- maize prices fall 0-3%, averaging 2% and other grain prices fall an average of 1%
- the small net effect on prices is due to the combination of procurement raising grain prices and food aid distribution reducing them.
- there are only minor changes in grain consumption across regions as slightly lower prices are offset by the reduction in food aid distribution.

We also simulate the doubling of local procurement from 180 thousand tons to 360 thousand tons. If we assume the program only affects prices through procurement, then the results are as follows:

- maize prices rise 3-12%, averaging 8%, due to the larger procurement program.
- wheat prices rise 2-7%, averaging 5%, and sorghum and teff by 1-2%.
- grain consumption is affected by both the increased distribution and the higher prices. The net effect is positive (1-3%) in regions that are major beneficiaries of the program and negative in others (-1 to -2%).

Finally, doubling the local procurement program has smaller effects if we assume that food aid distribution displaces commercial purchases, thus suppressing local prices:

- maize prices rise 2% and other grains just 1% on average because the effect of local procurement on prices is largely offset by the effect of food distribution.
- there are only minor changes in grain consumption across regions as slightly high prices are offset by the increase in food aid distribution.

Ethiopia is a major recipient of imported food aid, mainly in the form of wheat, though the levels have declined from 1.6 million tons during the drought of 2003 to about 400 thousand tons in 2006. We simulate the impact of eliminating imported food aid. In the short run:

- the price of wheat rises 20% on average, with the increase being greater in surplus zones of Bale and Hossana.
- the price of other grains rise 4-8% as consumers shift from wheat to other grains.

- the high price of wheat triggers commercial imports of 45 thousand tons
- wheat consumption declines 2-4% in all regions, particularly in major beneficiary regions.

In the long run, eliminating imported food aid has the following effect:

- wheat output rises 4% in response to the higher prices,
- the supply response dampens the price increase to 15% on average and eliminates commercial wheat imports,
- in response to the loss of 400 thousand tons of wheat food aid, cereal consumption falls by 250 thousand tons or 2% overall.

In 2005-06, Ethiopia introduced the Productive Safety Net Program (PSNP), which provides cash-for-work, cash transfers, and food aid in 203 woredas. In 2006, the cash benefits were 1.3 billion birr (about US$ 144 million). Some observers has questioned whether this program may have increased rural food demand, thus contributing to the food price increase. We simulate the elimination of the PSNP on grain markets. In the short run, the model suggests that:

- grain prices fall 3-6% because the elimination of PSNP cash transfers lowers the demand for grains.
- grain consumption falls slightly (1-2%) in Mekele and Desse, which have a large number of beneficiaries, but rises slightly (1%) in Addis Ababa, Jimma, and other regions with few beneficiaries.

In the long run:

- grain prices fall just 2% compared to the base scenario, the initial price decline having been dampened by the resulting supply response.
- changes in cereal consumption are similar to the short-run simulation, but smaller.

Finally, the model was used to simulate a doubling of maize and wheat prices, roughly simulating the trend in world prices between 2006 and 2008. The results of this simulation are as follows:

- the doubling of world maize and wheat prices has no effect on domestic prices, production, or consumption in Ethiopia.

- the explanation is that, even after the world price doubles, the export parity price for these commodities is below the domestic price, implying that grain exports remain unprofitable.

We can draw four overall conclusions from these findings. First, the expansion of the PSNP, the growth of local procurement food aid, and the sharp increase in world food prices do not help explain the rise in domestic food prices in Ethiopia. The income transfers under the PSNP program are simply too small to account for more than a few percentage points of increase in grain prices. Local procurement also has a small net effect on food prices, and in any case the program was suspended during 2007 and 2008 when prices began increasing. And world food prices are unlikely to have directly affected Ethiopian prices because neither the model nor empirical evidence suggest large flows of food exports during this period, flows which would be necessary to transmit world prices to domestic markets. These results suggest that explanations for the increase in prices must lie elsewhere.

Second, programs that influence the distribution of staple grains and cash resources have a valuable role to play in providing a safety net for the poorest and most vulnerable households, but they do not have large effects on national prices, production, and consumption. Thus, they can complement efforts to raise long-term agricultural productivity, including agricultural research and extension, but they cannot be considered a substitute for cannot substitute for these policies and programs.

Third, the effects of many of these policy shocks vary widely across commodities and across regions, suggesting the value of agricultural models that capture the spatial diversity of Ethiopia. This is particularly true of programs such as the PSNP, imported food aid, and the local procurement program, which are at least partially targeted to specific regions of the country.

Fourth, the ESGMM, being a spatial equilibrium model, describes the interaction of different commodity markets in a number of regions within the country. It provides a more spatially disaggregated description of the impact of alternative policies or shocks than a standard economy-wide model. However, the ESGMM it does not analyze the impact at the household level, which would be necessary to estimate the impact of policies and shocks on poverty and the proportion of households falling below a threshold of nutritional status. In order to carry out this kind of analysis, it would be necessary to link the ESGMM to household data on production and consumption patterns and make additional assumptions about household behavior. Although this type of micro-simulation analysis is beyond the scope of this study, it would be a useful direction for the extension of this study.

5.9 References

Abdulai, A., C. Barrett, and J. Hoddinott. 2005. "Does food aid really have disincentive effects? New evidence from sub-Saharan Africa." *World Development*. 33 (10): 1689-1704.

Alemu, Z.G., K. Oosthuizen, and H.D. van Schalkwyk. 2003. "Grain supply response in Ethiopia: An error-correction approach." *Agrekon* 42 (4) (December): 389-404.

Desallegne, G., T. Jayne, and J. Shaffer. 1998. "Market structure, conduct, and performance: Constraints on performance of Ethiopian grain markets." No. 8. Grain Market Research Project. Ministry Of Economic Development And Cooperation, Addis Ababa.

FAO (Food and Agriculture Organization). 2008a. Food Balance Sheet database. Accessed at http://faostat.fao.org/site/502/default.aspx. Rome.

FAO (Food and Agriculture Organization). 2008b. Food Production database. Accessed at http://faostat.fao.org/site/339/default.aspx. Rome.

FAO (Food and Agriculture Organization). 2008b. Commodity Price database. Accessed at http://www.fao.org/es/esc/prices/PricesServlet.jsp?lang=en. Rome.

Gilligan, D., J. Hoddinott, and Alemayehu Seyoum Taffesse. 2008. "The Impact of Ethiopia's Productive Safety Net Programme and its Linkages." Discussion Paper No. 00839. International Food Policy Research Institute, Washington, DC.

Kirwan, B. and M. McMillan. 2007. "Food aid and poverty." *American Journal of Agricultural Economics.* 89 (5): 1152–1160.

Levinsohn, J. and M. McMillan. 2005? "Does Food Aid Harm the Poor? Household Evidence from Ethiopia." University of Michigan, Ann Arbor.

Negessa, Asfaw and T. Jayne. 1997. "The response of Ethiopian grain markets to liberalization.": Working Paper No. 6. Grain Market Research Project. Ministry Of Economic Development And Cooperation, Addis Ababa.

Rashid, S., M. Assefa and G. Ayele. 2006. "Distortions to Agricultural Incentives in Ethiopia." Agricultural Distortions Research Project Working Paper, forthcoming, The World Bank. Washington, DC.

Seale, J. and A. Regmi. 2006. "Modeling International Consumption Patterns." *Review of Income and Wealth* 52 (4) (December): 603-624.

Washimo, K. and Bingxin Yu. 2007. "Estimates of consumer demand parameters for Ethiopia." International Food Policy Research Institute. Washington, DC.

World Bank. 2007. "Explaining Sources of Food Price Inflation in Ethiopia." "Just-in-time" Policy Note. World Bank. Washington, DC.

WFP (World Food Program). 2007. "Availability of cereals for local purchase in 2007." World Food Program, Addis Ababa.

WFP (World Food Program). 2008. "Availability of cereals for local purchase in 2008." World Food Program, Addis Ababa.

PART III

SUMMARY AND POLICY IMPLICATIONS

Chapter 6: Summary and Policy Implications

6.1 The issues re-stated

Since late 2005, Ethiopian grain markets started exhibiting some unusual trends. This was puzzling at least for three reasons. First, prices in Ethiopia started increasing long before food prices began to spike in the world market. This is evident in government's decision to ban cereal export in early 2006; and the rapid assessment of rising prices carried out by the International Food Policy Research Institute and the Ethiopian Development Research Institute (EDRI).[18] Second, prices were rising despite consecutive years of good harvest, which defied historical relationship between production and market prices. For instance, in 2002 producer prices collapsed by an average of 60 percent in response to what was then considered to be a bumper crop of 9 million tons, about 50 percent lower than the 2006-2007 cereal harvest 18.2 million tons. Finally, domestic prices of cereals have historically been within export and import parity bands. Prices of both wheat and maize, which hovered around import parity until 2006, fell significantly below import in the wake of rising food prices during 2007, making these commodity completely non-tradable.

These puzzling trends have been the source of major concerns for the Government of Ethiopia and its development partners. In addition to well-documented political and social consequences, an increasing body of recent literature suggests that even a temporary increase in food prices can have long-term economic consequences on nutritional status, labor productivity, and survival chances (Hoddinott 2006; Myers 2005). Accumulation of these effects, as documented in many country case studies, results in macroeconomic instability, social unrest, and overall reduction in economic growth (Timmer, 1988; Rashid et al. 2008). At the operational level, understanding these puzzling trends in Ethiopian cereal markets had direct implications for local food aid procurement by the World Food Program (WFP) and other agencies. Since most of locally procured food is distributed through humanitarian assistance and various social safety net programs, the unusual changes in grain markets posed challenges to the implementation of those essential food security programs.

The European Union, being one of the largest donors of local and regional procurement of food, was particularly concerned about these trends. Therefore, following an extensive consultation with various stakeholders, the Joint Research Centre (JRC) of the EU developed a technical specification of project to extend the scope of the usual Cereal Availability Study (CAS), which provides the guideline about the size of local procurement; and account for the unusual developments in the Ethiopian cereal markets. IFPRI consortium in collaboration with the Ethiopian Development Research Institute

[18] Getnet, K., E. Gabre-Madhin, and S. Timrat (2006)

(EDRI) and the Ethiopian Institute of Agricultural Research (EIAR) was selected to carry out the study.

The project was designed to (i) provide evidence based answers to many commonly held hypotheses, (ii) generate key parameters used in assessing cereal availability, and (iii) assessing the impacts of various policy interventions, including procurement and distribution through safety net programs. Some initial studies, conducted by the World Bank and IFPRI, came up with the following hypotheses behind rising cereal prices:

1. Reduced domestic cereal availability due to (a) increased cross border exports or cereals, (b) trade disruptions due to stock-holding bans, and (c) reduced availability due to reduction in food aid inflow in the past couple of years.
2. Demand has out-paced supply due to overall economic growth and increased incomes; as well unprecedented expansion of social safety net programs.
3. Increased diversification and changes in consumption patterns of both rural and urban households.
4. Increased storage by both households and grain traders.
5. Increased cross border trade. Inflationary pressure from increased money supply, new job creation, and disbursement of large volumes of credit to both rural and urban sectors.
6. Inflationary pressure from increased money supply, new job creation, and disbursement of large volumes of credit to both rural and urban sectors.

The hypotheses 1-5 are examined with set of four studies and the hypotheses 6 was extensively analyzed by the World Bank (2007). Although providing evidence on these hypotheses was critical for policy decisions, it was also important to examine how various policy interventions could affect grain markets in terms of prices, trade, and availability of cereals. This is accomplished by simulating the impacts with the help of a spatial equilibrium model.

6.2 The key findings

The study has generated primary information to answer widely held hypotheses about changes in the Ethiopian cereal markets since late 2005. Organized in five broad headings, this section presents the key results of the study. In addition to drawing from the main analytical chapters of this report, we also present results from IFPRI's ongoing research in order to complement / clarify the key findings.

Household survey

The household survey—called Ethiopian Agricultural Market and Household Survey (EAMHS)—was designed to cover a wide range of issues. But the central focus was on estimating some of the

parameters critical for assessing cereal availability and income growth. In this regard, the following results can be highlighted:

- The cereal production estimates are lower than those of the Central Statistical Agency's Agricultural Sample Survey, mainly because of lower yield estimates. This is consistent with other sources which point to an overestimation of cereal yields in Ethiopia, including lower yields for maize, sorghum, and teff in neighboring countries. A recent World Bank study finds that cereal yields in Ethiopia has grown much faster than any other developing countries in recent history (World Bank, 2008). Given there has not been substantial growth in modern input use, it is not clear what really account for this amazing growth.
- The estimated portion of marketed surplus of cereals is 21-31 percent. These estimates are similar to the 2000-01 Ethiopian Agricultural Sample Enumeration and the estimates from the Grain Marketing Research Project of the Michigan State University in the 1990s. For the three grains that are procured locally (maize, wheat, and Sorghum), the marketable surplus estimates are 27, 21, and 22 percents, respectively.
- There do not appear to be any major changes in agricultural marketing behavior over the past five years that would explain the higher cereal prices. Farmers report selling a smaller percentage of the harvest than before, but this is due to the size of the harvest rather than increases in consumption. There is some evidence of farmers, particularly larger farmers, selling later in the season, but this would affect the seasonality of prices rather than causing a trend of rising prices.
- The EAMHS does provide evidence of gradual diversification away from low-value crops such as cereals and pulses toward higher-value crops including some vegetables, coffee, and chat and toward livestock production, wage income, and non-farm business income. However, cereals and other staple crops continue to account for a large share of cropped area and rural income.
- Farm households report improvements in a number of dimensions of the rural economy, particularly advisory services, marketing information, the number of crop buyers, and rural roads. The EAMHS results suggest that more rural households are reporting improved well-being over the past four years than are reporting deterioration. Nonetheless, the gains appear to be concentrated among larger farmers, who benefit from higher prices, and among those in Amhara and Oromia.

Grain traders' survey

One of the key hypotheses behind rising cereal prices was that the grain market went through significant structural changes in terms of its conduct and performance. It was commonly perceived that: (i) transactions costs went up due to high fuel costs, (ii) traders' were storing larger quantities for

a longer period of time, and (iii) there was an increased concentration of certain types of traders. These hypotheses are tested by combining 2008 survey with that IFPRI / ILRI 2002 traders' survey. We draw the following conclusions from the analyses:

1. The study finds that, compared to 2002, there have been reductions in various components of transactions costs in real terms (inflation adjusted) in 2008. The following findings regarding transactions costs can be highlighted:
   a. There have been no statistically significant differences between 2008 and 2002 in real price differentials (difference between purchase and sales price); net margins per quintal, and total out of pocket transactions costs.
   b. Transportation costs per quintal of trade has fallen despite higher fuel prices, perhaps because increase fuel costs is compensated by significant improvement in infrastructure over the past few years.
   c. Compared to 2002, the proportion of costs spent on taxes has fallen; and so has the payments to intermediaries, which might be attributed to reduction in tax burden improved access to cellular phones, respectively.
   d. In the presence of market failure, such as information asymmetry, prices discovery becomes expensive, which in turn contributes towards increased transactions costs. This study finds that, compared to 2002, traders are able to follow more markets; collect price information more easily; and find buyers and sellers much quickly. This is clearly consistent with the reduction in transaction costs and improved market efficiency

2. Although not statistically significant, the study finds some changes in the storage behaviors of the traders. In particular:
   a. Average stock of the wholesalers in 2008 is found to be larger than that of 2002. In 2008, average stock of a wholesaler was 57 tons, which compares to 10 tons in 2002. This difference, however, was not found to be statistically significant, mainly because of fewer wholesalers (small sample) low power of the statistical test.
   b. The typical assemblers in 2002 held an average stock of 93 tons, which declined to 90 tons in 2008 with statistically insignificant differences.
   c. Average stock of the retailers increased only from 56 ton to 57 tons; and this increased was not statistically significant.

d. To examine whether the market efficiency is hindered by bottlenecks, the study has also explored testing for increasing returns to scale. These analyses suggest that there is some evidence of increasing returns to scale for one category of traders (assemblers) and one component of transactions costs (costs on intermediaries). Further diffusion of cellular phone technology and better market information can contribute towards reducing these costs and improve market efficiency.

Rapid assessment of cross border trade

This component of the study heavily relied on rapid assessments, review of public documents, and monitoring of four major cross border trade points, namely Humera, Metema, Assosa/Kumruk and Moyale. In carrying out the study, both primary and secondary data have been used. The primary data were collected using Rapid Market Appraisal (RMA) method. Expert field researchers from the regional offices of the Ethiopian Institute of Agricultural Research interviewed officials of the Bureaus of Agriculture and Rural Development and experts of Customs Agency at different level. In addition, the team also conducted interviews with farmers group, local traders, and community leaders. This section provides a summary of that exercise. The study finds little evidence on commonly held notions that cross border trade played significant roles in domestic price increase. In particular, the study finds that:

1. Since 2002/3, the trend shows that both legal and illegal trade values have increased, although the legal trade has increased faster than the illegal trade values. The estimated value of legal trade in 2003/04 was only US$ 31 thousand, which jumped to more than US$ 42 million in 2007/08. By contrast, illegal export increased from US$ 1.4 million to 52 million during the same time period.
2. The value of agricultural commodities exported formally through the cross border made quantum jump from ETB 0.13 million in 2003/04 to ETB 421 million (equivalent to US$ 38 million) in 2006/07.
3. However, the estimated size of the cross border trade is not found to be large enough to influence the domestic market prices of cereals. Assuming 25 percent of the country's total cereal production of 18 million tons is marketed, total marketable surplus would be 4.5 million tons. With an average price US$300 per ton, the value of total marketable surplus is US$ 1.35 billion, implying that the value of cereals traded across border is less than three percent!
4. While it shows an increasing trend, size of the livestock trade across border is still small. During 2003/04 to 2006/07, total trade value of livestock was estimated to be about US$ 18 million of which 2006/08 accounted for US$ 12 million dollars.

Policy simulation with spatial equilibrium model

The main objective of setting up the spatial equilibrium model was to assess the potential impacts of policy intervention—such as procurement of grain recommended by CAS; increasing the size of safety net programs, or assessing export potentials—on various market indicators. While only a set of simulations are carried for this report, this model allow assessing other policy scenarios along with updating the current ones. From the materials presented in this report, the following overall conclusions can be drawn:

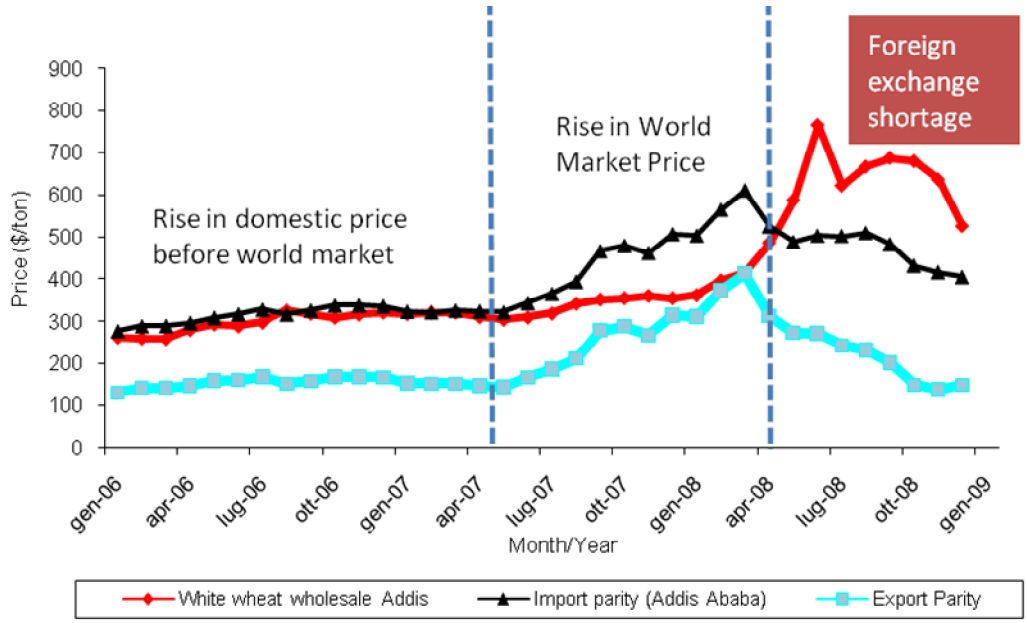
1. The expansion of the PSNP, the growth of local procurement food aid, and the sharp increase in world food prices do not help explain the rise in domestic food prices in Ethiopia.
    a. The income transfers under the PSNP program are simply too small to account for more than a few percentage points of increase in grain prices.
    b. Local procurement also has a small net effect on food prices, and in any case the program was suspended during 2007 and 2008 when prices began increasing.
    c. Finally, world food prices are unlikely to have directly affected Ethiopian prices because neither the model nor empirical evidence suggest large flows of food exports during this period, flows which would be necessary to transmit world prices to domestic markets.
    d. These results suggest that explanations for the increase in prices must lie elsewhere.
2. Programs that influence the distribution of staple grains and cash resources have a valuable role to play in providing a safety net for the poorest and most vulnerable households, but they do not have large effects on prices, production, and consumption. Thus, the safety net programs can be considered as complementary efforts to raise long-term agricultural productivity, but they should not be considered as a substitute for agricultural growth programs.
3. The effects of many of these policy shocks vary widely across commodities and across regions, suggesting the value of agricultural models that capture the spatial diversity of Ethiopia. This is particularly true of programs such as the PSNP, imported food aid, and the local procurement program, which are at least partially targeted to specific regions of the country.

6.3 Implications for future CAS and other food policy interventions

Contrary to commonly held hypotheses, this study has found little evidence on: (a) increased storage at both household and market levels, (b) statistically significant changes in market conduct and performance; (c) no statistically significant changes in seasonality; and (d) cross border trade to be too small to contribute towards rising cereal prices. On the other the study provides on increased rural wellbeing in terms of a host of indicators; and there seems to be a gradual move towards diversification from cereals to high value crops. One central piece of findings of the study is that the cereal yield estimates, published by the CSA, are found to be overestimated by more than 30 percent. This can partly explain rise in cereal prices. While launching of the PSNP might have contributed to the price rise, the magnitude of the price increase was small.[19]

Relating these results with other IFPRI ongoing studies, a coherent picture emerges for explaining the puzzling trends in Ethiopian grain markets. It appears to be a combination of three main factors: (i) overestimated production, (ii) unprecedented monetary expansion, (ii) increased price expectations in the wake of rising global food price trends, and (iii) a shortage of foreign currency reserves, resulted mainly by ballooning fuel subsidies (Rashid and Dorosh 2009). These factors can be demonstrated by the figure below.

Figure 6.1 Exports and Import Parity Prices of Wheat



[19] It's less than one percentage point according to World Bank (2007) and about 2 percent according to Rashid et al. (2008).

Notice three different episodes of price patterns in the figure. First, until about May 2007, domestic prices were literally tracking with the international parity prices. This was a shift from historical trends when domestic prices generally remained much below import parity. Second, while domestic prices kept rising, they fell far below import parity by March 2008. In the third stage, domestic prices started shooting way above import parity despite rapid decline in international prices. This period reflects the balance of payment crisis or shortage of foreign exchange. Although domestic prices were almost US$200 above the import parity—meaning a rough profit of $200 per metric ton—private importers could not import because the central bank did not have the necessary foreign exchange to support private sector imports.

Figure 6.2 Exports and Import Parity Prices of Wheat

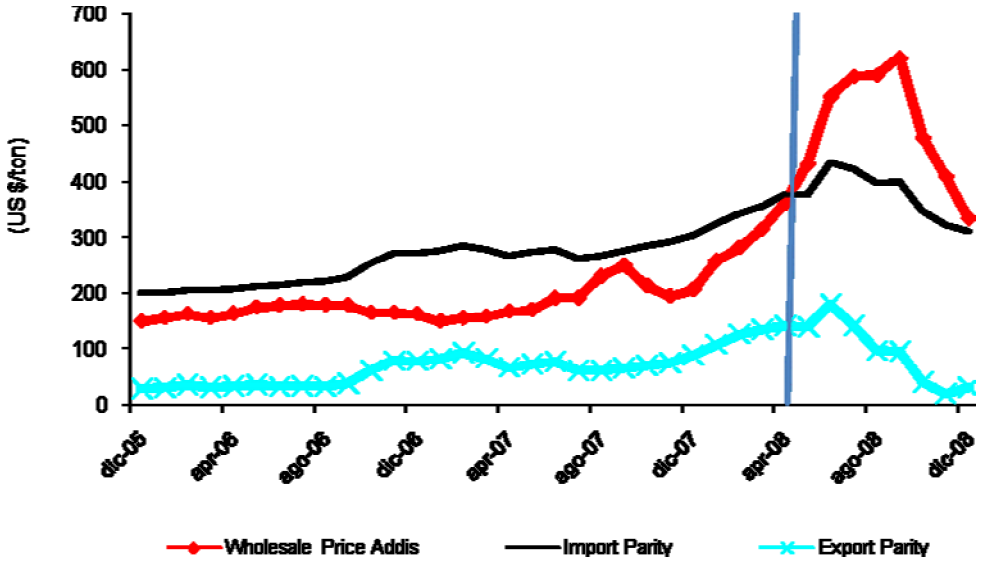


Figure 6.2 represents the same export and import parity data for maize. It shows more or less the same pattern as the wheat graph since April 2008. What is interesting in this graph is that harvesting season of the 2007 showed the same trend as previous years, a dip in November-December, despite rapidly accelerating world prices. The balance of payment crisis is clearly visible from March-April 2008, with the difference between domestic price and import parity reaching $210 in August 2008.

All these results point to the fact that rising food prices in Ethiopia has been the outcome of overestimated production, monetary policy misalignment, and the balance of payment problems resulting from sharp increases in fuel prices. This study does not find any structural changes in the production marketing systems. Quite contrary to prevailing perceptions, the study finds that the grain market efficiency has actually improved due to improved access to road, information, and other infrastructure that resulted in reduced costs of transactions in grain trade. Thus, once macroeconomic

stability is restored and production forecasting / estimate improve, local and regional procurement will once again be possible. The key parameters generated by this study can then be used to assess the cereal availability; and the model developed under this study can be used to triangulate and better predict the consequences on markets due to procurement, safety net transfers, as well as transoceanic food aid imports.

6.4 References

Getnet, K, E. Z. Gabre-Madhin, and T. Sineshew, 2006. *Magnitudes and Causes of Rising Food Prices: A Rapid Assessment,* Ethiopian Strategy Support Program of the IFPRI (draft)

Hoddinott, J., 2006. "Shocks and their Consequences Across and Within Households in Rural Zimbabwe", *Journal of Development Studies,* Vol. 42 (2), pp. 301-321.

Myers, J. Robert, 2006. "On the Costs of Food Price Fluctuations in Low-income Countries", Food Policy, 31(4), pp. 275-285.

Rashid, S., A. Seyoum, B. Fekadu, and B. Behute 2008. "Grain Markets and Large Social Transfers: An Analysis of Productive Safety Net Program (PSNP) in Ethiopia," report submitted to WFP, December 2008.

Rashid, S., A. Gulati, R.W. Cummings Jr. (eds), 2008. *From Parastatals to Private Trade: Lessons from Asian Agriculture,* Baltimore, MD: Johns Hopkins University Press.

Rashid, S., Cummings R. and A. Gulati, 2007. "Grain Marketing Parastatals in Asia: Why Do They Have to Change Now? *World Development* vol. 35, issue 11, pp 1872-1888

Timmer, P. 1997. "Farmers and Markets: The Political Economy of New Paradigms," *American Journal of Agricultural Economics,* vol. 79 (2), pp. 621-627.

World Bank, 2007. *Explaining Sources of Food Price Inflation in Ethiopia: "Just-in-time" policy note,* Washington DC: World Bank (Draft)

Appendix Tables for Chapter 5

Table A-5.1 Regional food balance sheets for four main cereals

		Population (thousand)	Production	Net inflow	Net imports	Net aid Inflow	Consumption	Per capita consumption (kg/person)
					(thousand tons)			
	Addis	2,973	0	154	0	-100	54	18
	Mekele	3,707	64	19	0	18	101	27
	Desse	9,514	66	460	0	27	553	58
	D. Dawa	6,619	218	149	0	10	377	57
Maize	Bale	12,890	819		0	8	827	64
	Hossana	13,411	695	-17	0	21	698	52
	Jimma	9,446	1,245	-551	0	1	695	74
	B. Dar	8,826	783	-263	0	7	527	60
	Gonder	3,907	141	50	0	8	199	51
	Total	71,293	4,031	0	0	0	4,031	57
	Addis	2,973	10	174	0	0	184	62
	Mekele	3,707	125	33	0	0	158	43
	Desse	9,514	381	7	0	0	388	41
	D. Dawa	6,619	19	207	0	0	226	34
Teff	Bale	12,890	254	71	0	0	325	25
	Hossana	13,411	437	-248	0	0	189	14
	Jimma	9,446	333	-73	0	0	260	28
	B. Dar	8,826	585	-192	0	0	393	45
	Gonder	3,907	145	21	0	0	166	42
	Total	71,293	2,289	0	0	0	2,289	32
	Addis	2,973	18	235	0	-60	193	65
	Mekele	3,707	153	19	0	83	256	69
	Desse	9,514	402	0	0	126	528	56
	D. Dawa	6,619	41	261	0	47	349	53
Wheat	Bale	12,890	1,159	-714	0	37	482	37
	Hossana	13,411	480	-258	0	96	318	24
	Jimma	9,446	166	154	0	2	322	34
	B. Dar	8,826	298	167	0	31	496	56
	Gonder	3,907	62	136	0	37	235	60
	Total	71,293	2,779	0	0	400	3,179	45
	Addis	2,973	0	46	0	-20	26	9
	Mekele	3,707	176	95	0	4	275	74
	Desse	9,514	524	-192	0	5	337	35
	D. Dawa	6,619	413	-109	0	2	306	46
Sorghum	Bale	12,890	122	294	0	2	418	32
	Hossana	13,411	217	-19	0	4	202	15
	Jimma	9,446	318		0	0	318	34
	B. Dar	8,826	170	94	0	1	266	30
	Gonder	3,907	372	-209	0	2	164	42
	Total	71,293	2,312	0	0	0	2,312	32

Table A-5.2 Impact of eliminating locally procured food aid with no displacement

National cereal consumption (1000 tons)	Before	After	Change
Maize	4031	4031	0%
Teff	2289	2289	0%
Wheat	3179	3179	0%
Sorghum	2312	2312	0%

National cereal production (1000 tons)	Before	After	Change
Maize	4031	4031	0%
Teff	2289	2289	0%
Wheat	2779	2779	0%
Sorghum	2312	2312	0%

Net imports incl. food aid (1000 tons)	Before	After	Change
Wheat	400	400	0%
			-
			-
			-

National average price (Birr/quintal)	Before	After	Change
Maize	172	156	-9%
Teff	393	380	-3%
Wheat	271	256	-6%
Sorghum	246	231	-6%

Regional prices (Birr/quintal)		Before	After	Change
Maize	Addis	175	159	-10%
Maize	Mekele	203	186	-8%
Maize	Desse	196	179	-9%
Maize	D_Dawa	201	184	-8%
Maize	Bale	154	147	-5%
Maize	Hossana	142	127	-10%
Maize	Jimma	136	119	-12%
Maize	B_Dar	153	136	-11%
Maize	Gonder	184	168	-9%
Teff	Addis	406	394	-3%
Teff	Mekele	405	393	-3%
Teff	Desse	398	386	-3%
Teff	D_Dawa	432	420	-3%
Teff	Bale	411	399	-3%
Teff	Hossana	372	360	-3%
Teff	Jimma	366	354	-3%
Teff	B_Dar	355	343	-3%
Teff	Gonder	387	375	-3%
Wheat	Addis	265	249	-6%
Wheat	Mekele	304	288	-5%
Wheat	Desse	278	269	-3%
Wheat	D_Dawa	281	265	-6%
Wheat	Bale	221	204	-8%
Wheat	Hossana	231	215	-7%
Wheat	Jimma	266	249	-6%
Wheat	B_Dar	293	277	-6%
Wheat	Gonder	302	286	-5%
Sorghum	Addis	266	251	-6%
Sorghum	Mekele	257	242	-6%
Sorghum	Desse	224	208	-7%
Sorghum	D_Dawa	228	213	-7%
Sorghum	Bale	288	273	-5%
Sorghum	Hossana	249	234	-6%
Sorghum	Jimma	258	244	-6%
Sorghum	B_Dar	238	223	-6%
Sorghum	Gonder	207	192	-7%

Regional cereal consumption (1000 tons)	Before	After	Change
Addis	451	458	1%
Mekele	813	791	-3%
Desse	1,828	1,802	-1%
D_Dawa	1,259	1,260	0%
Bale	2,042	2,050	0%
Hossana	1,416	1,406	-1%
Jimma	1,567	1,597	2%
B_Dar	1,668	1,684	1%
Gonder	768	765	0%

Cereal movement by region of origin		Before	After	Change
Maize	Hossana	22		-100%
Maize	Jimma	577	548	-5%
Maize	B_Dar	273	255	-7%
Teff	Hossana	247	248	1%
Teff	Jimma	72	74	2%
Teff	B_Dar	193	192	0%
Wheat	Bale	722	704	-2%
Wheat	Hossana	249	243	-3%
Sorghum	Desse	190	185	-3%
Sorghum	D_Dawa	111	107	-3%
Sorghum	Hossana	16	15	-3%
Sorghum	Gonder	210	208	-1%
				-
				-
				-
				-

Cereal movement by destination region		Before	After	Change
Maize	Addis	153	54	-65%
Maize	Mekele	36	38	5%
Maize	Desse	478	493	3%
Maize	D_Dawa	151	160	5%
Maize	Gonder	54	59	9%
Teff	Addis	174	174	0%
Teff	Mekele	32	33	1%
Teff	Desse	8	9	17%
Teff	D_Dawa	207	207	0%
Teff	Bale	71	72	1%
Teff	Gonder	20	20	1%
Wheat	Addis	231	176	-24%
Wheat	Mekele	27	32	19%
Wheat	Desse		1	-
Wheat	D_Dawa	262	269	3%
Wheat	Jimma	151	155	3%
Wheat	B_Dar	164	173	6%
Wheat	Gonder	137	141	3%
Sorghum	Addis	46	26	-43%
Sorghum	Mekele	95	98	3%
Sorghum	Bale	292	296	2%
Sorghum	B_Dar	94	95	1%
				-
				-
				-

Table A-5.3 Impact of eliminating locally procured food aid with full displacement

National cereal consumption (1000 tons)	Before	After	Change
Maize	4031	4031	0%
Teff	2289	2289	0%
Wheat	3179	3179	0%
Sorghum	2312	2312	0%

National cereal production (1000 tons)	Before	After	Change
Maize	4031	4031	0%
Teff	2289	2289	0%
Wheat	2779	2779	0%
Sorghum	2312	2312	0%

Net imports incl. food aid (1000 tons)	Before	After	Change
Wheat	400	400	0%
			-
			-
			-

National average price (Birr/quintal)	Before	After	Change
Maize	157	154	-2%
Teff	381	377	-1%
Wheat	256	253	-1%
Sorghum	231	228	-1%

Regional prices (Birr/quintal)		Before	After	Change
Maize	Addis	160	157	-2%
Maize	Mekele	187	184	-2%
Maize	Desse	180	177	-2%
Maize	D_Dawa	186	182	-2%
Maize	Bale	144	145	0%
Maize	Hossana	126	125	-1%
Maize	Jimma	120	117	-3%
Maize	B_Dar	137	134	-2%
Maize	Gonder	169	165	-2%
Teff	Addis	394	390	-1%
Teff	Mekele	393	389	-1%
Teff	Desse	386	382	-1%
Teff	D_Dawa	420	416	-1%
Teff	Bale	399	395	-1%
Teff	Hossana	360	356	-1%
Teff	Jimma	354	350	-1%
Teff	B_Dar	343	339	-1%
Teff	Gonder	375	371	-1%
Wheat	Addis	251	246	-2%
Wheat	Mekele	290	285	-2%
Wheat	Desse	258	266	3%
Wheat	D_Dawa	267	262	-2%
Wheat	Bale	206	201	-2%
Wheat	Hossana	217	212	-2%
Wheat	Jimma	251	246	-2%
Wheat	B_Dar	279	274	-2%
Wheat	Gonder	288	283	-2%
Sorghum	Addis	251	248	-1%
Sorghum	Mekele	242	239	-1%
Sorghum	Desse	208	206	-1%
Sorghum	D_Dawa	212	210	-1%
Sorghum	Bale	273	270	-1%
Sorghum	Hossana	234	231	-1%
Sorghum	Jimma	245	242	-1%
Sorghum	B_Dar	223	220	-1%
Sorghum	Gonder	192	189	-1%

Regional cereal consumption (1000 tons)	Before	After	Change
Addis	457	459	0%
Mekele	790	785	-1%
Desse	1,807	1,798	-1%
D_Dawa	1,258	1,259	0%
Bale	2,052	2,053	0%
Hossana	1,407	1,404	0%
Jimma	1,595	1,602	0%
B_Dar	1,682	1,687	0%
Gonder	764	764	0%

Cereal movement by region of origin		Before	After	Change
Maize	Hossana	17		-100%
Maize	Jimma	551	546	-1%
Maize	B_Dar	263	254	-3%
Teff	Hossana	248	249	0%
Teff	Jimma	73	73	0%
Teff	B_Dar	192	191	0%
Wheat	Bale	714	702	-2%
Wheat	Hossana	258	244	-6%
Sorghum	Desse	192	185	-4%
Sorghum	D_Dawa	109	107	-2%
Sorghum	Hossana	19	16	-20%
Sorghum	Gonder	209	208	-1%
				-
				-
				-
				-

Cereal movement by destination region		Before	After	Change
Maize	Addis	154	54	-65%
Maize	Mekele	19	37	91%
Maize	Desse	460	492	7%
Maize	D_Dawa	149	159	7%
Maize	Gonder	50	58	16%
Teff	Addis	174	174	0%
Teff	Mekele	33	31	-5%
Teff	Desse	7	8	13%
Teff	D_Dawa	207	207	0%
Teff	Bale	71	72	1%
Teff	Gonder	21	20	-2%
Wheat	Addis	235	177	-25%
Wheat	Mekele	19	29	50%
Wheat	D_Dawa	261	269	3%
Wheat	Jimma	154	156	2%
Wheat	B_Dar	167	174	4%
Wheat	Gonder	136	141	4%
Sorghum	Addis	46	26	-44%
Sorghum	Mekele	95	98	2%
Sorghum	Bale	294	296	1%
Sorghum	B_Dar	94	95	1%
				-
				-
				-
				-

Table A-5.4 Impact of doubling locally procured food aid with no displacement

National cereal consumption (1000 tons)	Before	After	Change
Maize	4031	4031	0%
Teff	2289	2289	0%
Wheat	3179	3180	0%
Sorghum	2312	2365	2%

National cereal production (1000 tons)	Before	After	Change
Maize	4031	4031	0%
Teff	2289	2289	0%
Wheat	2779	2779	0%
Sorghum	2312	2312	0%

Net imports incl. food aid (1000 tons)	Before	After	Change
Wheat	400	400	0%
Sorghum		53	-
			-
			-

National average price (Birr/quintal)	Before	After	Change
Maize	172	186	8%
Teff	393	401	2%
Wheat	271	285	5%
Sorghum	246	248	1%

Regional prices (Birr/quintal)		Before	After	Change
Maize	Addis	175	191	9%
Maize	Mekele	203	218	8%
Maize	Desse	196	211	8%
Maize	D_Dawa	201	217	8%
Maize	Bale	154	158	3%
Maize	Hossana	142	157	11%
Maize	Jimma	136	151	11%
Maize	B_Dar	153	168	10%
Maize	Gonder	184	200	8%
Teff	Addis	406	414	2%
Teff	Mekele	405	414	2%
Teff	Desse	398	406	2%
Teff	D_Dawa	432	440	2%
Teff	Bale	411	420	2%
Teff	Hossana	372	381	2%
Teff	Jimma	366	375	2%
Teff	B_Dar	355	364	2%
Teff	Gonder	387	395	2%
Wheat	Addis	265	280	5%
Wheat	Mekele	304	319	5%
Wheat	Desse	278	283	2%
Wheat	D_Dawa	281	296	5%
Wheat	Bale	221	235	7%
Wheat	Hossana	231	246	6%
Wheat	Jimma	266	280	5%
Wheat	B_Dar	293	308	5%
Wheat	Gonder	302	317	5%
Sorghum	Addis	266	267	0%
Sorghum	Mekele	257	258	0%
Sorghum	Desse	224	224	0%
Sorghum	D_Dawa	228	229	0%
Sorghum	Bale	288	289	0%
Sorghum	Hossana	249	250	0%
Sorghum	Jimma	258	271	5%
Sorghum	B_Dar	238	239	0%
Sorghum	Gonder	207	208	0%

Regional cereal consumption (1000 tons)	Before	After	Change
Addis	451	446	-1%
Mekele	813	840	3%
Desse	1,828	1,864	2%
D_Dawa	1,259	1,265	0%
Bale	2,042	2,042	0%
Hossana	1,416	1,430	1%
Jimma	1,567	1,543	-2%
B_Dar	1,668	1,660	0%
Gonder	768	775	1%

Cereal movement by region of origin		Before	After	Change
Maize	Hossana	22	47	115%
Maize	Jimma	577	600	4%
Maize	B_Dar	273	289	6%
Teff	Hossana	247	245	-1%
Teff	Jimma	72	70	-3%
Teff	B_Dar	193	193	0%
Wheat	Bale	722	739	2%
Wheat	Hossana	249	255	2%
Sorghum	Desse	190	186	-2%
Sorghum	D_Dawa	111	106	-5%
Sorghum	Hossana	16	11	-33%
Sorghum	Gonder	210	207	-2%
				-
				-
				-
				-

Cereal movement by destination region		Before	After	Change
Maize	Addis	153	251	65%
Maize	Mekele	36	33	-7%
Maize	Desse	478	462	-3%
Maize	D_Dawa	151	142	-6%
Maize	Gonder	54	49	-10%
Teff	Addis	174	174	0%
Teff	Mekele	32	32	-2%
Teff	Desse	8	6	-20%
Teff	D_Dawa	207	207	0%
Teff	Bale	71	69	-2%
Teff	Gonder	20	20	-1%
Wheat	Addis	231	286	24%
Wheat	Mekele	27	20	-24%
Wheat	D_Dawa	262	253	-3%
Wheat	Jimma	151	147	-2%
Wheat	B_Dar	164	155	-6%
Wheat	Gonder	137	132	-4%
Sorghum	Addis	46	13	-71%
Sorghum	Mekele	95	100	4%
Sorghum	Bale	292	296	1%
Sorghum	B_Dar	94	100	6%
				-
				-
				-
				-

Table A-5.5 Impact of doubling locally procured food aid with full displacement

National cereal consumption (1000 tons)	Before	After	Change
Maize	4031	4031	0%
Teff	2289	2289	0%
Wheat	3179	3180	0%
Sorghum	2312	2312	0%

National cereal production (1000 tons)	Before	After	Change
Maize	4031	4031	0%
Teff	2289	2289	0%
Wheat	2779	2779	0%
Sorghum	2312	2312	0%

Net imports incl. food aid (1000 tons)	Before	After	Change
Wheat	400	400	0%
			-
			-
			-

National average price (Birr/quintal)	Before	After	Change
Maize	157	159	2%
Teff	381	385	1%
Wheat	256	260	1%
Sorghum	231	234	1%

Regional prices (Birr/quintal)		Before	After	Change
Maize	Addis	160	163	2%
Maize	Mekele	187	190	1%
Maize	Desse	180	183	2%
Maize	D_Dawa	186	188	2%
Maize	Bale	144	144	-1%
Maize	Hossana	126	129	2%
Maize	Jimma	120	123	2%
Maize	B_Dar	137	140	2%
Maize	Gonder	169	172	2%
Teff	Addis	394	398	1%
Teff	Mekele	393	397	1%
Teff	Desse	386	390	1%
Teff	D_Dawa	420	424	1%
Teff	Bale	399	403	1%
Teff	Hossana	360	364	1%
Teff	Jimma	354	358	1%
Teff	B_Dar	343	347	1%
Teff	Gonder	375	379	1%
Wheat	Addis	251	255	2%
Wheat	Mekele	290	294	2%
Wheat	Desse	258	253	-2%
Wheat	D_Dawa	267	271	2%
Wheat	Bale	206	211	2%
Wheat	Hossana	217	221	2%
Wheat	Jimma	251	256	2%
Wheat	B_Dar	279	283	2%
Wheat	Gonder	288	292	2%
Sorghum	Addis	251	254	1%
Sorghum	Mekele	242	244	1%
Sorghum	Desse	208	211	1%
Sorghum	D_Dawa	212	215	1%
Sorghum	Bale	273	276	1%
Sorghum	Hossana	234	237	1%
Sorghum	Jimma	245	248	1%
Sorghum	B_Dar	223	226	1%
Sorghum	Gonder	192	194	2%

Regional cereal consumption (1000 tons)	Before	After	Change
Addis	457	455	0%
Mekele	790	794	1%
Desse	1,807	1,816	0%
D_Dawa	1,258	1,258	0%
Bale	2,052	2,052	0%
Hossana	1,407	1,407	0%
Jimma	1,595	1,589	0%
B_Dar	1,682	1,678	0%
Gonder	764	764	0%

Cereal movement by region of origin		Before	After	Change
Maize	Hossana	17	39	125%
Maize	Jimma	551	555	1%
Maize	B_Dar	263	271	3%
Teff	Hossana	248	247	0%
Teff	Jimma	73	73	1%
Teff	B_Dar	192	192	0%
Wheat	Desse		3	-
Wheat	Bale	714	725	2%
Wheat	Hossana	258	271	5%
Sorghum	Desse	192	199	4%
Sorghum	D_Dawa	109	111	2%
Sorghum	Hossana	19	23	18%
Sorghum	Gonder	209	211	1%
				-
				-
				-

Cereal movement by destination region		Before	After	Change
Maize	Addis	154	254	65%
Maize	Mekele	19	2	-90%
Maize	Desse	460	430	-7%
Maize	D_Dawa	149	138	-7%
Maize	Gonder	50	42	-16%
Teff	Addis	174	174	0%
Teff	Mekele	33	34	5%
Teff	Desse	7	7	-8%
Teff	D_Dawa	207	207	0%
Teff	Bale	71	70	-2%
Teff	Gonder	21	21	1%
Wheat	Addis	235	294	25%
Wheat	Mekele	19	10	-49%
Wheat	D_Dawa	261	254	-3%
Wheat	Jimma	154	151	-1%
Wheat	B_Dar	167	161	-4%
Wheat	Gonder	136	130	-4%
Sorghum	Addis	46	66	44%
Sorghum	Mekele	95	93	-3%
Sorghum	Bale	294	291	-1%
Sorghum	B_Dar	94	93	-1%
				-
				-
				-
				-

Table A-5.6 Impact of eliminating imported food aid in the short run

National cereal consumption (1000 tons)	Before	After	Change
Maize	4031	4031	0%
Teff	2289	2289	0%
Wheat	3179	2824	-11%
Sorghum	2312	2323	0%

National cereal production (1000 tons)	Before	After	Change
Maize	4031	4031	0%
Teff	2289	2289	0%
Wheat	2779	2779	0%
Sorghum	2312	2312	0%

Net imports incl. food aid (1000 tons)	Before	After	Change
Wheat	400	45	-89%
Sorghum		11	-
			-
			-

National average price (Birr/quintal)	Before	After	Change
Maize	157	170	8%
Teff	381	398	4%
Wheat	256	309	20%
Sorghum	231	247	7%

Regional prices (Birr/quintal)		Before	After	Change
Maize	Addis	160	173	8%
Maize	Mekele	187	201	7%
Maize	Desse	180	193	7%
Maize	D_Dawa	186	199	7%
Maize	Bale	144	158	10%
Maize	Hossana	126	139	10%
Maize	Jimma	120	133	11%
Maize	B_Dar	137	151	9%
Maize	Gonder	169	182	8%
Teff	Addis	394	411	4%
Teff	Mekele	393	410	4%
Teff	Desse	386	403	4%
Teff	D_Dawa	420	437	4%
Teff	Bale	399	416	4%
Teff	Hossana	360	377	5%
Teff	Jimma	354	371	5%
Teff	B_Dar	343	360	5%
Teff	Gonder	375	392	5%
Wheat	Addis	251	302	20%
Wheat	Mekele	290	341	18%
Wheat	Desse	258	322	25%
Wheat	D_Dawa	267	318	19%
Wheat	Bale	206	257	25%
Wheat	Hossana	217	268	24%
Wheat	Jimma	251	302	20%
Wheat	B_Dar	279	330	18%
Wheat	Gonder	288	339	18%
Sorghum	Addis	251	267	6%
Sorghum	Mekele	242	258	7%
Sorghum	Desse	208	224	8%
Sorghum	D_Dawa	212	229	8%
Sorghum	Bale	273	289	6%
Sorghum	Hossana	234	250	7%
Sorghum	Jimma	245	264	8%
Sorghum	B_Dar	223	239	7%
Sorghum	Gonder	192	208	8%

Regional cereal consumption (1000 tons)	Before	After	Change
Addis	457	443	-3%
Mekele	790	757	-4%
Desse	1,807	1,742	-4%
D_Dawa	1,258	1,222	-3%
Bale	2,052	1,998	-3%
Hossana	1,407	1,361	-3%
Jimma	1,595	1,562	-2%
B_Dar	1,682	1,639	-3%
Gonder	764	741	-3%

Cereal movement by region of origin		Before	After	Change
Maize	Hossana	17	25	41%
Maize	Jimma	551	554	1%
Maize	B_Dar	263	262	0%
Teff	Hossana	248	249	0%
Teff	Jimma	73	72	-2%
Teff	B_Dar	192	192	0%
Wheat	Bale	714	741	4%
Wheat	Hossana	258	213	-17%
Sorghum	Desse	192	190	-1%
Sorghum	D_Dawa	109	109	0%
Sorghum	Hossana	19	19	-4%
Sorghum	Gonder	209	209	0%
				-
				-
				-
				-

Cereal movement by destination region		Before	After	Change
Maize	Addis	154	155	1%
Maize	Mekele	19	19	-2%
Maize	Desse	460	466	1%
Maize	D_Dawa	149	150	1%
Maize	Gonder	50	51	1%
Teff	Addis	174	178	2%
Teff	Mekele	33	29	-10%
Teff	Desse	7	7	-12%
Teff	D_Dawa	207	207	0%
Teff	Bale	71	73	2%
Teff	Gonder	21	20	-4%
Wheat	Addis	235	171	-27%
Wheat	Mekele	19	63	223%
Wheat	Desse		37	-
Wheat	D_Dawa	261	265	2%
Wheat	Jimma	154	125	-19%
Wheat	B_Dar	167	147	-12%
Wheat	Gonder	136	145	7%
Sorghum	Addis	46	36	-22%
Sorghum	Mekele	95	95	0%
Sorghum	Bale	294	297	1%
Sorghum	B_Dar	94	98	4%
				-
				-
				-

Table A-5.7 Impact of eliminating imported food aid in the long run

National cereal consumption (1000 tons)	Before	After	Change
Maize	4000	4026	1%
Teff	2285	2278	0%
Wheat	3182	2889	-9%
Sorghum	2314	2339	1%

National cereal production (1000 tons)	Before	After	Change
Maize	4000	4026	1%
Teff	2285	2278	0%
Wheat	2781	2889	4%
Sorghum	2314	2339	1%

Net imports incl. food aid (1000 tons)	Before	Change
Wheat	400	-100%
		-
		-
		-

National average price (Birr/quintal)	Before	After	Change
Maize	160	167	4%
Teff	383	395	3%
Wheat	257	296	15%
Sorghum	232	239	3%

Regional prices (Birr/quintal)		Before	After	Change
Maize	Addis	164	170	4%
Maize	Mekele	191	198	3%
Maize	Desse	184	190	3%
Maize	D_Dawa	190	196	3%
Maize	Bale	140	149	7%
Maize	Hossana	136	141	4%
Maize	Jimma	124	130	5%
Maize	B_Dar	141	148	4%
Maize	Gonder	173	179	4%
Teff	Addis	397	408	3%
Teff	Mekele	396	407	3%
Teff	Desse	389	400	3%
Teff	D_Dawa	422	434	3%
Teff	Bale	402	413	3%
Teff	Hossana	363	374	3%
Teff	Jimma	357	368	3%
Teff	B_Dar	346	357	3%
Teff	Gonder	377	389	3%
Wheat	Addis	252	289	15%
Wheat	Mekele	291	328	13%
Wheat	Desse	261	309	18%
Wheat	D_Dawa	268	305	14%
Wheat	Bale	207	245	18%
Wheat	Hossana	218	255	17%
Wheat	Jimma	252	290	15%
Wheat	B_Dar	280	317	13%
Wheat	Gonder	289	326	13%
Sorghum	Addis	249	256	3%
Sorghum	Mekele	240	247	3%
Sorghum	Desse	207	214	3%
Sorghum	D_Dawa	211	218	3%
Sorghum	Bale	271	279	3%
Sorghum	Hossana	234	240	3%
Sorghum	Jimma	267	274	3%
Sorghum	B_Dar	221	228	3%
Sorghum	Gonder	190	197	4%

Regional cereal consumption (1000 tons)	Before	After	Change
Addis	456	446	-2%
Mekele	789	763	-3%
Desse	1,802	1,752	-3%
D_Dawa	1,256	1,230	-2%
Bale	2,058	2,017	-2%
Hossana	1,392	1,361	-2%
Jimma	1,587	1,568	-1%
B_Dar	1,677	1,648	-2%
Gonder	763	746	-2%
	11,782	11,532	-2%

Cereal movement by region of origin		Before	After	Change
Maize	Jimma	505	516	2%
Maize	B_Dar	291	292	0%
Teff	Hossana	255	255	0%
Teff	Jimma	69	68	-1%
Teff	B_Dar	186	186	0%
Wheat	Bale	713	774	9%
Wheat	Hossana	250	219	-12%
Sorghum	Desse	170	174	2%
Sorghum	D_Dawa	93	95	2%
Sorghum	Gonder	237	241	2%
				-
				-
				-
				-
				-

Cereal movement by destination region		Before	After	Change
Maize	Addis	153	155	1%
Maize	Mekele	16	16	-2%
Maize	Desse	450	458	2%
Maize	D_Dawa	134	136	2%
Maize	Gonder	43	44	2%
Teff	Addis	173	176	2%
Teff	Mekele	36	32	-10%
Teff	Desse	7	6	-17%
Teff	D_Dawa	206	205	-1%
Teff	Bale	67	72	8%
Teff	Gonder	20	18	-9%
Wheat	Addis	236	220	-7%
Wheat	Mekele	12	55	347%
Wheat	Desse		32	-
Wheat	D_Dawa	262	272	4%
Wheat	Jimma	155	126	-19%
Wheat	B_Dar	163	143	-12%
Wheat	Gonder	135	146	8%
Sorghum	Addis	46	47	1%
Sorghum	Mekele	84	83	-1%
Sorghum	Bale	298	302	2%
Sorghum	Jimma	2	4	116%
Sorghum	B_Dar	71	73	4%
				-
				-

Table A-5.8 Impact of eliminating the PSNP in the short run

National cereal consumption (1000 tons)	Before	After	Change
Maize	4031	4031	0%
Teff	2289	2289	0%
Wheat	3179	3179	0%
Sorghum	2312	2312	0%

National cereal production (1000 tons)	Before	After	Change
Maize	4031	4031	0%
Teff	2289	2289	0%
Wheat	2779	2779	0%
Sorghum	2312	2312	0%

Net imports incl. food aid (1000 tons)	Before	After	Change
Wheat	400	400	0%
			-
			-
			-

National average price (Birr/quintal)	Before	After	Change
Maize	157	150	-5%
Teff	381	367	-4%
Wheat	256	246	-4%
Sorghum	231	221	-4%

Regional prices (Birr/quintal)		Before	After	Change
Maize	Addis	160	153	-5%
Maize	Mekele	187	180	-4%
Maize	Desse	180	173	-4%
Maize	D_Dawa	186	178	-4%
Maize	Bale	144	138	-4%
Maize	Hossana	126	119	-6%
Maize	Jimma	120	113	-6%
Maize	B_Dar	137	130	-5%
Maize	Gonder	169	161	-4%
Teff	Addis	394	380	-4%
Teff	Mekele	393	379	-4%
Teff	Desse	386	372	-4%
Teff	D_Dawa	420	406	-3%
Teff	Bale	399	385	-4%
Teff	Hossana	360	346	-4%
Teff	Jimma	354	340	-4%
Teff	B_Dar	343	329	-4%
Teff	Gonder	375	361	-4%
Wheat	Addis	251	241	-4%
Wheat	Mekele	290	280	-3%
Wheat	Desse	258	245	-5%
Wheat	D_Dawa	267	257	-4%
Wheat	Bale	206	196	-5%
Wheat	Hossana	217	207	-5%
Wheat	Jimma	251	241	-4%
Wheat	B_Dar	279	269	-4%
Wheat	Gonder	288	278	-3%
Sorghum	Addis	251	241	-4%
Sorghum	Mekele	242	231	-4%
Sorghum	Desse	208	198	-5%
Sorghum	D_Dawa	212	202	-5%
Sorghum	Bale	273	263	-4%
Sorghum	Hossana	234	224	-4%
Sorghum	Jimma	245	237	-3%
Sorghum	B_Dar	223	213	-5%
Sorghum	Gonder	192	181	-5%

Regional cereal consumption (1000 tons)	Before	After	Change
Addis	457	462	1%
Mekele	790	771	-2%
Desse	1,807	1,796	-1%
D_Dawa	1,258	1,257	0%
Bale	2,052	2,062	0%
Hossana	1,407	1,400	0%
Jimma	1,595	1,611	1%
B_Dar	1,682	1,691	1%
Gonder	764	762	0%

Cereal movement by region of origin		Before	After	Change
Maize	Hossana	17	18	1%
Maize	Jimma	551	541	-2%
Maize	B_Dar	263	261	-1%
Teff	Hossana	248	250	1%
Teff	Jimma	73	70	-4%
Teff	B_Dar	192	188	-2%
Wheat	Bale	714	708	-1%
Wheat	Hossana	258	261	1%
Sorghum	Desse	192	192	0%
Sorghum	D_Dawa	109	107	-1%
Sorghum	Hossana	19	20	5%
Sorghum	Gonder	209	209	0%
				-
				-
				-
				-

Cereal movement by destination region		Before	After	Change
Maize	Addis	154	154	0%
Maize	Mekele	19	17	-13%
Maize	Desse	460	453	-1%
Maize	D_Dawa	149	147	-1%
Maize	Gonder	50	49	-2%
Teff	Addis	174	176	1%
Teff	Mekele	33	28	-15%
Teff	Desse	7	4	-52%
Teff	D_Dawa	207	206	0%
Teff	Bale	71	73	3%
Teff	Gonder	21	20	-1%
Wheat	Addis	235	238	1%
Wheat	Mekele	19	11	-45%
Wheat	D_Dawa	261	261	0%
Wheat	Jimma	154	157	2%
Wheat	B_Dar	167	169	1%
Wheat	Gonder	136	134	-1%
Sorghum	Addis	46	46	0%
Sorghum	Mekele	95	92	-3%
Sorghum	Bale	294	295	0%
Sorghum	B_Dar	94	95	1%
				-
				-
				-
				-

Table A-5.9 Impact of eliminating the PSNP in the long run

National cereal consumption (1000 tons)			
	Before	After	Change
Maize	4000	3977	-1%
Teff	2285	2277	0%
Wheat	3182	3170	0%
Sorghum	2314	2300	-1%

National cereal production (1000 tons)			
	Before	After	Change
Maize	4000	3977	-1%
Teff	2285	2277	0%
Wheat	2781	2769	0%
Sorghum	2314	2300	-1%

Net imports incl. food aid (1000 tons)			
	Before	After	Change
Wheat	400	400	0%
			-
			-
			-

National average price (Birr/quintal)			
	Before	After	Change
Maize	160	157	-2%
Teff	383	375	-2%
Wheat	257	251	-2%
Sorghum	232	228	-2%

Regional prices (Birr/quintal)				
		Before	After	Change
Maize	Addis	164	161	-2%
Maize	Mekele	191	188	-2%
Maize	Desse	184	181	-2%
Maize	D_Dawa	190	186	-2%
Maize	Bale	140	138	-2%
Maize	Hossana	136	132	-3%
Maize	Jimma	124	121	-3%
Maize	B_Dar	141	138	-2%
Maize	Gonder	173	169	-2%
Teff	Addis	397	388	-2%
Teff	Mekele	396	387	-2%
Teff	Desse	389	380	-2%
Teff	D_Dawa	422	414	-2%
Teff	Bale	402	394	-2%
Teff	Hossana	363	355	-2%
Teff	Jimma	357	348	-2%
Teff	B_Dar	346	337	-2%
Teff	Gonder	377	369	-2%
Wheat	Addis	252	246	-2%
Wheat	Mekele	291	285	-2%
Wheat	Desse	261	253	-3%
Wheat	D_Dawa	268	262	-2%
Wheat	Bale	207	201	-3%
Wheat	Hossana	218	212	-3%
Wheat	Jimma	252	246	-2%
Wheat	B_Dar	280	274	-2%
Wheat	Gonder	289	283	-2%
Sorghum	Addis	249	245	-2%
Sorghum	Mekele	240	236	-2%
Sorghum	Desse	207	203	-2%
Sorghum	D_Dawa	211	207	-2%
Sorghum	Bale	271	268	-1%
Sorghum	Hossana	234	229	-2%
Sorghum	Jimma	267	263	-1%
Sorghum	B_Dar	221	217	-2%
Sorghum	Gonder	190	186	-2%

Regional cereal consumption (1000 tons)			
	Before	After	Change
Addis	456	459	1%
Mekele	789	767	-3%
Desse	1,802	1,783	-1%
D_Dawa	1,256	1,249	-1%
Bale	2,058	2,059	0%
Hossana	1,392	1,378	-1%
Jimma	1,587	1,594	0%
B_Dar	1,677	1,678	0%
Gonder	763	757	-1%

Cereal movement by region of origin				
		Before	After	Change
Maize	Jimma	505	493	-2%
Maize	B_Dar	291	288	-1%
Teff	Hossana	255	256	1%
Teff	Jimma	69	66	-5%
Teff	B_Dar	186	181	-2%
Wheat	Bale	713	704	-1%
Wheat	Hossana	250	253	1%
Sorghum	Desse	170	170	-1%
Sorghum	D_Dawa	93	92	-1%
Sorghum	Gonder	237	235	-1%
				-
				-
				-
				-
				-

Cereal movement by destination region				
		Before	After	Change
Maize	Addis	153	153	0%
Maize	Mekele	16	13	-16%
Maize	Desse	450	441	-2%
Maize	D_Dawa	134	132	-2%
Maize	Gonder	43	42	-3%
Teff	Addis	173	175	1%
Teff	Mekele	36	31	-13%
Teff	Desse	7	4	-50%
Teff	D_Dawa	206	205	-1%
Teff	Bale	67	68	2%
Teff	Gonder	20	20	-1%
Wheat	Addis	236	237	1%
Wheat	Mekele	12	4	-71%
Wheat	D_Dawa	262	261	-1%
Wheat	Jimma	155	158	2%
Wheat	B_Dar	163	164	1%
Wheat	Gonder	135	133	-1%
Sorghum	Addis	46	46	0%
Sorghum	Mekele	84	80	-4%
Sorghum	Bale	298	297	0%
Sorghum	Jimma	2	2	14%
Sorghum	B_Dar	71	71	0%
				-
				-
				-

Table A-5.10 Impact of doubling international food prices in the short run

National cereal consumption (1000 tons)	Before	After	Change
Maize	4031	4031	0%
Teff	2289	2289	0%
Wheat	3179	3179	0%
Sorghum	2312	2312	0%

National cereal production (1000 tons)	Before	After	Change
Maize	4031	4031	0%
Teff	2289	2289	0%
Wheat	2779	2779	0%
Sorghum	2312	2312	0%

Net imports incl. food aid (1000 tons)	Before	After	Change
Wheat	400	400	0%
			-
			-
			-

National average price (Birr/quintal)	Before	After	Change
Maize	157	157	0%
Teff	381	381	0%
Wheat	256	256	0%
Sorghum	231	231	0%

Regional prices (Birr/quintal)		Before	After	Change
Maize	Addis	160	160	0%
Maize	Mekele	187	187	0%
Maize	Desse	180	180	0%
Maize	D_Dawa	186	186	0%
Maize	Bale	144	144	0%
Maize	Hossana	126	126	0%
Maize	Jimma	120	120	0%
Maize	B_Dar	137	137	0%
Maize	Gonder	169	169	0%
Teff	Addis	394	394	0%
Teff	Mekele	393	393	0%
Teff	Desse	386	386	0%
Teff	D_Dawa	420	420	0%
Teff	Bale	399	399	0%
Teff	Hossana	360	360	0%
Teff	Jimma	354	354	0%
Teff	B_Dar	343	343	0%
Teff	Gonder	375	375	0%
Wheat	Addis	251	251	0%
Wheat	Mekele	290	290	0%
Wheat	Desse	258	258	0%
Wheat	D_Dawa	267	267	0%
Wheat	Bale	206	206	0%
Wheat	Hossana	217	217	0%
Wheat	Jimma	251	251	0%
Wheat	B_Dar	279	279	0%
Wheat	Gonder	288	288	0%
Sorghum	Addis	251	251	0%
Sorghum	Mekele	242	242	0%
Sorghum	Desse	208	208	0%
Sorghum	D_Dawa	212	212	0%
Sorghum	Bale	273	273	0%
Sorghum	Hossana	234	234	0%
Sorghum	Jimma	245	245	0%
Sorghum	B_Dar	223	223	0%
Sorghum	Gonder	192	192	0%

Regional cereal consumption (1000 tons)	Before	After	Change
Addis	457	457	0%
Mekele	790	790	0%
Desse	1,807	1,807	0%
D_Dawa	1,258	1,258	0%
Bale	2,052	2,052	0%
Hossana	1,407	1,407	0%
Jimma	1,595	1,595	0%
B_Dar	1,682	1,682	0%
Gonder	764	764	0%

Cereal movement by region of origin		Before	After	Change
Maize	Hossana	17	17	0%
Maize	Jimma	551	551	0%
Maize	B_Dar	263	263	0%
Teff	Hossana	248	248	0%
Teff	Jimma	73	73	0%
Teff	B_Dar	192	192	0%
Wheat	Bale	714	714	0%
Wheat	Hossana	258	258	0%
Sorghum	Desse	192	192	0%
Sorghum	D_Dawa	109	109	0%
Sorghum	Hossana	19	19	0%
Sorghum	Gonder	209	209	0%
				-
				-
				-
				-

Cereal movement by destination region		Before	After	Change
Maize	Addis	154	154	0%
Maize	Mekele	19	19	0%
Maize	Desse	460	460	0%
Maize	D_Dawa	149	149	0%
Maize	Gonder	50	50	0%
Teff	Addis	174	174	0%
Teff	Mekele	33	33	0%
Teff	Desse	7	7	0%
Teff	D_Dawa	207	207	0%
Teff	Bale	71	71	0%
Teff	Gonder	21	21	0%
Wheat	Addis	235	235	0%
Wheat	Mekele	19	19	0%
Wheat	D_Dawa	261	261	0%
Wheat	Jimma	154	154	0%
Wheat	B_Dar	167	167	0%
Wheat	Gonder	136	136	0%
Sorghum	Addis	46	46	0%
Sorghum	Mekele	95	95	0%
Sorghum	Bale	294	294	0%
Sorghum	B_Dar	94	94	0%
				-
				-
				-
				-

List of Other Project Output/ Events

Reports

1. The Ethiopia Cereal Availability Study 2008: The Descriptive Report, by 2008 Ethiopia Cereal Availability Study Team Shahidur Rashid, Nicholas Minot, Ruth V. Hill, Gezahegn Ayele, Dawit Alemu, Alemayehu Seyoum Taffesse, Belay Fekadu, Reno Dewina, and Befekadu Behute
2. Ethiopia CAS 2008 Agricultural Household Survey: A Note on Sampling and Survey Progress, by 2008 Ethiopia Cereal Availability Study Team
3. Assessment of Cereal Production and Availability Forecasts in Ethiopia: A Review of Existing Studies, by Shahidur Rashid, Nicholas Minot and Alemayehu Seyoum Taffesse
4. Grain Markets and Large Social Transfers: An Analysis of Productive Safety Net Program (PSNP) in Ethiopia, by Shahidur Rashid, Alemayehu Seyoum Taffesse, Belay Fekadu, and Befekadu Behute

Policy Briefs

1. CEREAL MARKETS AND PRODUCTIVE SOCIAL SAFETY NET PROGRAM (PSNP) IN ETHIOPIA Shahidur Rashid, Alemayehu Seyoum, Belay Fekadu and Befekadu Behute
2. AGRICULTURAL HOUSEHOLD SURVEY: Understanding changes in farm-level crop marketing by Nicholas Minot With CAS Study Team
3. THE KEY ELEMENTS OF ETHIOPIAN GRAIN MARKETS: What has and hasn't changed? by Ruth Vargas Hill With CAS Study Team
4. STRUCTURE AND INSTITUTIONAL MECHANISMS OF CROSS-BORDER TRADE IN ETHIOPIA, by Gezahegn Ayele and Dawit Alemu

Workshops

1. MARKET DYNAMICS AND CEREAL AVAILABILITY IN ETHIOPIA: *PRODUCERS, TRADERS, AND THE POLICIES*, Final Result Presentation workshop, 05 Dec 2008, UNECA, Addis Ababa, Ethiopia, 68 representatives of donors and stakeholders have attended the workshop.
2. MARKET DYNAMICS AND CEREAL AVAILABILITY IN ETHIOPIA: *PRODUCERS, TRADERS, AND THE POLICIES*, Preliminary result presentation workshop, 19 June, 2008, ILRI Campus, Addis Ababa, Ethiopia, representatives of around 15 donors and stakeholders have attended the workshop.

European Commission

EUR 24801 EN – Joint Research Centre – Institute for Environment and Sustainability
Title: Cereals Availability Study in Ethiopia, 2008
Author(s): D. Alemu, G. Ayele, B. Behute, Y. Beyone, R. Dewana, B. Fekadu, R. Vargas Hill, N. Minot, S. Rashid, A. Taffesse and N. Tefera
Luxembourg: Publications Office of the European Union
2012 – 122 pp. – 21.0 x 29.7 cm
EUR – Scientific and Technical Research series – ISSN 1018-5593 (print), ISSN 1831-9424 (online)
ISBN 978-92-79-20045-8 (print)
ISBN 978-92-79-20046-5 (PDF)

doi:10.2788/14890

Abstract
Unusual changes in grain markets have been the source of major concerns for the Government of Ethiopia and its development partners. Increase in cereal price presented serious challenges to the implementation of country's food security programs. Local procurement of food by the WFP declined also in the recent years. Being one of the largest donors of local procurement of food, the European Union was particularly concerned about these developments. Thus, as a General Directorate in charge of supporting EU policies, the Joint Research Centre (JRC) of the EU developed the technical specification of a project to extend the scope of the usual Cereal Availability Study (CAS) in order to account for the developments in the Ethiopian cereal markets. International Food Policy Research Institute (IFPRI) consortium with the Ethiopian Development Research Institute (EDRI) and the Ethiopian Institute of Agricultural Research (EIAR) was selected to carry out the study.

A number of preliminary analyses, undertaken by the World Bank and IFPRI had put forward a number of hypotheses to explain unusual high cereal prices. While the different hypotheses were widely debated in the country, there is limited primary information to validate or refute them. It is in this context that the current study was undertaken. The focus has been mainly on achieving the three following objectives: (1) To gather information regarding recent changes in cereal production, storage, and marketing patterns in order to test the hypotheses that have been proposed to explain the high price of cereals in Ethiopian markets. (2) To improve the general methodology of the past cereal availability studies. (3) To estimate the quantity of maize, sorghum, and wheat that can be procured from domestic markets in the 2008 for relief purposes without disturbing the local market.

How to obtain EU publications

Our priced publications are available from EU Bookshop (http://bookshop.europa.eu), where you can place an order with the sales agent of your choice.

The Publications Office has a worldwide network of sales agents. You can obtain their contact details by sending a fax to (352) 29 29-42758.

The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.

JRC
EUROPEAN COMMISSION

LB-NA-24801-EN-N

Publications Office

ISBN 978-92-79-20046-5