Paul Dorosh and Shahidur Rashid
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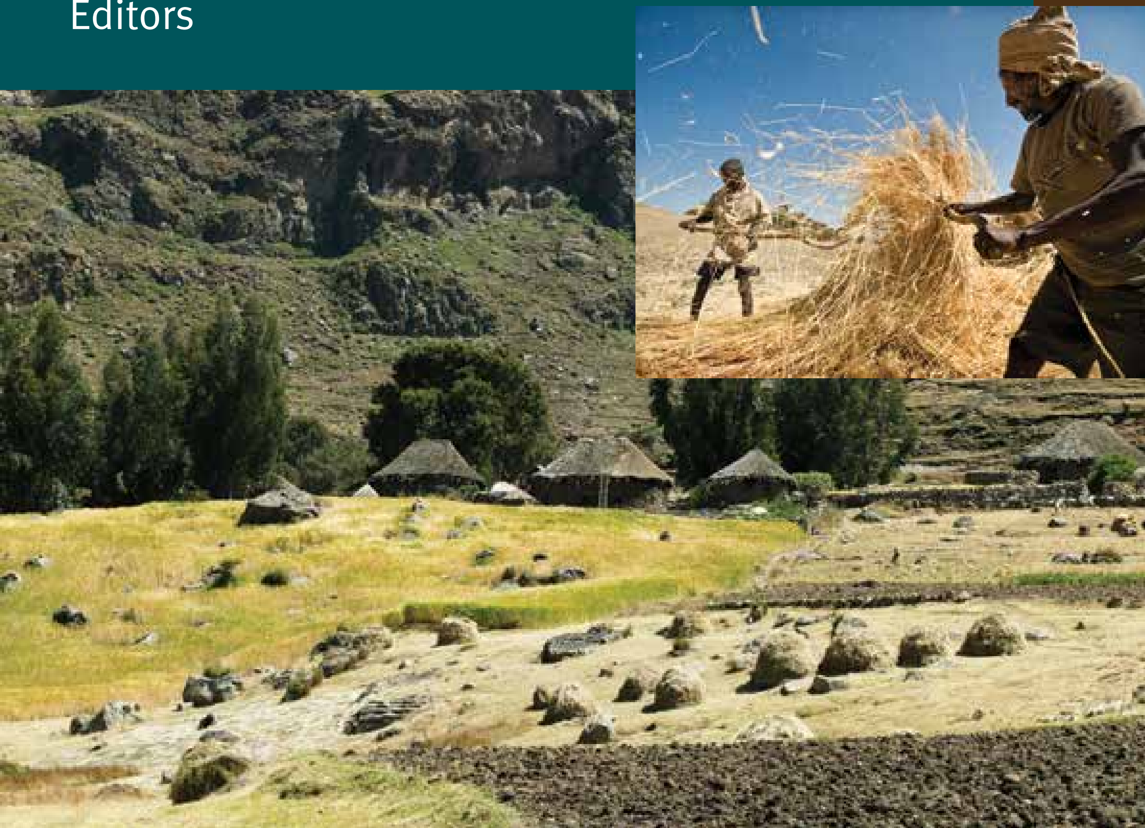

Food and Agriculture in Ethiopia

PROGRESS AND POLICY CHALLENGES

Food and Agriculture in Ethiopia

This book is published by the University of Pennsylvania Press (UPP) on behalf of the International Food Policy Research Institute (IFPRI) as part of a joint-publication series. Books in the series present research on food security and economic development with the aim of reducing poverty and eliminating hunger and malnutrition in developing nations. They are the product of peer-reviewed IFPRI research and are selected by mutual agreement between the parties for publication under the joint IFPRI-UPP imprint.

Food and Agriculture in Ethiopia

Progress and Policy Challenges

EDITED BY PAUL A. DOROSH AND SHAHIDUR RASHID

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Foreword

Food security issues in Ethiopia are extremely complex because of large variations across space and over time related to agroecologies, weather shocks, government policies, and other factors. In this context, Ethiopia's agricultural and food policies are crucially important, having profound effects on tens of millions of low-income people throughout the country.

Following major famines in the 1970s and 1980s, the country has made huge strides in the past two decades—increasing food production, promoting market development, building an effective safety net for millions of food-insecure households, improving its disaster food emergency response capabilities, and laying a foundation for future economic growth. Yet there is much to be done to reduce the still-high levels of food insecurity.

This book describes these past developments and the policies likely to shape future trends. The analysis it contains builds on and extends a long history of IFPRI work in Ethiopia in collaboration with the Ethiopian Development Research Institute and researchers at Addis Ababa University, including work on causes of and responses to major famines in Ethiopia in the 1970s and 1980s, rural poverty dynamics, analyses of cereal markets that helped lead to the creation of the Ethiopian Commodity Exchange, and the impact of the Productive Safety Net Programme.

The analysis presented in this book shows the importance of continued investments in increasing agricultural productivity in order to promote both economic growth and poverty reduction. The book also highlights five major challenges Ethiopia must face to achieve high economic growth rates, reduce poverty, and enhance household food security: sustaining growth in crop and livestock production, increasing market efficiency, providing effective safety nets, maintaining macroeconomic incentives and stability, and managing the rural–urban transformation. If these challenges are met, there is good reason to expect that Ethiopia will enjoy further progress in reducing poverty and enhancing food security.

Shenggen Fan
Director General, International Food Policy Research Institute

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It is our hope that this book, produced with the support and efforts of all those mentioned here, along with those of the chapter authors, will prove useful to students, researchers, development specialists, and government officials and will ultimately contribute in some way to increased agricultural growth and enhanced food security in Ethiopia.

Acronyms and Abbreviations

AAU	Addis Ababa University
ADLI	Agricultural Development–Led Industrialization
AISCO	Agricultural Input Supply Corporation
AISE	Agricultural Input Supply Enterprise
AMC	Agricultural Marketing Corporation
BBC	British Broadcasting Corporation
BoARD	Bureau of Agriculture and Rural Development
CAADP	Comprehensive Africa Agriculture Development Programme
CES	constant elasticity of substitution
CET	constant elasticity of transformation
CFSTF	Community Food Security Task Force
CGE	computable general equilibrium
CGH	Coady–Grosh–Hoddinott
CLVI	Cuddy La Valle index
CPI	consumer price index
CRED	Centre for Research on Epidemiology and Disaster
CSA	Central Statistical Agency
CTF	community therapeutic feeding
CV	coefficient of variation
DA	development agent
DAP	diammonium phosphate
DFID	Department for International Development (UK)
DPPC	Disaster Prevention and Preparedness Commission
DREME	Dynamic Regional Economywide Model of Ethiopia
DRMFSS	Disaster Risk Management and Food Security Service
DS	direct support
EA	enumeration area
EARO	Ethiopian Agricultural Research Organization
E.C.	Ethiopian calendar
ECX	Ethiopian Commodity Exchange
EDRI	Ethiopian Development Research Institute

EFSRA	Emergency Food Security Reserve Administration
EFSS	Ethiopian Food Security Survey
EGB	Ethiopian Grain Board
EGC	Ethiopian Grain Council
EGS	Employment Generation Scheme
EGTE	Ethiopian Grain Trade Enterprise
EIAR	Ethiopian Institute of Agricultural Research
EOS	Enhanced Outreach Strategy
EPRDF	Ethiopian People's Revolutionary Democratic Front
ERHI	Ethiopia Regional Hunger Index
ERHS	Ethiopian Rural Household Survey
ERSS	Ethiopia Rural Smallholder Survey
ESE	Ethiopian Seed Enterprise
ESRC	Economic and Social Research Council
ESSP	Ethiopia Strategy Support Program
ETB	Ethiopian birr
EU	European Union
EW	early warning
FAO	Food and Agricultural Organization
FAOSTAT	FAO Statistical Database
FCU	foreign currency unit
FTC	farmer training center
GDP	gross domestic product
GIS	geographic information system
GoE	Government of Ethiopia
GTP	Growth and Transformation Plan
ha	hectare
HABP	Household Assets Building Program
HAP	high agricultural potential
HICES	Household Income, Consumption, and Expenditure Survey
HMA	high market access
IFPRI	International Food Policy Research Institute
KFSTF	Kebele Food Security Task Force
LAP	low agricultural potential
LIU	Livelihoods Integration Unit
LMA	low market access
masl	meters above sea level
mm	millimeter
MoA	Ministry of Agriculture
MoARD	Ministry of Agriculture and Rural Development
MoFED	Ministry of Finance and Economic Development
MoH	Ministry of Health
MPP-I	Minimum Package Program I

MPP-II	Minimum Package Program II
n.a.	not available
NAC	National Advisory Committee (ESSP)
NAEIP	National Agricultural Extension Intervention Program
NEPAD	New Economic Partnership for Africa's Development
NGO	nongovernmental organization
NPDPM	National Policy on Disaster Prevention and Management
OCHA	Office for the Coordination of Human Affairs
OFSP	Other Food Security Program
OTC	outpatient therapeutic care
PA	peasant association
PADEP	Peasant Agricultural Development Program
PADETES	Participatory Demonstration and Training Extension System
PASDEP	Plan for Accelerated and Sustained Development to End Poverty
PBM	parity-bound model
PIM	Program Implementation Manual
PPP	purchasing power parity
PSNP	Productive Safety Net Programme
PW	public works
R&D	research and development
RRC	Relief and Rehabilitation Commission
SAM	social accounting matrix
SG2000	Sasakawa Global 2000
SIDA	Swedish International Development Agency
SNNPR	Southern Nations, Nationalities, and People's Region
SWC	soil and water conservation
T&V	training and visit
TFP	total factor productivity
TLU	tropical livestock unit
TPLF	Tigray Peoples' Liberation Front
UK	United Kingdom
UN	United Nations
US	United States
USAID	United States Agency for International Development
US$	US dollar
VCR	value–cost ratio
WFP	World Food Programme
WFSTF	Woreda Food Security Task Force
WMS	Welfare Monitoring Survey

Glossary

aja	Amharic for Emmer wheat
ayib	traditional cheese
belg	secondary rainy season (February to May)
bereha	desert
Borana	an administrative zone in Southern Ethiopia, located on the border with Kenya
bulla	highest-quality processed *enset*
chat	a stimulant product
dega	highland agroecological zone (2,300 to 3,200 meters above sea level)
Derg	literally “committee”; Ethiopia’s ruling government, 1974–91
enset	“false banana” (*Ensete ventricosum*), a perennial tuber grown as a staple foodcrop, especially in southern Ethiopian highlands
ergo	sour milk
gebbar	private land ownership contracts
gult	grants of land given to individuals
injera	Ethiopia’s main national dish: a fermented pancake traditionally made with teff (although often made with cheaper grains)
kebele	the smallest administrative unit in the local government system
kocho	a bread made out of processed *enset*
kolla	lowland agroecological zone (less than 1,500 meters above sea level)
Megabit	March
meher	the primary rainy season and therefore the primary crop season
mengist	government
Meskerem	September
Nehase	August
neug	niger seed, a common oilseed crop in Ethiopia
ras	king (literally “head” in Amharic)
rist	a communal land tenure system

samon	land owned by the church
teff	a cereal crop related to millet (*Eragrostis tef*)
tsimdi	an amount of land equivalent to 0.25 hectare
weyna dega	midelevation agroecological zone (1,500 to 2,300 meters above sea level)
woreda	administrative level under the zone level
wurch	frost, or extremely highland area (3,200 to 3,700 meters above sea level)
Yekatit	February

Food and Agriculture in Ethiopia

1 Introduction

PAUL DOROSH AND SHAHIDUR RASHID

Ethiopia is often perceived as a country of droughts, widespread poverty, and economic stagnation. Indeed the country experienced severe famines in both the 1970s and the 1980s, which resulted in a depletion of household assets and savings and caused excess mortality, estimated at 250,000 in 1972–74 and 590,000 in 1984–85 (Africa Watch 1991; de Waal 1997).[1] More localized food shortages have often been less documented, such as the one in Somali region during 1999–2000 whereby an estimated 100,000 people died following three consecutive years of drought (Hammond and Maxwell 2002). Other serious production shortfalls related to droughts, such as that in 2003, significantly reduced the food production and consumption of millions of households. Moreover, even in normal years, the level of food insecurity is high, with an estimated 44 percent of the population undernourished, 35 percent of children under five years of age underweight, and 11 percent of children dying before the age of five (von Grebmer et al. 2010).

Yet much of Ethiopia differs sharply from the grim view suggested by these figures. Most of the rural population resides in rainfall-sufficient areas in which harvests are normal in most years. Nationally, the available data suggest that food production and availability are increasing due to increases in area cultivated and, in 2005–09, increases in yield. Outside the agricultural sector itself, massive investments in roads and the spread of cell phone technology have greatly increased access to markets, urban centers, services, and information for tens of millions of rural Ethiopians. And per capita incomes increased by over 50 percent from 2001 to 2009 (World Bank 2010).

Indeed, the reality of Ethiopia's agriculture and food security situation is complex because of variations across space within Ethiopia as well as variations over time due to changes in policies, weather shocks, and other factors. A complete picture of Ethiopia's agriculture and food security must include both

1. Estimates of famine deaths vary widely. The Centre for Research on Epidemiology and Disaster (CRED 2011) reports that 100,000 people died in the 1972–74 famine and 300,000 people died in 1984–85.

the very serious acute and chronic food insecurity problems faced by many Ethiopians and the progress achieved in other areas and at the national level.

Moreover, the country faces major strategic questions regarding the role of agriculture in its overall development strategy. Agricultural Development–Led Industrialization has been a foundation of government economic policy since 1992. Up until the early 2000s, however, the relative stagnation of cereal yields suggested to many that significant expansion of smallholder production (particularly for cereals) was severely limited by relative land shortage in the Ethiopian highlands, limited potential for irrigation, inadequate marketing infrastructure, and a weak seed sector. In addition, because of Ethiopia's high costs for transport and marketing both internally and to external international markets, neither export nor import trade is profitable for most cereals (though imported wheat has been an exception in some years). Thus, there has been concern that agricultural growth alone (even with sizable growth linkages to the nonagricultural sector) cannot generate sufficient domestic demand to keep agricultural prices from falling substantially and putting a brake on further growth (World Bank 2006; Dercon, Hill, and Zeitlin 2009).

The official Central Statistical Agency (CSA) data indicating large increases in both cereal area cultivated and yields from 2003–04 to 2009–10 (Ethiopia, CSA 2005–10) have not settled the debate, however. The manner in which this gain in cereal productivity has been achieved remains a puzzle given land constraints, the uncertain effectiveness of agricultural extension, and the slow dissemination of improved seed varieties to complement increased fertilizer use (Dercon, Hill, and Zeitlin 2009). Equally important for future policy are whether further gains in productivity are realistic and the extent to which future agricultural growth can generate sufficient income growth (in both the agricultural and the nonagricultural sectors) to ensure there is sufficient demand to prevent a price collapse.

This book is designed to inform this policy debate by documenting the state of the agricultural and food economy of Ethiopia through the first decade of the 2000s and to highlight major structural features that will greatly influence the outcome of future development strategies in Ethiopia. In showing the complexity of Ethiopian agriculture, ongoing constraints to growth, the substantial progress achieved, and the scale of the food security challenge that remains, the book can provide a solid foundation for students, researchers, policy analysts, and decisionmakers. It builds on previous research documenting Ethiopia's political, economic, and agricultural transformation while aiming to provide a realistic and balanced foundation for the key aspects of major food policy issues in Ethiopia. It extends the discussion presented in *People of the Plow* (McCann 1995) to assess the dramatic investments in infrastructure and agricultural development (that have occurred since 1990) on current economic growth. Overall, the tone of the book is cautiously optimistic, bearing in mind the trends and manifestations of previous food shortages and mismanaged food policy decisions documented in *Famine and Food Security in Ethiopia* (Webb and von Braun 1994).

The Long Path from Famine to Food Security

Although Ethiopia has experienced major food production shortfalls over the past two decades, it has managed to avoid large-scale, countrywide famines such as those in 1972–74 and 1984–85 (Table 1.1). In part, this can be explained using the lens of the basic components of food security: availability, access, and utilization (nutrition). The occurrence of a famine—a complete collapse in food security on a large scale—however, involves much more than the proximate cause of a drought or other disruption in food supply. A complex interaction of short- and long-term policies related to agricultural investments and markets, capacities of the government to respond, household coping strategies,

TABLE 1.1 Summary of major historical events in Ethiopia, 1890–2010

Time frame	Event
March 1896	Ethiopian army under Menelik II defeats Italian troops at the Battle of Adwa
March 1929	Ras (King) Tafari proclaimed as Emperor Haile Selassie
1936–41	Ethiopia occupied by Italian troops; Ethiopian imperial family exiled
1972–74	Droughts and famine in northern Ethiopia and parts of south[a] cause quarter million deaths
September 1974	Haile Selassie deposed by the military
1974–91	Mengistu Haile Mariam leads Derg government; state takes ownership of private land and enterprises
1984–85	Droughts and famine cause 1 million deaths
May 1991	Mengistu flees Ethiopia; Ethiopian People's Revolutionary Democratic Front (EPRDF) troops enter Addis Ababa
1991–present	EPRDF government led by Meles Zenawi
May 1993	Eritrea declares its independence following a referendum
May 1998–June 2000	War between Ethiopia and Eritrea
2005	Violence erupts after national elections
2005–10	Five-year plan: Plan for Accelerated and Sustained Development to End Poverty
2010	EPRDF wins national elections; new five-year Growth and Transformation Plan announced

SOURCES: Authors; Webb and von Braun (1994); Marcus (2002).

[a]Harerge, Bale, Sidamo, and Gamo Gofa regions.

and other factors were key to Ethiopia's previous famines. Moreover, chronic malnutrition and periodic localized severe food insecurity continue to affect tens of millions of Ethiopians.[2]

Adequate availability (supply) of food is a necessary but not sufficient condition for food security. Production shortfalls related to drought directly threaten food supply, but increases in public interventions (including distribution of food aid) and private trade can prevent a major decline in food supply. Even when there is adequate availability at the national or local level, poor households often do not have adequate access to food because they lack sufficient entitlements to food—that is, legal means to acquire sufficient food—such as their own production of food, other earned incomes, gifts, and government transfers.[3] In addition to availability and access, food security of individuals depends on their utilization of food (the amounts and types of food they eat) and various factors affecting the body's capacity to absorb nutrients, which in turn affect overall health. Thus, adequate nutritional outcomes for individuals depend not only on consumption of macronutrients (calories, proteins, and fats and oils) or micronutrients (for example, iron, vitamin A, and iodine) but on whether diarrheal disease or other health problems inhibit effective absorption of nutrients.[4]

The large-scale famines in Ethiopia in 1972–74 and 1984–85 involved collapses of all three components of food security. In both cases, droughts played a key role in reducing production and availability, and food aid and other imports were insufficient to offset the losses. But other broad factors were also major causes of these famines, including key government policies. In the case of the 1984–85 famine, military conflict, government policies on land reform and investment, and market failures were instrumental (Webb and von Braun 1994). Ongoing wars against the federal government by regional armies resulted in loss of life and serious injuries.[5] These conflicts also reduced the labor available for crop cultivation and diverted scarce public resources away from needed investments in agriculture, roads, telecommunications, and emergency response programs. Government land reform policies abolished private landownership in 1975 and placed ceilings on rights of access to private land, imposing a limit

2. Chapter 9 of this book provides an overview and chronology of food security and famine in Ethiopia since 1888, as well as the medium- and long-term policy forces behind food shortages and emergencies.

3. The concept of entitlements is due to Amartya Sen and his work on the Great Bengal Famine, which argued that the famine was due largely to a loss of purchasing power (entitlements) of many poor households rather than to a shortfall in supply of food. See Sen (1981).

4. See Devereux and Maxwell (2001) for a more detailed summary of the various aspects of food security.

5. The armies involved were those of the Eritrean People's Liberation Front and the Tigray Peoples' Liberation Front.

of 10 hectares per farm. Public investment in agriculture was allocated mainly to state farms and producer cooperatives instead of independent small farmers. Finally, market restrictions (regulation of and bans on interregional movement of grain and labor) forced sales of private traders' grain to the Agricultural Marketing Corporation at low fixed prices, and poor market infrastructure also contributed to a lack of market integration.

Since the 1984–85 famine, and particularly following the fall of the Derg regime in May 1991, government policy in Ethiopia has included substantial liberalization of agricultural markets, investment in agricultural research and extension, building of key transport infrastructure, and establishment of the Productive Safety Net Programme. These policy developments have contributed to major increases in national food production and enhanced food security. Production of the major cereals increased substantially in the 1990s and the first decade of the 2000s. Although increases in area cultivated accounted for most of the production increase from 1991–92 through 2003–04, yield increases have accounted for about half of the more recent surge in cereal production from 10 million metric tons in 2003–04 to more than 14 million metric tons in 2008–09.[6] Growth in production during the 1990s was nearly 2 percent lower than production gains during the 2000s. Growth in the area cultivated was near 6 percent in the 1990s, with insignificant yield increases, whereas in the 2000s improved intensification and yield growth of 3.5 percent were recorded, with an average area increase of 3 percent. Nationally, the proportion of people below the poverty line decreased from 45 percent in the mid-1990s to 39 percent in 2005. Rural poverty rates dropped from 48 to 39 percent, although the urban poverty rate rose slightly, from 33 to 35 percent, in the same period (Ethiopia, MoFED 2008). Nonetheless, according to estimates from 2005 national household survey data, the level of malnutrition in Ethiopia remains very high: an estimated 44 percent of the population in the country consumes fewer calories than the minimum dietary requirement (Schmidt and Dorosh 2009; von Grebmer et al. 2010).

The Historical and Geographical Context

Ethiopia's current food security and prospects for the future are very much shaped by the geography and history of the country. Located in East Africa, with borders connecting it to Sudan, Eritrea, Djibouti, Somalia, and Kenya, Ethiopia has been a landlocked country since the independence of Eritrea in May 1993. Geographically, Ethiopia is commonly described as "Three Ethiopias": the dry, semiarid lowlands that dominate the eastern third of the country; the rainfall-sufficient (mainly highland) areas in the western third of the coun-

6. All tons in this book are metric tons.

try; and the drought-prone highlands in northern and central Ethiopia. Most of the population resides in the latter two broad areas.[7] Throughout the country, the population is more concentrated along major road networks, but much of Ethiopia's population remains remote: 45 percent of the population lives more than five hours from a city of 50,000 (Schmidt and Kedir 2009).

These variations in geography and agroclimatic zones have important implications for the food economy of Ethiopia. The rugged terrain in much of the highlands makes transport and communication difficult. Rainfall varies significantly between mountains and valleys, even across short distances. With these large variations in altitude, rainfall, and connectivity, cropping patterns also vary sharply, and no single crop dominates Ethiopia's food consumption, as does rice in much of Asia, maize in Latin America, or wheat in many cooler climates. Instead, five cereals are cultivated on a wide scale: teff (an indigenous crop widely grown only in Ethiopia and Eritrea), wheat, maize, sorghum, and barley. Coffee, cultivated in the rainfall-sufficient southern highlands, is Ethiopia's major export crop. Livestock—mainly cattle, sheep, and goats—are the major sources of meat and livelihood of the pastoralist and agropastoralist populations.

Ethiopia's recorded history dates to a biblical account of a visit by the Queen of Sheba to King Solomon of Israel (10th century BC). According to the Kebre Negast (The glory of the kings), a history written in Ge'ez in the 14th century AD, King Solomon and Queen Makeda's son became Emperor Menelik I, Ethiopia's first emperor.[8] From the 1st to the 6th century AD, the kingdom of Axum in northern Ethiopia (in today's Amhara region) was a major economic and military power in the region, with significant interactions with Egypt and the Middle East. Until the 19th century, however, what is today Ethiopia was divided into small subnational groups, which in the highlands were each ruled by their own *ras* (literally, "head"). A series of emperors in the 19th century—Tewodros II (1855–68), Yohannes IV (1872–89), and finally Menelik II (1889–1913)—gradually united more and more groups, extending their control to most of the Ethiopian highlands by the end of the 20th century.

Ethiopia avoided colonization in the 1900s through a combination of the military advantages of defensive positions in the highlands, defeat of an Italian army at the Battle of Adwa in March 1896, and deft diplomacy under Menelik II that played British, French, and Italian interests against one another. Ethiopia retained its independence under Haile Selassie (crowned emperor in 1929),

7. Administratively, Ethiopia is divided into 11 regions largely based on ethnic groups, including three urban administrative areas (Addis Ababa, Dire Dawa, and Harari); the major regions are further subdivided into zones, *woredas*, and *kebeles*. To avoid confusion, this book uses the terms *regions* or *zones* only when referring to actual administrative areas.

8. Marcus (2002). See also Zewde (2002).

though it was occupied by the Italian army during World War II (from 1936 to 1941).

Under the long reign of Haile Selassie Ethiopia began to modernize, but rural Ethiopia, in general, remained isolated and very poor. Most land was formally owned by the state, churches, and the rural elite, with significant rents due from private small farmers for use of the land. There were few paved roads in the country. The electricity-generating capacity was only 4.7 watts per person nationally in 1972, and almost no electricity was available outside of a few major cities.

A series of droughts contributed to famines in much of Ethiopia from 1972 to 1974, and as the economic and social situation worsened, a group of officers later known as the Derg ("committee" in Amharic) gradually gained more power. Haile Selassie was increasingly seen as being out of touch with the suffering of the Ethiopian people, particularly after a television report by the British Broadcasting Corporation, originally aired in Britain in October 1973, was re-edited and shown in Ethiopia, showing scenes of the emperor feeding his dogs along with horrific scenes of famine in Wollo (northern Ethiopia).[9] The aging emperor was finally deposed on September 12, 1974, and ultimately succeeded by Mengistu Haile Mariam, who took power formally in 1977.

Under the Derg, Ethiopia adopted socialist economic policies, nationalizing land and private businesses and placing greater controls on markets and prices. Agricultural investments focused on large state farms. When a severe drought hit much of Ethiopia in 1984, a famine ensued. Although the international community responded with millions of dollars of food aid and other relief through various charity events and programs,[10] the famine led to more than half a million deaths.

The Derg regime nonetheless survived until 1991, when it was overthrown by forces of the Ethiopian People's Revolutionary Democratic Front (EPRDF), which marched on Addis Ababa from the north. The new government, led by Meles Zenawi, subsequently adopted a more liberal economic policy, allowing private-sector markets to operate more freely.

Eritrea, up until that point the northernmost part of Ethiopia, seceded in May 1993 following a referendum on independence. Initially, relationships between the two countries were peaceful, but a war confined largely to Eritrean territory broke out and lasted from May 1998 to June 2000. Since that time, economic and diplomatic ties have been disrupted, depriving Ethiopia of its only ports (Mitsiwa and Aseb on the Red Sea coast).

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9. Gill (2010, 34–35).

10. These charities and events included Band Aid, formed by Bob Geldof in 1984; USAID (United States Agency for International Development) for Africa, for which Michael Jackson and Lionel Ritchie wrote "We Are the World"; and the Live Aid concerts held in 1985 in London and Philadelphia (Gill 2010, 12–13).

After the downfall of the Derg, Meles and the EPRDF won national elections in 1995 and 2000 by wide margins. The 2005 elections were very close, however, and violence erupted following announcement of the EPRDF victory. The EPRDF won handily in 2010, but Prime Minster Meles died soon thereafter, in July 2012.

Economic Reforms and Outcomes in the 1990s and 2000s

The immediate post-Derg period of the mid-1990s was marked by administrative decentralization in 1992 and substantial liberalization of the economy as restrictions on domestic food markets were removed, private enterprise was encouraged, export taxes were eliminated, and the currency was devalued by more than 100 percent in 1993 (from 2.5 to 5.5 birr/US$). Moreover, a new development strategy, Agricultural Development–Led Industrialization (ADLI), announced in 1992, dramatically shifted the focus of government investments away from industry and large farms to support broad-based growth of smallholder agriculture. This emphasis on smallholder agriculture based on the ADLI approach continued with the Sustainable Poverty Reduction Strategy of 2002 (Ethiopia, MoFED 2002) and the Plan for Accelerated and Sustained Development to End Poverty in 2006 (Ethiopia, MoFED 2006). In further support for private markets, the Ethiopian Commodity Exchange was launched in 2008, designed to provide a transparent and efficient market for agricultural products.

Economic liberalization in Ethiopia did not mean a complete withdrawal of the government from markets. Although initially the government liberalized the fertilizer sector, the market shares of individually owned private firms dropped from 30 percent in 1995 to zero in 1999. According to Jayne et al. (2003), these firms were replaced by "private" holding companies in 1999, which continued to dominate markets until 2007. Since 2008, the import of fertilizer has been controlled by the Agricultural Input Supply Enterprise, and the distribution is carried out by the cooperative unions.[11] In addition, land markets were not liberalized but rather remained under state control, with farmers receiving usufruct rights to agricultural land. The Ethiopian Grain Trading Enterprise, a public marketing enterprise, was established in 1992 to stabilize grain prices, though the volumes of its commercial imports, domestic purchases, and sales have been small relative to the overall cereal markets. More important have been public imports of food aid, generally distributed as direct transfers to households until the advent of the Productive Safety Net Programme in 2005, which introduced a work requirement for able-bodied individuals as a condition of food or cash transfers. In addition, a dramatic rise in domestic inflation in 2007 and 2008 led to occasional crackdowns on private traders deemed to be hoarding commodities or charging excessive prices.

11. Chapter 4 discusses these issues in greater detail and examines the systems and markets for seed, fertilizer, and extension in Ethiopia.

Overall, Ethiopia's economic performance in the past two decades has far surpassed its performance in the 1970s and 1980s. Real gross domestic product (GDP) grew only 1.2 percent between 1981 and 1991 but has since accelerated to 4.3 percent from 1991 to 2001 and to 8.2 percent from 2001 to 2009 (1.2). Over these three decades, the total population has more than doubled, from 36.3 million in 1981 to 82.8 million in 2009, though population growth slowed from 3.3 percent per year in the 1980s to 3.0 percent in the 1990s and 2.6 percent in the 2000s. Thus, per capita GDP, which fell by 2.0 percent per year in the 1980s, rose by 1.3 percent per year in the 1990s and 5.4 percent from 2001 to 2009. In constant (2000) US dollars, per capita GDP in 2009 is estimated at $201, which is almost 75 percent higher than the per capita GDP of $116 in 1991.[12]

Agricultural growth has made a major contribution to Ethiopia's impressive overall growth performance, accelerating from 1.3 percent per year in the 1980s to 2.9 percent in the 1990s to 6.2 percent in the 2000s (see Table 1.2). Nonetheless, the industrial sector (which includes processing of agricultural goods) and services grew even more rapidly than did agriculture. In fact, the share of agriculture in national GDP fell steeply between 1991 and 2001, from 64.1 percent to 47.7 percent (and to 47.3 percent in 2009).

Substantial investment, which increased from 11.1 percent of GDP in 1991 to over 20 percent in 2001, has been a major source of growth. Most of this investment, however, has been financed by foreign capital inflows and transfers (workers' remittances and private transfers). Gross domestic savings was only 9.7 percent of GDP in 2001 and just 2.3 percent of GDP in 2009.

Up until 2007, Ethiopia enjoyed considerable macroeconomic stability in the post-Derg period. Inflation, which averaged 7.0 percent per year in the 1980s, fell to 3.0 percent per year in the 1990s. Inflation surged to an annual average of 44 percent in 2008, though, as Ethiopia's money supply and international energy prices increased sharply. Tight monetary policy in late 2008 contributed to a sharp decline in inflation in 2009 and 2010, and a gradual depreciation of the birr relative to the US dollar and other currencies restored the real exchange rate to its levels of the early 2000s by mid-2010 (Ahmed and Dorosh 2009). The subsequent 19 percent devaluation of the birr from 14.1 to 16.8 birr/US$ between August and September 2010 further improved the incentives for production of tradable goods in Ethiopia's economy and may have signaled a greater emphasis on incentives for long-term economic growth.

Other economic and social indicators generally paint a picture of substantial progress in Ethiopia over the past two decades as well (Table 1.3). The country's electricity-generating capacity and the number of kilometers of paved roads increased by 123 and 52 percent, respectively, between 1991 and 2009. Most of the population still resides in rural areas, though the rate of urbanization (as measured using the official administrative definition) increased from only

12. All dollar amounts in this book are US dollars.

TABLE 1.2 Ethiopia: Selected economic variables, 1981–2009

					Annualized growth rate (percent)		
Variable	1981	1991	2001	2009	1981–91	1991–2001	2001–09
Population (millions)	36.3	50.0	67.3	82.8	3.3	3.0	2.6
GDP (constant 1980 US$, millions)	5,147	5,789	8,859	16,623	1.2	4.3	8.2
GDP per capita (constant 2000 US$)	141.9	115.9	131.7	200.7	–2.0	1.3	5.4
GDP (constant 1980 birr, billions)	41.9	47.2	72.2	135.5	1.2	4.3	8.2
Agricultural GDP (constant 1980 birr, billions)	22.4	25.6	34.1	55.0	1.3	2.9	6.2
Share of agriculture (percent of GDP)	60.7	64.1	47.7	47.3	0.5	–2.9	–0.1
Share of industry (percent of GDP)	10.6	8.7	13.0	14.1	–2.0	4.1	1.0
Share of manufactures (percent of GDP)	4.9	3.0	5.7	5.2	–4.7	6.5	–1.3
Share of services (percent of GDP)	28.8	27.3	39.3	38.6	–0.5	3.7	–0.2
Gross domestic savings (percent of GDP)	10.2	6.0	9.7	2.3	–5.2	5.0	–16.3
Gross capital formation (percent of GDP)	14.5	11.1	21.5	20.5	–2.7	6.8	–0.6
Exports of goods and services (percent of GDP)	7.6	4.1	12.0	9.9	–6.1	11.4	–2.3
Imports of goods and services (percent of GDP)	11.9	9.2	23.7	28.1	–2.6	10.0	2.1
Official exchange rate (birr/US$)	2.1	2.1	8.5	10.7	0.0	15.1	3.0
Consumer price index (2005 = 100)	27.3	53.8	72.5	206.2	7.0	3.0	14.0

SOURCE: World Bank (2010).

NOTE: GDP = gross domestic product.

TABLE 1.3 Ethiopia: Selected economic and social indicators, 1981–2009

					Annualized growth rate (percent)		
Indicator	1981	1991	2001	2009	1981–91	1991–2001	2001–09
Paved roads (thousands of kilometers)	n.a.	28.0	31.4	42.4	n.a.	1.2	3.8
Electricity-generating capacity (thousands of kilowatts)	175.5	331.5	417.0	737.7	6.6	2.3	7.4
Urban population (millions)	3.9	6.4	10.2	13.7	5.3	4.7	3.8
Urbanization rate (percent of population)	10.6	12.9	15.1	17.0	1.9	1.6	1.5
Life expectancy at birth (years)							
Females	45.2	48.9	53.4	56.7	0.8	0.9	0.7
Males	42.3	45.9	50.3	53.8	0.8	0.9	0.8
Total	43.7	47.4	51.8	55.2	0.8	0.9	0.8
Poverty headcount (percent) at US$1.25 a day (PPP)[a]	66.2	60.5	55.6	39.0	–0.4	–1.0	–3.3
Poverty headcount (percent) at US$2 a day (PPP)	89.9	84.6	86.4	77.6	–0.4	0.4	–1.8

SOURCE: World Bank (2010).

NOTES: Life expectancy at birth for 2009 is based on 2008 data; paved roads figure for 2009 is based on 2007 data; n.a. = not available; PPP = purchasing power parity.

[a]Poverty headcount data are for 1982, 1995, 2000, and 2005. Figures for changes in poverty are percentage points per year.

10.6 percent in 1981 to 17.0 percent in 2009. Life expectancy at birth rose from 42.3 to 53.8 years for males and from 45.2 to 56.7 years for females over the same period. Poverty estimates are not available for all years, but the available data also show a steady improvement in that area. World Bank (2010) estimates show the poverty headcount falling from 66.2 percent in 1982 to 60.5 in 1995 to 55.6 in 2000, followed by an even steeper drop to 39.0 percent in 2005.[13] Unfortunately, no nationally representative survey has been conducted since 2005, but the high reported levels of agricultural and overall GDP growth suggest that poverty rates may have continued to decline.

Regional Comparisons

Ethiopia is vastly different from its neighbors, particularly in terms of its large land area and population and its widely varying ecologies. Nonetheless, comparisons with neighboring countries provide a useful perspective on the huge development challenge facing the country.

Ethiopia has the largest population in the region (82.8 million people in 2009), approximately double that of Sudan and Kenya (42.3 and 39.8 million, respectively) and nine times larger than that of Somalia (9.1 million) (Table 1.4). In spite of the rapid economic growth of the past two decades, however, Ethiopia remains one of the poorest countries in East Africa. Ethiopia's growth in GDP per capita outpaced that of neighboring countries in the 2000s (5.7 percent per year compared to 4.3 percent in Uganda and 2.6 percent in Sub-Saharan Africa as a whole). Yet it remains one of the poorest countries in the region, with a GDP per capita of only $201 (2000) per person in 2009, 45 percent less than that of Uganda ($366 [2000] per person), less than half that of Kenya or Sudan, and less than one-third the average for Sub-Saharan Africa ($620 [2000] per person). Eritrea, Ethiopia's small neighbor to the north (population 5.1 million), is much poorer than Ethiopia, though, with a GDP per capita of only $130 (2000) per person.[14]

Agriculture accounts for a much higher share of GDP in Ethiopia (47.3 percent) than in neighboring Kenya (22.6 percent), Sudan (29.7 percent) or Uganda (24.7 percent) (see Table 1.4). This, in large part, reflects the low rate of industrialization and urbanization of Ethiopia relative to its neighbors. Few data are available on poverty for any of the countries in the region. Using a poverty line of $1.25 a day purchasing power parity, the World Bank estimates Ethiopia's poverty rate at 39 percent for 2004/05. Kenya's poverty rate was almost exactly half of Ethiopia's (19.7 percent); Uganda's poverty rate was higher than Ethiopia's (51.5 percent). Note, though, that poverty figures vary

13. Measured at the US$1.25-per-day poverty line.

14. For most countries of eastern Africa, and especially for Eritrea and Somalia, economic data are very scarce, adding considerable uncertainty to cross-country comparisons.

TABLE 1.4 East African countries: Selected indicators, 2009

Indicator	Ethiopia	Eritrea	Kenya	Somalia	Sudan	Uganda	Sub-Saharan Africa
Population (millions)	82.8	5.1	39.8	9.1	42.3	32.7	840.3
Population growth rate (percent, 2000–09)	2.6	3.8	2.7	2.4	2.1	3.3	2.5
GDP per capita (constant 2000 US$)	201	130	452	n.d.	536	366	620
GDP per capita growth rate (percent, 2000–09)	5.7	–3.3	1.7	n.d.	5.0	4.3	2.6
Agriculture, value-added (percent of GDP)	47.3	14.4	22.6	n.d.	29.7	24.7	12.3
Poverty headcount ratio at US$1.25 a day (PPP)	39	n.d.	19.7	n.d.	n.d.	51.5	n.d.
Hunger index	29.8	35.7	19.8	n.d.	20.9	15	21.7
Undernourished population	44	66	30	n.d.	20	15	27.5
Underweight children under five years of age	34.6	35.3	16.5	32.8	31.7	16.4	23.6
Under five mortality rate	10.9	5.8	12.8	20	10.9	13.5	14.0

SOURCES: von Grebmer et al. (2010); World Bank (2010).

NOTES: Data on the poverty headcount ratio for Ethiopia and Kenya are for 2005; data on GDP (gross domestic product) per capita for Eritrea are for 2008, and the growth rate is for 2000–08; n.d. = no data for the country.

widely depending on the poverty line used (the Ethiopian government does not use the $1.25-per-day poverty line in its official poverty estimates).

The estimated percentage of the population consuming inadequate calories in Ethiopia (44 percent) is significantly higher than that of Kenya (30 percent) and almost three times higher than that of Uganda (15 percent) but only two-thirds the rate in Eritrea (66 percent). Similarly, the percentage of children under five years of age who are underweight is more than double that of Kenya or Uganda (34.6 percent, as compared to 16.5 and 16.4 percent in the latter two countries). The under-five mortality rate, which is affected heavily by the incidence of malaria and other diseases as well as food intake, is lower in Ethiopia (10.9 percent) than in Kenya or Uganda, however, and below the rate for Sub-Saharan Africa (14.0).

The Plan of the Book

Part I of the book presents an overview and analysis of Ethiopia's food economy. Key to an understanding of the complex food production systems of a country as large as Ethiopia are the various development domains, as determined by agroecology, settlement patterns, and road networks (Chapter 2). Given the wide variations in elevation, rainfall, and market access in the country, patterns of crop production often vary sharply across short distances. Yet overall cereal production increased rapidly in the 2000s in much of the country due to both area and yield expansion (Chapter 3). Though increasing, the use of modern inputs such as fertilizer and improved seeds remains considerably low. In 2007/08, only about 40 percent of the total land allocated to cereal cultivation benefited from chemical fertilizers, and most of these chemical fertilizers went to maize and wheat. Besides, the amount of land in cereal cultivation declined from 2001/02 to 2007/08. The use of improved seeds in 2007/08 was negligible; they were applied over about 5 percent of the total cereal acreage.[15] In addition, irrigation has seldom been employed, with only 1 percent of cereal acreage irrigated in 2007/08. Expanded use of fertilizer is one major factor behind increases in land productivity, though the level of use of improved seeds remains low and indeed has suffered setbacks in recent years (Chapter 4).

Increased cereal production has greatly increased market volumes, and there is substantial evidence of greater market integration across major wholesale markets and reduced marketing costs and margins, in part due to investments in roads and improvements in telecommunications (Chapter 5). In addition, livestock (mainly cattle, sheep, and goats) and dairy also play major roles in Ethiopia's food economy and fulfill an important function in coping with

15. This low figure for improved seed use is based on official CSA farmer survey estimates that likely do not include seed of improved, open-pollinated varieties saved from their own previous year's harvest. Overall, some estimates suggest that the use of improved seed for wheat and maize cultivation may be as much as 50 to 70 percent (see Chapter 4, "Improved Seed Adoption," pp. 92–94).

shocks, accumulating wealth, and serving as a store of value in the absence of credit and savings markets. Yet, productivity in the livestock subsector in Ethiopia lags behind those in both its neighbors in East Africa as well as the least developed countries, and import bans by the Arab States of the Persian Gulf in some years resulted in major suffering for livestock keepers in both pastoral regions and central highlands. Thus, understanding the causes of low productivity and the problems with marketing is essential for appropriate policy formulation (Chapter 6).

Overall, gains in agricultural production and improvements in markets have contributed to increases in household consumption and reductions in poverty (Chapter 7). The wide diversity in consumption patterns across regions of Ethiopia and the tendency for nearly all household groups to consume more than just one cereal (as well as *enset,* especially in the Southern Nations, Nationalities, and People's Region) reduce reliance on a single staple and thereby reduce the risks associated with failure of a single crop. For pastoralists and agropastoralists in dry lowland parts of Ethiopia, livestock products (including dairy) are major sources of calories and incomes, but both poor and nonpoor households purchase a large share of their food.

Part II of the book discusses major agricultural and food policy interventions and includes a concluding chapter on key policy issues facing Ethiopia today. Like most other Sub-Saharan African countries, Ethiopia has committed itself to investing in sustainable agricultural growth as part of the Comprehensive Africa Agriculture Development Programme. Economywide analysis of continued gains in agricultural productivity (Chapter 8) shows not only that effective agricultural investments lead to gains in production levels that benefit net buyers but also that there is sufficient demand for food products to keep agricultural prices from falling so rapidly as to impoverish surplus-producing farmers. Assuming that agricultural growth reaches 6 percent per year, model estimates suggest that overall GDP growth will increase by 1 percentage point per year. This higher growth rate would lift an additional 3.7 million people above the poverty line by 2015. The model results also show, however, that rapid non-agricultural growth can produce similar reductions in overall poverty. Nonetheless, in the absence of effective disaster response policy and safety nets, increases in production and moderate reductions in food prices are not sufficient to substantially increase food security for many asset-poor households. Private-sector imports have been discouraged through restrictions on foreign exchange and uncertainties regarding government policy actions and food aid; as a result, public cereal stocks and food aid continue to be the major mechanisms for disaster response and cereal price risk management in Ethiopia (Chapter 9). Yet the success in addressing disasters cannot be attributed merely to cereal stocks and food aid. A key aspect of the country's success in addressing emergencies has been institutional development that has included well-managed grain reserves, early warning systems, and coordination between grain stocks and safety net programs, as well as innovative safety nets and overall improvements in emergency management. In an effort to improve food security among the most vulnerable, the Productive Safety Net Programme (PSNP) aims to target the poor (in terms of assets and income) for a public works program and food-insecure households for a direct support program. Findings suggest that the PSNP has been able to target resources to the poorest households in rural areas using a combination of geographic and community-based targeting and that, compared to other safety net programs, the PSNP is better at supporting its desired population (Chapter 10).

Finally, in spite of the enormous progress of the past two decades, Ethiopia continues to face key challenges to raising incomes, reducing poverty, and achieving food security for all. Chapter 11 summarizes the key findings of the book and places them in the context of major policy choices regarding raising agricultural productivity, reducing poverty and chronic food insecurity, and instilling mechanisms to prevent severe increases in transitory food insecurity caused by droughts and other production and market shocks.

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PART I

Overview and Analysis of Ethiopia’s Food Economy

2 Ethiopian Agriculture: A Dynamic Geographic Perspective

JORDAN CHAMBERLIN AND EMILY SCHMIDT

The opportunities and constraints facing Ethiopian agriculture are strongly influenced by geographical location. Ethiopia's diverse landscape defines certain agricultural production potentials, access to input and output markets, and local population densities, which determine both labor availability and local demand for food. Understanding the geographical expression of Ethiopia's agricultural and rural development options provides greater information for more locally targeted policy options.

These conditions not only vary over space but change over time as well. New and improved roads, greater telecommunications, improved access to electricity, and ongoing urban growth continue to lower transaction costs and improve market access. Evolving production opportunities and technologies continue to provide greater flexibility of livelihood decisions within defined biophysical endowments. As Ethiopia continues to invest in infrastructure and technology, its agricultural landscape continues to be reshaped and redefined into broader areas of opportunity and growth.

The objectives of this chapter are twofold. First we provide an overview of the geographical features that constitute a basic reference for understanding production systems and the geography of agricultural production in rural Ethiopia. This characterization is organized around the economic logic of comparative advantage for a variety of generalized production decisions of relevance in Ethiopia. Second we extend this framework to organize evidence for and discussion of important areas of dynamism in Ethiopia's rural economic landscape, including a discussion of land tenure policy and its effects on the level of investments in the agricultural sector. Thus, this chapter is mainly a descriptive assessment of important production contexts and the manner in which these contexts are evolving.

Characterizing Production Contexts

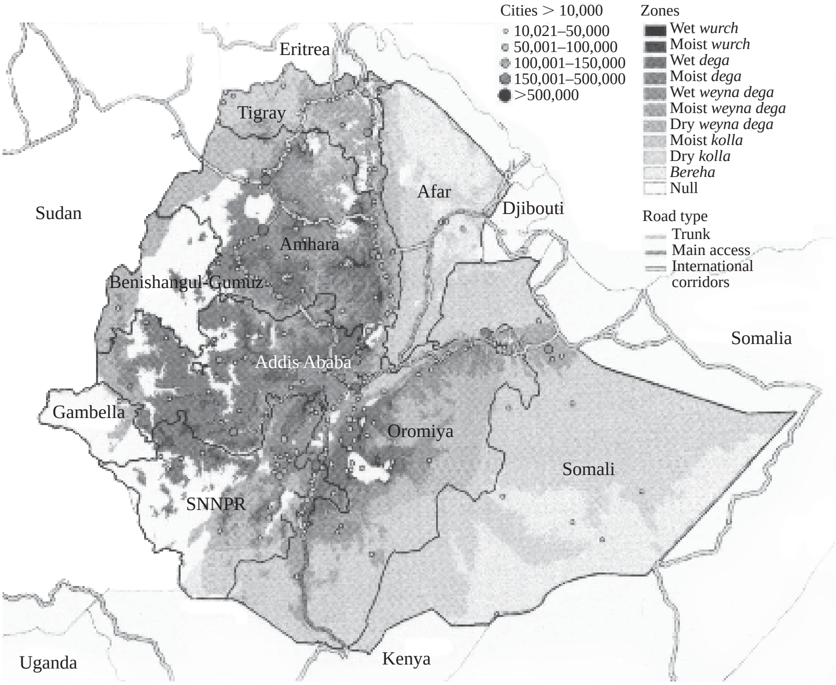
In large and heterogeneous countries such as Ethiopia, agricultural potential is unevenly distributed over space, and the distribution of production patterns reflects this landscape. Mapped zones of smallholder production systems have long been recognized as important in Ethiopia precisely because of such landscape heterogeneity (for example, Westphal 1975; De Pauw and Bruggeman 1988; Hurni 1998). To provide a useful characterization of agricultural landscapes, geographical perspectives seek a balance between too little information and too much. On the one hand, spatial characterization is motivated by the fact that average national statistics and one-size-fits-all development strategies are insufficient for effective rural planning. On the other hand, a surfeit of detail may render mapped classifications useless for planning on the basis of shared conditions: hundreds of subcategories, whether on a map or in a table, even when they accurately portray local variation, usually contain too much information to be tractable as a planning aid. Thus, characterizations generally seek to reduce complexity by prioritizing characteristics that are most meaningful to the production systems of interest.

Agroecological zones are perhaps the predominant methodology used to understand actual and potential agricultural production across geographic space. Agroecological zonation uses biophysical attributes of soil, terrain, and climate to organize land-use types or production systems into relatively homogenous units (FAO 1978; Hurni 1998). Hurni (1998) implemented a set of agroecological zone definitions for Ethiopia based on traditional zone designations widely used by rural residents. He linked these designations with specific elevation and rainfall parameters, which allowed mappable boundaries to be imposed on agroecological zones (Figure 2.1).

In Ethiopia most agricultural production takes place in the *weyna dega* and *dega* zones (highland areas from 1,500 to 2,300 and from 2,300 to 3,200 meters above sea level), where land productivity has traditionally coincided with the densest rural populations. Figure 2.1 shows these zones in midtone gray, scattered throughout the highlands. Specific crops and livelihood choices within and outside this band are conditioned by moisture and temperature regimes, among other factors. The crops most suited to grow in the *weyna dega* and *dega* zones are also the most commonly produced crops in Ethiopia. Most producers in these zones are smallholders occupying less than a hectare of land per household on average.[1] Smallholder production is dominated by five major cereal crops accounting for almost three quarters of the total cultivated area and about 68 percent of total production. Each of the major cereals—teff, maize, wheat, sorghum, and barley—has its own distribution, defined primarily by bioclimatic ranges (Table 2.1).

1. Information in this section, unless otherwise cited, is from the *Atlas of the Ethiopian Rural Economy* (Ethiopia, CSA; IFPRI; and EDRI 2006), whose agricultural data are drawn primarily from the 2001/02 Ethiopian Agricultural Sample Enumeration.

FIGURE 2.1 Characteristics of rainfall and altitude



SOURCE: The agroecological zones depicted here are according to Hurni's (1998) characterization.

Biophysical Envelopes of Ethiopian Staple Crops

Rural livelihoods are strongly influenced by environment because biophysical conditions and cropping patterns vary widely across Ethiopia (Figure 2.2). Non-biophysical factors, such as access to markets, labor availability, local demand (and markets) for food, and export linkages, may impose additional limitations on locally viable production options. Here we briefly describe some of the major crops—cereals, tubers, and pulses—that make up the Ethiopian agricultural economy, emphasizing the conditions under which they are produced.

Teff (*Eragrostis tef*) is the preferred staple food in much of the highlands. It is grown by nearly half of all farming households (to a greater extent if only highland households are considered) and accounts for 28 percent of all cultivated land, more than any other single crop. Although traditionally grown in the highlands, teff can be grown under a wide variety of agroclimatic conditions, including elevations from zero to 2,800 meters above sea level (masl),

TABLE 2.1 Traditional ecological zones and altitudinal ranges of selected crops

Meters above sea level	Annual rainfall (mm) <900	900–1,400	>1,400
More than 3,700			High *wurch* (no crops)
3,700–3,200		Moist *wurch* (barley)	Wet *wurch* (barley)
3,200–2,300		Moist *dega* (barley, wheat, pulses)	Wet *dega* (barley, wheat, pulses, oilseeds)
2,300–1,500	Dry *weyna dega* (wheat, teff, maize)	Moist *weyna dega* (maize, sorghum, teff, wheat, oilseeds, barley, *enset*)	Wet *weyna dega* (teff, maize, *enset*, oilseeds, barley)
1,500–500	Dry *kolla* (sorghum, teff)	Moist *kolla* (sorghum, teff, pulses, oilseeds)	
Less than 500	*Bereha* (only irrigated crops)		

SOURCE: Hurni (1998).

NOTES: Crops in parentheses have restricted distribution within the zone and/or grow under less than ideal conditions in these areas. Blank cells indicate not applicable.

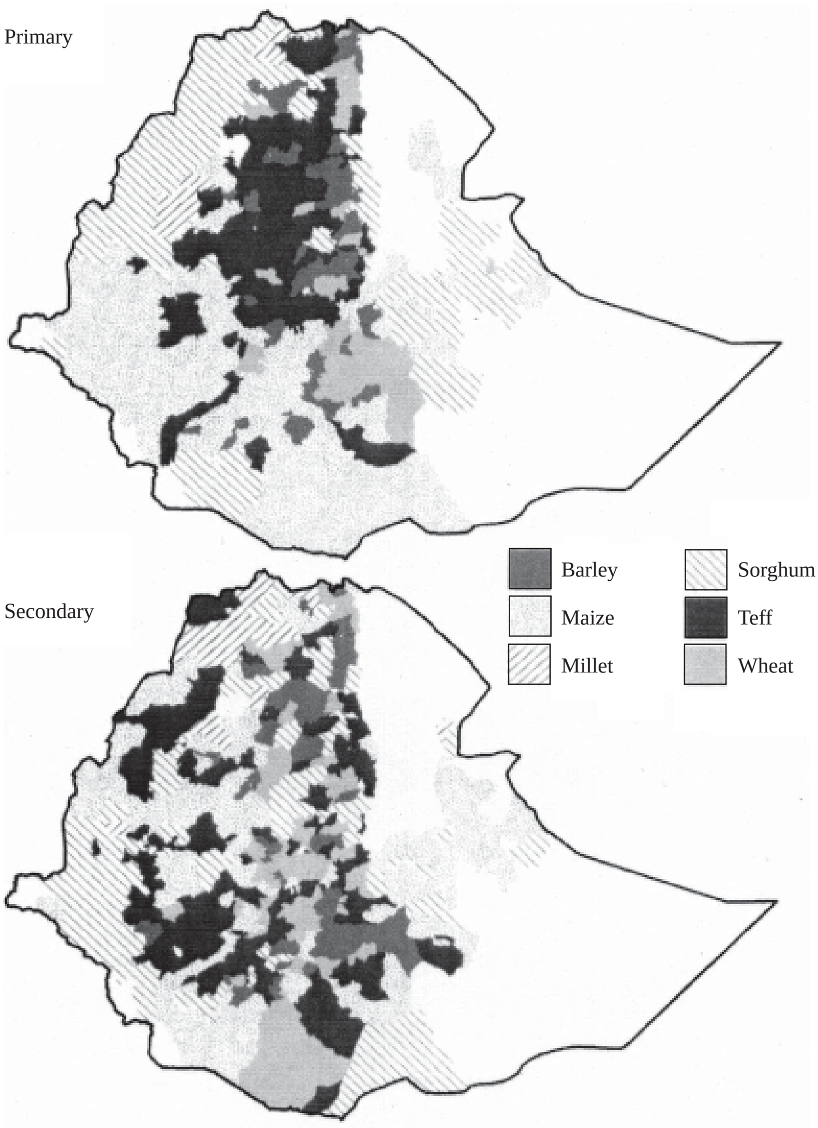
under a similarly wide variety of moisture, temperature, and soil conditions. Its optimal growing conditions coincide with its traditional production areas: an average elevation of 1,800–2,100 masl, average annual rainfall of 750–1,000 millimeters (mm), and average annual temperature of 10–27°C.

Maize is the second most widely cultivated cereal in Ethiopia in terms of area but is produced by more farms than any other crop. It accounts for the largest share of production by volume at 18.8 percent and appears to be increasing throughout Ethiopia. In addition to being a foodgrain, parts of the maize plants are also used as fodder, fencing materials, and cooking fuel.

Although maize is becoming more widely grown, it is less tolerant of cold than teff, barley, and wheat. Teff can grow at elevations up to 2,800 masl; there is only limited maize production above 2,400 meters. In Ethiopia, the highest maize yields require an annual rainfall of 800–1,500 mm. More than 60 percent of maize production comes from Oromiya region, followed by Amhara, with about 20 percent of total production.

Sorghum accounts for about 17 percent of all area planted with cereals and for about 18 percent of production. Relative to other cereals, sorghum is gener-

FIGURE 2.2 Dominant cereals in Ethiopia



SOURCE: Ethiopia, CACC (2003).

ally drought tolerant and is also accepting of excess water conditions. These characteristics give sorghum a large range of feasible climate regimes, although it grows best in semiarid conditions, especially in comparison to other cereals. For example, sorghum can produce grain in areas too dry for maize (those receiving less than 250 mm average annual rainfall). However, it is sensitive to cold temperatures and is rarely found at higher altitudes (2,500 masl may be considered a ceiling).

Wheat accounts for similar shares of national cereal production as sorghum, with 17 percent of planted area and 19 percent of production. Varieties include Durum, Emmer, and so-called bread wheat. Durum wheat is often grown for domestic pasta fabrication. Emmer (*aja* in Amharic) is grown mainly in eastern Oromiya (Arsi and Bale) and Amhara (Shewa and Wollo). Bread wheat is widely grown throughout the highlands and transitional areas. Ethiopian wheat production typically takes place at altitudes of 1,600–3,200 masl, in areas with average annual rainfall of 400–1,200 mm and average annual temperatures of 15–25°C.

Unlike the other major cereals cultivated in Ethiopia, for which the highest cereal yields are achieved at lower elevations (between 500 and 2,300 masl), barley grows well at high altitudes, and its share of area cultivated generally increases with altitude. At elevations above 2,500 masl it is frequently the only cereal grown. Nationally, barley is grown by about a third of all cereal producers and occupies about 9 percent of cultivated land. Many local varieties of barley are produced in Ethiopia, with a range of production and consumption characteristics such as rate of maturation and size of grain. Ethiopian barley varieties are reported to be relatively quick growing and more drought tolerant than other varieties (NRC 1996).

In addition to the five major cereals grown in Ethiopia, *enset* (*Ensete ventricosum*, sometimes referred to as false banana) is an important staple in large parts of the southern highlands, where it has been estimated that more than 10 million people depend on *enset* for food, fiber, and other uses (Brandt et al. 1997). *Enset*, which is cultivated solely in Ethiopia, is planted at elevations ranging from 1,100 to 3,100 masl, although its optimal range is 2,000–2,750 masl. *Enset* does not tolerate frost, and it is not drought resistant. Thus, optimal growing environments are humid and temperate. Annual rainfall in *enset*-growing areas ranges from 1,100 to 1,500 mm, with average annual temperatures of 10–21°C.

Agroecologies and Farming Systems

Farming systems, encompassing bundled sets of agricultural livelihood choices, including crop type and production technologies, are related to agroecological space because production choices must be viable given the available technology and the physical parameters required for plant growth. To the extent that the latter are reflected in agroecological zones, the spatial expression of traditional farming systems in Ethiopia is at least partially coincident with agroecological zone maps.

Westphal (1975) identified four major farming systems for Ethiopia: seed farming, *enset* planting, shifting cultivation, and pastoral complexes. The seed-farming complex focuses on the production of grain, particularly cereals, but also pulses and oilseeds. Grain-based, seed-farming production systems are found throughout the central, northern, and eastern highlands and involve the majority of Ethiopian small farmers. Crop choice within the grain-based systems varies widely, with these systems found from *kolla* (lowlands, between 500 and 1,500 masl) to *wurch* (highlands, between 3,200 and 3,700 masl), and in moisture conditions ranging from dry to wet. Similarly, the *enset*-planting complex (in moist and wet *dega* and *weyna dega*) allows for flexibility of production whereby *enset* could be the principal staple, a co-staple with cereals and/or tubers, or a minor component of cereal- or tuber-based systems. Finally, shifting cultivation and pastoral complexes are most common in the western and eastern lowlands, respectively. In the humid western lowlands (primarily moist *kolla*), disease is a limiting factor for livestock. The arid and semiarid lowlands in the eastern part of the country (mostly *bereha*, less than 500 masl) lack available moisture, which limits rainfed crop production. In both areas, population densities are low, reflecting the low carrying capacities of land resources under current technologies.

Characterization for Policy Guidance

The classification systems described earlier are roughly contoured. They may easily be (and frequently are) further refined on the basis of more detailed environmental data such as soil type, seasonality, terrain, technology specificity, or local production idiosyncrasies. For example, the Ethiopian Institute of Agricultural Research (EIAR) organizes crop management research by 18 major and 49 minor agroecological zones, which are refined from the traditional agroclimatic zones outlined earlier.[2]

For policy guidance, however, more detail may not be what is most required for identifying overarching challenges to the agricultural sector and corresponding investment priorities. Emphasizing the importance of moisture availability for the country's rainfed production systems, the Government of Ethiopia has long framed basic agricultural policy discussions within the

2. EIAR was called the Ethiopian Agricultural Research Organization (EARO) until 2006. The Food and Agriculture Organization (FAO) was involved in identifying 18 major and 42 minor agroecological zones in the late 1980s, and EIAR has now subdivided some of these zones, with a total of 49 currently. These agroecological zones were developed under an FAO-led project within the Ministry of Agriculture, described by De Pauw (1987).

“Three Ethiopias”: moisture-reliable highlands, drought-prone highlands, and pastoral lowland areas.[3] For many rural experts, these basic regimes of moisture availability and the production systems therein are the critical distinctions when evaluating first-order strategic options for rural development across the country.

However, production choices are a function of not just biophysical endowments but also socioeconomic conditions and the man-made environment. These include the local availability of labor, demand for food, cost of transportation between farms, and presence of input and output markets. Development domains are used in an attempt to build on basic information on agricultural potential by adding economic information within a framework of potential production choices.

The Development Domains of Ethiopia

Development domains were developed out of work by Pender, Wood, and colleagues based on household- and community-level research in Ethiopia, Honduras, and Uganda (Pender, Place, and Ehui 1999; Wood et al. 1999; Pender et al. 2001a, 2001b; Pender, Scherr, and Durón 2001; Nkonya et al. 2004; Pender 2004a, 2004b; Pender et al. 2004; Pender, Ehui, and Place 2006; Pender, Place, and Ehui 2006). Drawing on the theory of comparative advantage and location theory (von Thünen 1826; Chomitz and Gray 1996) and the literature on the evolution of farming systems in tropical agriculture (Boserup 1965; Ruthenberg 1980; Binswanger and McIntire 1987; Pingali, Bigot, and Binswanger 1987; McIntire, Bourzat, and Pingali 1992), we can understand key components of an area’s agricultural development endowment in terms of a relatively reduced set of factors: agricultural potential, access to markets, and population density.

Agricultural potential is determined by crop characteristics, inputs (including seed and fertilizer), and the biophysical environment. The income potential of alternative cropping patterns and livelihoods, however, depends on access to markets and population density, as well as agricultural potential. For example, an area with high and reliable rainfall and good soils may have an absolute advantage in producing high-value perishable vegetables but may have little comparative advantage in this livelihood if it is remote from markets. Population density, by affecting local land–labor ratios, influences the comparative advantage of labor-intensive livelihoods. High land–labor ratios in areas with poor access to markets and low agricultural potential endowments may encourage labor-intensive but low–external input production strategies. All three fac-

3. This characterization has recently been expanded to “Five Ethiopias” (drought-prone, humid lowland moisture-reliable, moisture-reliable–cereals, moisture-reliable–*enset,* and pastoralist) for the Ethiopian Social Accounting Matrix developed by the Ethiopian Development Research Institute (EDRI).

tors together influence the profitability of different commodities, production technologies, and land management practices.

Implementing development domains means applying this conceptual framework to identify mappable conditions that broadly enable or constrain development options of national importance. This implies that two decisions must be made. First, the scale of strategic planning must be determined. For national strategy formulation, sectorwide perspectives require some level of generalization greater than that typically used in commodity- or technology-specific recommendation domains. A second decision is how best to represent these factors given local conditions and the relevant scope of perspective. In practice, this means identifying the best indicators to represent relative levels of agricultural endowments for rainfed (and irrigated) agriculture, access to market opportunities, and the availability of labor relative to land.

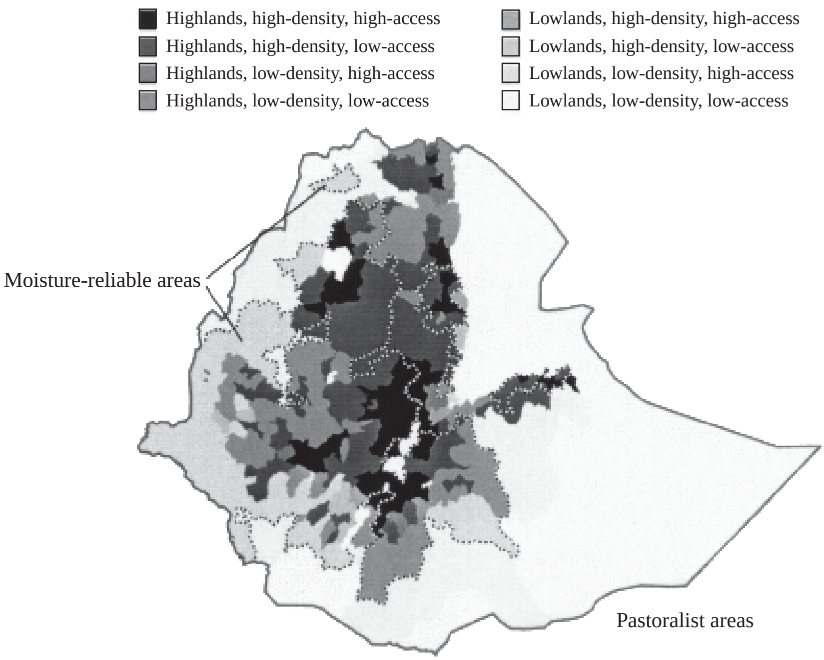
In Ethiopia, Chamberlin, Pender, and Yu (2006) defined development domains by starting with the long-standing moisture regime distinctions featured in policy discussion of the "Three Ethiopias" and further distinguishing between highland and lowland areas of rainfed agriculture. This yielded a total of five basic zones of agricultural potential (moisture-sufficient highlands, moisture-sufficient lowlands, drought-prone highlands, drought-prone lowlands, and pastoralist areas). Socioeconomic characteristics were also included in the characterization: two classes of market access (low and high) and three classes of population density (high, medium, and low). The resulting 25 domains were significant predictors of a range of rural livelihood variables at the *woreda* (district) level.

These domains highlight important aspects of the Ethiopian rural context. Of particular note is the predominance of low market access conditions. In 1994, 92 percent of land resources and 69 percent of rural populations were located in areas with low market access, as defined here (Figures 2.3 and 2.4; Tables 2.2 and 2.3). These conditions have improved considerably, with reductions to 79 percent of land and 40 percent of population in 2007, and represent one of the dimensions of greatest change in Ethiopia over the past two decades.[4] Nonetheless, the portion of the country's land and population resources that may be fairly characterized as remote is still very high. Although high-density areas are becoming even denser (and are accounting for larger shares of total populations), almost half of Ethiopia's land and people are still in low- and medium-density areas. Many of these areas are also characterized by poor market access.

Although crop choice is heavily influenced by biophysical parameters (at least partially captured in the agricultural potential dimension of the domains),

4. The domain classification was made on the basis of *woreda* boundaries; we acknowledge that some shifts in categories may simply be artifacts of changing boundaries. Due to this modifiable areal unit problem (Openshaw 1984), we restrict our discussion to broad changes in characteristics rather than shifts between individual domains.

FIGURE 2.3 Map of *woreda* domain assignments, 1994

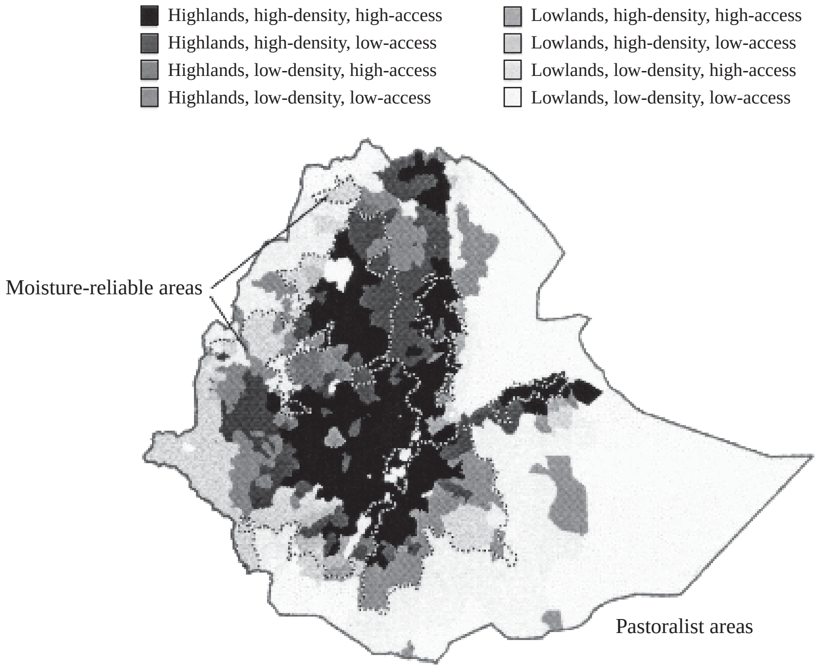


SOURCE: Authors' calculations.

access to markets and land–labor ratios appear to wield considerable influence on production choices and market orientation. Chamberlin, Pender, and Yu (2006) evaluated grain yields (using the Agricultural Census [Ethiopia, CSA 2002]) with regard to the development domains classifications and found that yields (except for those of oilseeds) tend to be higher in high-access and high-density areas, although not strongly or uniformly so. In general, the positive impacts of market access and population density on yields likely reflect the greater availability of inputs and labor in these areas and higher returns to using inputs and labor in areas with better access. However, the relatively small differences in grain yields in high- and low-access areas may suggest that factors other than market access are constraining the use of inputs such as fertilizer. A future agricultural census, with disaggregated crop production data, may be able to highlight these issues when evaluated over time, taking into consideration infrastructure improvements and greater access to markets in certain high-potential areas of the country.

Cereal commercialization is generally greater in moisture-reliable areas as opposed to drought-prone areas, reflecting greater productivity and marketable surplus in these higher-potential areas. However, in moisture-reliable

FIGURE 2.4 Map of *woreda* domain assignments, 2007



SOURCE: Authors' calculations.

TABLE 2.2 Domain summary statistics: Share of national totals by domain factor, 1994 and 2007 (percent)

	1994		2007	
Domain factor	Area	Population	Area	Population
Agricultural potential				
Moisture-reliable highlands	25	62	31	67
Moisture-reliable lowlands	12	7	9	4
Drought-prone highlands	10	18	9	17
Drought-prone lowlands	16	5	21	6
Pastoralist	37	9	30	6
Market access				
High	8	31	21	60
Low	92	69	79	40
Population density				
High	6	32	11	47
Low and medium	94	68	89	53

SOURCE: Authors' calculations.

TABLE 2.3 Domain summary statistics: Domain share of national totals, 1994 and 2007 (percent)

	1994		2007	
Development domain	Area	Population	Area	Population
Moisture-reliable highlands, high-access, high-density	8.7	38.6	2.8	18.2
Moisture-reliable highlands, high-access, low-density	6.3	10.9	2.7	6.5
Moisture-reliable highlands, low-access, high-density	1.1	3.6	2.1	10.4
Moisture-reliable highlands, low-access, low-density	15.2	13.9	17.1	27.4
Moisture-reliable lowlands, high-access, high-density	0.1	0.3	0.0	0.4
Moisture-reliable lowlands, high-access, low-density	0.2	0.3	0.1	0.2
Moisture-reliable lowlands, low-access, high-density	0.0	0.0	0.1	0.5
Moisture-reliable lowlands, low-access, low-density	8.7	3.7	11.5	5.6
Drought-prone highlands, high-access, high-density	0.8	3.2	0.4	1.9
Drought-prone highlands, high-access, low-density	3.1	5.1	1.3	2.5
Drought-prone highlands, low-access, high-density	0.3	1.0	0.3	1.1
Drought-prone highlands, low-access, low-density	5.2	7.3	7.5	12.3
Drought-prone lowlands, high-access, high-density	0.1	0.3	0.0	0.0
Drought-prone lowlands, high-access, low-density	1.2	1.2	0.3	0.6
Drought-prone lowlands, low-access, low-density	19.4	5.1	16.1	4.0
Pastoralist, high-access, low-density	0.4	0.3	0.3	0.4
Pastoralist, low-access, high-density	0.0	0.0	0.0	0.0
Pastoralist, low-access, low-density	29.3	5.2	37.2	8.2
Total	100	100	100	100

SOURCE: Authors' calculations.

areas, the highest commercialization rates are found in areas with low access, whereas the highest commercialization rates in drought-prone areas are in high-access areas. In high-potential areas, cereals are likely less profitable than higher-value commodities such as vegetables in areas with high market access but may have a strong comparative advantage in areas with low market access. In more drought-prone areas, cereals may be the most profitable and/or least risky option for farmers with relatively good market access (but without access to irrigation). Consistent with this explanation, in the drought-prone highlands we find the highest commercialization rates for cereals in areas with favorable market access, whereas in the moisture-reliable lowlands we find the lowest commercialization rate for cereals in areas with high access.

These domains were used to structure a set of tables containing generalized strategic recommendations. It is the purpose of these tables not to narrowly define recommendations for specific locations but rather to help link strategic planning within the agricultural sector (and in other sectors). Identifying conditions that could be associated with specific places may allow for aggregate strategic planning that corresponds with locally meaningful development priorities. Further definition of those local priorities would most appropriately take place at the local level.

Implicit in these recommendations is a choice of scale, the “resolution” of information, and spatial extent. For example, recommendations for a particular variety of maize are more detailed than for all varieties together, and thus the spatial expression of the optimal conditions will also vary. Generally speaking, maize may have a wide and loosely defined envelope of optimal growing conditions. A given variety, on the other hand, may require soil, slope, temperature, and growing season parameters that are more restricted in space and require more detailed data to map. More detailed assessments of this sort, sometimes referred to as technology-specific recommendation domains, may be essential components of addressing specific questions.

Ethiopia’s Changing Economic and Biophysical Landscape

The contexts of rural production outlined earlier have transformed over the last decade given changes in rural infrastructure, expanding urbanization, and the adoption of new technologies. As noted earlier, market access and population density are increasing due to expanded transportation and communication networks, as well as greater urbanization. Because these transformations mirror, in some respects, the components of the development domains’ conceptual framework, we follow our empirical assessment of the change in development domains from 1994 to 2007 with a brief analysis and discussion of the evolving socioeconomic landscape with regard to increased investments in infrastructure and technology and greater urbanization. Finally we review land tenure policy as it pertains to agricultural investment and urbanization.

Infrastructure Expansion

Ethiopia's unique geography continues to play a major role in defining not only suitable areas for specific crop production and development domains but also the country's economic transformation on the whole. The development of rural areas and agricultural production is characterized by fragmented and dispersed landholdings (the average plot size is 0.5 hectare [Ethiopia, CSA 2002]), limited irrigation potential in the highlands, and limited infrastructure in peripheral areas of the country.[5] Related to Ethiopia's biophysical geography is the challenge of building and maintaining infrastructure in a mountainous landscape. Not only improving the physical mobility of people, goods, and services via transportation networks but also increasing access to telecommunication systems and electrical grids may open opportunities for improved farming and marketing conditions to better realize agricultural potential. It is important to take into account the multidimensionality of access when viewing change in Ethiopia. For example, information asymmetries are a feature of remoteness and may be mitigated by nonroad investments in such things as liberalized telecommunications and information markets. In addition, a growing literature on land tenure and ownership suggests that Ethiopia's policy of state-owned land remains an obstacle to sustained agricultural growth and rural development, regardless of improved or expanded infrastructure. We will address each of these issues (changes in roads, telecommunications, and electricity in addition to land policy variations) and how improvement over the last several decades has opened up the potential for significant increases in productivity and output.

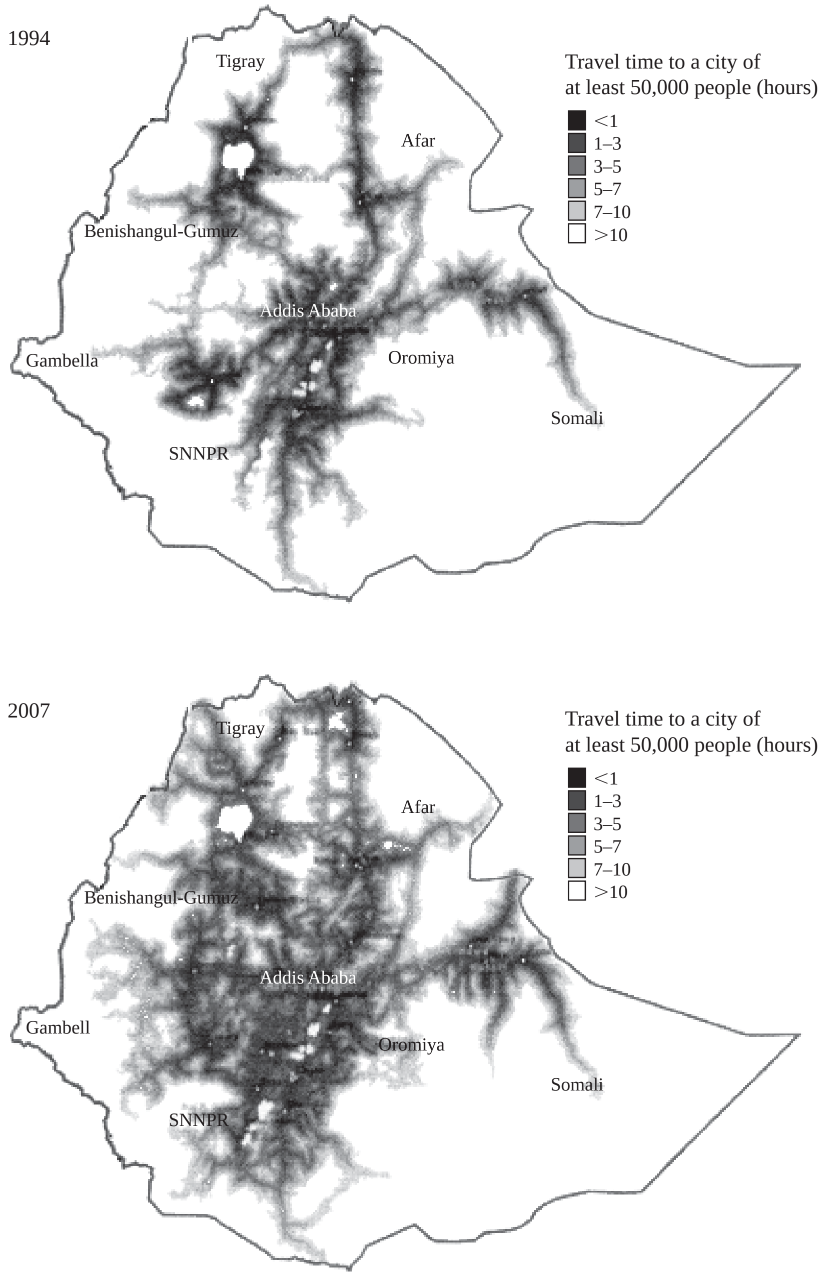
Improving Market Access through Improved Transportation Infrastructure

Given the limited infrastructure during the 1980s and early1990s, the Ethiopian government prioritized transportation infrastructure investment in order to enhance linkages between cities in the highlands. In 2007, almost 62 percent of the country's population was within 5 hours' travel time of a city of at least 50,000 people (Figure 2.5; Table 2.4). This shows a remarkable improvement in market access from 1994, when only 33 percent of the total population was within 5 hours' travel time of a major city.

Currently, only 3.2 percent of the population in Amhara and 4.5 percent in the Southern Nations, Nationalities, and People's Region (SNNPR) are more than 10 hours from a major city. SNNPR showed the most improvement in travel time by connecting 45 percent more people to a city within 3 hours' travel time (Table 2.5). In Tigray and Oromiya, 21 percent of the population improved

5. Highland systems in Ethiopia tend to have smaller catchments and feed from gravelly rivers in the upper parts of basins. Flash floods are more common and difficult to predict than floods in lowland systems. Command areas are relatively small, defined by fluctuating topography.

FIGURE 2.5 Travel time to a city, 1994 and 2007



SOURCE: Schmidt and Kedir (2009).

TABLE 2.4 Percentage of regions' populations connected to a city of at least 50,000 people, by access time, 2007

Region	Access < 1 hour	Access < 3 hours	Access < 5 hours	Access < 10 hours	Access > 10 hours
Tigray	10.89	15.36	12.48	53.71	7.57
Afar	n.a.	n.a.	1.77	9.73	88.49
Amhara	5.05	22.72	37.06	31.98	3.20
Oromiya	9.03	18.06	36.39	27.84	8.68
Somali	7.99	n.a.	n.a.	13.57	78.44
Benishangul-Gumuz	n.a.	n.a.	n.a.	29.15	70.85
SNNPR	12.55	52.65	12.28	18.05	4.47
Gambella	n.a.	n.a.	n.a.	n.a.	100.00
Harari	100.00	n.a.	n.a.	n.a.	n.a.
Addis Ababa	100.00	n.a.	n.a.	n.a.	n.a.
Dire Dawa	100.00	n.a.	n.a.	n.a.	n.a.
Ethiopia	12.48	23.56	25.73	26.03	12.20

SOURCE: Schmidt and Kedir (2009).

NOTE: SNNPR = Southern Nations, Nationalities, and People's Region; n.a. = not available.

TABLE 2.5 Percentage change in regions' connection to a city of at least 50,000 people, by access time, 1994–2007

Region	Access < 1 hour	Access < 3 hours	Access < 5 hours	Access < 10 hours	Access > 10 hours
Tigray	7.13	12.01	(3.72)	5.98	(21.39)
Afar	n.a.	n.a.	n.a.	4.11	(5.89)
Amhara	2.23	14.68	18.94	(12.49)	(23.35)
Oromiya	3.74	10.40	15.84	(8.88)	(21.10)
Somali	n.a.	n.a.	n.a.	2.62	(2.61)
Benishangul-Gumuz	n.a.	n.a.	n.a.	17.91	(17.91)
SNNPR	9.17	45.37	(14.59)	(21.56)	(18.39)
Gambella	n.a.	n.a.	n.a.	n.a.	n.a.
Harari	n.a.	n.a.	n.a.	n.a.	n.a.
Addis Ababa	n.a.	n.a.	n.a.	n.a.	n.a.
Dire Dawa	n.a.	n.a.	n.a.	n.a.	n.a.
Ethiopia	4.10	17.12	7.54	(9.93)	(18.83)

SOURCE: Schmidt and Kedir (2009).

NOTES: Values in parentheses are negative. SNNPR = Southern Nations, Nationalities, and People's Region; n.a. = not available.

market access from more than 10 hours to between 3 and 10 hours from a city. At present, every region except Gambella has a city of at least 50,000 people, and many of these cities have built key transportation infrastructure in order to harness the potential of economic corridors between cities. Although urban centers are linked to other large cities through improved infrastructure, only 5–13 percent of the population in any region is within 1 hour's travel time of a city of at least 50,000, except in Addis Ababa, Dire Dawa, and Harari, where 100 percent of the populations are less than 1 hour from a major city.

It is important to note, however, that population densities and the quality or density of transportation infrastructure affect diverse administrative regions in different manners. In Ethiopia, the central and peripheral regions represent two very different economic, geographic, and demographic landscapes. Although in the main central administrative regions (Amhara, Oromiya, SNNPR, and Tigray) higher population densities and a more integrated road network are characteristic of the economic landscape, in the peripheral administrative regions limited road access and dispersed settlements create larger challenges for linking remote populations to the benefits of agglomeration economies. Improving transportation infrastructure along main access roads will benefit those already in densely populated areas, but maintaining and building select rural road infrastructure in areas with economic (agricultural) potential will be critical for poverty reduction and economic growth strategies in the more remote areas.

Expanding Electricity Generation

Large investments in hydroelectric power over the last 30 years have dramatically changed the lives of many individuals living in cities in Ethiopia. In the 1960s, Ethiopia increased its electricity-generating capacity from approximately 65 megawatts to an estimated 1,918 (planned) megawatts at the end of 2011, an increase of 8.9 times on a per capita basis (Table 2.6). The comparison with 1958 is even more striking, because there was essentially no electricity generation in Ethiopia at that time, with the nation having only 2.3 megawatts of diesel-powered capacity. The introduction of hydroelectric power in subsequent decades, and especially the large surge in capacity since 2005, increased the nation's electricity-generating capacity 834-fold between 1958 and 2011, a 29-fold increase on a per capita basis.

Actual electricity use is generally 35–45 percent of theoretical generating capacity because there is insufficient water behind the hydroelectric power dams for full-scale operation throughout much of the year. Domestic use accounted for 30 percent of total use in 2006/07, whereas commercial and industrial use accounted for 20 and 28 percent, respectively (Dorosh and Schmidt 2010). Overall, electricity use grew at an average rate of 12.5 percent per year from 2002/03 to 2006/07, with the highest growth rate for street lighting (27.1 percent per year).

TABLE 2.6 Electricity-generating capacity, 1958–2011 (annual averages)

Year	Hydroelectric capacity (megawatts)	Other capacity (megawatts)	Total capacity (megawatts)	Capacity per capita (watts per person)
1958–59	n.a.	2.3	2.3	0.1
1960–69	62.8	2.5	65.4	2.4
1970–79	152.9	3.0	155.9	4.7
1980–89	202.8	4.7	207.5	4.9
1990–99	325.2	9.0	334.2	6.0
2000–04	452.6	25.0	477.6	6.9
2005–09	747.2	50.2	797.4	10.0
2010	1,447.5	50.2	1,497.7	17.4
2011[a]	1,867.5	50.2	1,917.7	21.7

SOURCE: Dorosh and Schmidt (2010).

NOTES: Figures for 2008–10 based on additional capacity from Tekeze I (300 Mw) in 2009 and Tana Beles (460 Mw) in 2010; n.a. = not available.

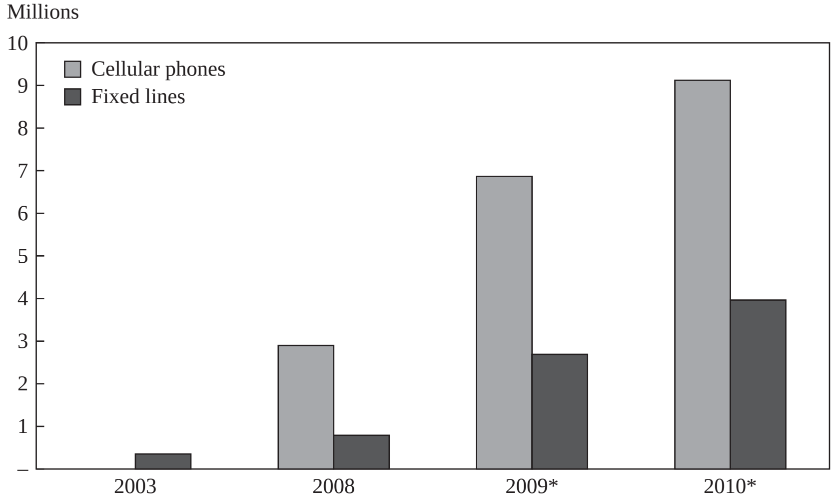
[a]The 2011 figure is the 2010 figure plus that for Gile Gibe II (420 Mw). Gile Gibe II is a hydroelectric power station on the Omo River in Ethiopia for which the tunnel collapsed in December 2009.

Recent research on the productivity effects of electrification suggests that benefits from improved and extended hours of access could be very large, particularly as measured by output per worker. A 2008 survey of small-scale handlooms in Addis Ababa and SNNPR (Ayele et al. 2009) indicates that productivity per worker was about 40 percent higher in electrified versus nonelectrified firms in SNNPR. Workers in nonelectrified rural villages on average worked only 7.2 hours per day, whereas their counterparts in other electrified (but rural) villages worked 10.7 hours per day. This productivity effect is achieved in large part because in towns with electricity access, producers work longer hours and firms share work spaces with electric lights at lower rental costs.

Enhancing Telecommunications

Ethiopia is gradually becoming connected. Individuals who once had to walk hours to gain information about market prices and supply are steadily joining a network of connected individuals who are able to let their fingers do the walking. In 2003, some 405,000 fixed telephone lines were in place and only 51,000 cell phone subscriptions existed throughout the country (Figure 2.6; Table 2.7). By 2008, cell phone subscriptions had catapulted to 3.17 million subscribers and fixed telephone lines had more than doubled. Infrastructure plans reported that cell phone subscriptions might reach as many as 9.9 million users by 2010. It is important to note, however, that only 3.9 percent of the total population had cell phone subscriptions in 2008 (5.3 percent of subscribers were located in connected areas), whereas the share of the population with cellular subscrip-

FIGURE 2.6 Fixed-line and cellular telephones, 2003, 2008, 2009, and 2010



SOURCE: ITU (2009).
NOTE: Asterisks denote planned coverage.

TABLE 2.7 Fixed-line and cellular telephones in Ethiopia compared to all of Africa, 2003, 2008, 2009, and 2010

Type of phone, region	2003	2008	2009[a]	2010[a]
Main (fixed) telephone lines (thousands)				
Ethiopia	405	909	3,000	4,400
Africa	9,553	10,617	n.a.	n.a.
Mobile cellular subscriptions (thousands)				
Ethiopia	51	3,168	7,500	9,900
Africa	35,251	245,608	n.a.	n.a.
Mobile cellular subscriptions				
Ethiopia (share of total population)	0.1	3.9	9.0	11.5
Ethiopia (share in connected area)	0.1	5.3	n.a.	n.a.
Africa (share in connected area)	3.7	32.5	n.a.	n.a.

SOURCE: Dorosh and Schmidt (2010).

NOTE: n.a. = not available.

[a]Planned coverage.

tions within a connected area in Sub-Saharan Africa reached 32.5 percent of the population. The total number of cell phone subscribers in Africa amounted to 245.6 million people, while a total of approximately 3.17 million Ethiopians benefited from a cellular subscription.

Urban Growth and Expansion

Ethiopia's recently published 2007 census reports urban population figures at the city level and allows for greater insight into how Ethiopia's demographic landscape has evolved. Schmidt and Kedir (2009) provide an analysis of city growth and expansion using city populations, infrastructure networks, and population density in order to provide a standardized comparison of urban growth over the last three census periods (Table 2.8).

TABLE 2.8 Agglomeration index: Percentage of people considered urban by region, 1984, 1994, and 2007

	1984[a]		1994		2007	
Region	Total population (thousands)	Percentage urban	Total population (thousands)	Percentage urban	Total population (thousands)	Percentage urban
Addis Ababa	1,423	61.2	2,113	85.5	2,738	99.3
Afar	780	n.a.	1,061	n.a.	1,411	n.a.
Amhara	10,686	2.0	13,834	3.7	17,214	7.5
Benishangul-Gumuz	351	n.a.	460	n.a.	671	n.a.
Dire Dawa	158	20.3	252	58.2	343	66.3
Gambella	172	n.a.	182	n.a.	307	n.a.
Harari	82	55.2	131	76.2	183	86.0
Oromiya	14,016	1.7	18,733	4.6	27,158	9.2
SNNPR	7,501	n.a.	10,377	2.2	15,043	21.1
Somali	2,006	0.2	3,199	1.6	4,439	1.9
Tigray	2,692	2.0	3,136	3.8	4,314	8.0
Ethiopia	39,869	3.7	53,477	7.1	73,919	14.2

SOURCES: CIESIN, IFPRI, World Bank, and CIAT (2004); Schmidt and Kedir (2009); population estimates based on data from the past three Ethiopian censuses.

NOTES: Population density per square kilometer (derived by GRUMP, the Global Rural–Urban Mapping Project, and LandScan for the year 2000), a major component of the agglomeration index, was projected using a growth rate of 3 percent per annum to adjust for different census years. SNNPR = Southern Nations, Nationalities, and People's Region; n.a. = not available.

[a]Population figures for 1984 were approximated due to changes in administrative boundaries after 1984. In order to maintain consistency across all years, we geographically allocated population to the current regional boundaries.

Urban estimates from the 2007 census are similar to those developed by Schmidt and Kedir (2009) using the agglomeration index methodology, yet when comparing urban growth over time, these estimates show a dramatic difference (Table 2.9). This difference is primarily derived from the definition of an urban area used for the two estimates. The Central Statistical Agency (CSA) measures urban areas as all administrative capitals of regions, zones, and *woredas*, as well as localities with at least 1,000 people who are primarily engaged in nonagricultural activities, and/or areas where the administrative official declares that the locality is urban. In comparison, the agglomeration index provides a measure of the economic strength of urban areas rather than a definition of *urban* based on political status, administrative boundary, or the presence of particular urban services or activities.

Evaluating Ethiopia's urban growth using the agglomeration index methodology shows that urbanization growth rates are much higher (approximately 9 percent on average) than previously calculated by the CSA (on average 4 percent over the last three decades). Although Ethiopia's agglomeration index suggests significant levels of urban clustering and growth over time, when compared with other countries in the region, Ethiopia remains one of the least urbanized nations in East Africa. In 2000, agglomeration in Ethiopia was measured at 11.9 percent, whereas the rates in most other East African countries were between 25 and 32 percent. Overall, Ethiopia's agglomeration index is 10 percentage points below the average agglomeration index for East Africa.

TABLE 2.9 Alternative urbanization estimates, 1984, 1994, and 2007

Year	Official estimate (percent)	Agglomeration index (percent)
1984	11.40	3.70
1994	13.70	7.10
2007	15.90	14.20
	(Millions of people)	(Millions of people)
1984	4.55	1.48
1994	7.33	3.8
2007	11.72	10.5
	(Growth rate, percent)	(Growth rate, percent)
1984–94	4.90	9.90
1994–2007	3.70	8.10
1984–2007	4.20	8.90

SOURCES: CSA population estimates; Schmidt and Kedir (2009).

Given the overwhelming revenue generated from agricultural activities in Ethiopia, policymakers have focused primarily on ADLI (Agricultural Development–Led Industrialization), but continuous growth of urban centers requires a greater understanding of the dynamic geographic and economic transformations occurring throughout the country. Urban areas facilitate social and economic interactions. These exchanges lead to increased efficiency in flows of goods and services, more efficient matching of workers to jobs, and enhanced information and knowledge spillovers. Increased access to markets also affects development domains, allowing for improved access to new technologies, necessary inputs to boost production and yields, and increased opportunity for cash-crop development for export. Earlier evidence by Chamberlin, Pender, and Yu (2006) suggests that grain yields tend to be higher in high-access and high-density areas. Previous studies on the adoption of technology (such as improved seeds and fertilizer) find clear spatial patterns suggesting that access to main roads and market centers determine the success and pace of adoption (Staal et al. 2002; Croppenstedt, Demeke, and Meschi 2003; Yu et al. 2010). Further investment in connective infrastructure that reduces the distance to areas of greater density and enhances access to information and markets is likely to accelerate adoption. Finally, land tenure policies that ensure land security also play a crucial role in incentivizing investment and promoting labor mobility that allows for greater information exchange and more interactive development between rural and urban areas.

Land Tenure Policy

Land tenure policies have changed dramatically over time in Ethiopia, and there continues to be an ongoing debate on land tenure and privatization. This discourse centers on the trade-offs between state protection and equity versus privatization and increased market efficiency. Given Ethiopia's relatively recent history of land tenure reforms associated with regime change, the current government policy is based on state ownership that ensures free access to land for all peoples of Ethiopia so as to prevent a small number of wealthier landowners from acquiring a majority of land through distress sales and other mechanisms. State ownership of land is thus designed to protect against conditions experienced under the imperial regime, whereby a majority of rural farmers worked under tenancy contracts with exploitative labor agreements (Jemma 2001; Rahmato 2004). However, concerns have been raised that state ownership and limits to land transfers are restricting the development of key land markets, producing negative spillovers in agricultural productivity and off-farm labor (EEA/EEPRI 2002; Deininger et al. 2004). This section briefly outlines land policy in Ethiopia since the imperial regime and provides a synthesis of the ongoing dialogue about land tenure as it relates to agricultural production and development within the country.

The History of Land Tenure Policy in Ethiopia

Land tenure policy in Ethiopia can be categorized into three general periods characterized by the past three political regimes. During the imperial regime of Haile Selassie (1929–74), the land tenure system was multitiered, spatially diverse, and one of the most complex systems used in Africa (Joireman 2000). In the north, usufruct land tenure was defined by a *rist*, or communal system that allowed farmers (who were usually politically connected) to claim access to ancestral land, as well as trade land in the rental market, but not to sell or mortgage any land. In the south of Ethiopia, however, land transfers through sales and mortgages were allowed through *gebbar*, or private ownership contracts (Rahmato 1984; Teklu 2004). In addition to communal land allocated by the state (*madeira* or *mengist*), other land was owned by the church (*samon*) or given as grants (*gult*) to individuals. Absentee landlords, insecure tenure due to arbitrary evictions, and exploitative labor agreements were widespread during this period and, some argue, were among the primary reasons that the regime was toppled in 1974 (Jemberre 2000; Adal 2001; Deininger et al. 2003).

The Marxist Derg regime (1974–91) that ruled after the overthrow of Haile Selassie quickly set forth to redefine and reorganize the land tenure laws. The Proclamation to Provide for the Public Ownership of Rural Lands (Proclamation 31/1975) dissolved the previously exploitative landlord–tenant relations by nationalizing all rural land and redistributing land rights to all farmers. The regime constructed peasant associations (PAs) to organize redistribution contingent on proof of permanent physical residence within the PA. This system required each farmer to be a member in the PA, with the leadership of each PA entitled to expropriate land from landholders and redistribute it equally among members. Land transfers were granted only by bequest to an immediate family member, and leases or rentals, exchanges, and mortgages were prohibited. Plot sizes were restricted to a maximum of 10 hectares, and the use of hired agricultural labor was prohibited under Article 5 of the Proclamation (Crewett, Bogale, and Korf 2008).

Given that land distribution was organized around permanent residency and membership in a PA, the option of migration was highly risky, involving the possible loss of not only land but also membership in the PA, the administrative unit that distributed land. Because of this limited migration, however, PAs steadily began to confront land scarcity, while new claimants declared usufruct rights under Proclamation 31/1975. Thus, expropriation and redistribution became frequent in more densely populated areas, and tenure security was undermined by the PA leadership's ability to redistribute land for political reasons, while wealthier farmers used bribery to ensure that they received better-quality or larger land parcels (Ege 1997; Azeze 2002). The scale and frequency of redistribution varied by region and area; while some areas faced frequent redistributions made in an effort to maintain the egalitarian approach of land access, less pressured PA leadership reallocated land only once during the land reform (Rahmato 1984; Clapham 1988; Holden and Yohannes 2002).

The Ethiopian People's Revolutionary Democratic Front government that took power in 1991 pursued an economic strategy that was, overall, more open than that of the previous socialist Derg regime. Although many groups called for land tenure reform involving privatization of land ownership, the new constitution of 1995 confirmed state ownership of all land in Ethiopia, and few revisions were made to the previous land tenure regime under the Derg (FDRE 1995 [Article 40]; Adal 2001; Belay and Manig 2004). Of the revisions that were enacted, several stand out as important modifications: (1) land redistribution was to be reduced; (2) regional governments were given responsibility to enact laws regarding land rights, transferability, and taxation as long as these laws adhered to national guidelines; and (3) land rental was deemed lawful (Pender and Fafchamps 2006). Although these amendments to the earlier Derg-defined land tenure laws significantly improved farmers' perception of their land security, researchers have found mixed evidence of land or labor market improvement and enhanced off-farm employment incentives in an already dense rural population (studies of land tenure are discussed later).

Since 1995, earlier land tenure laws outlined in the constitution have been primarily modified by regional governments (Crewett, Bogale, and Korf 2008). For example, Tigray region declared an end to all administrative land redistribution; Oromiya region restricted redistribution to only those lands with irrigation potential, whereby farmers would be compensated with reasonable rainfed land (Regional Government of Oromia 2002, Article 14.4; Crewett, Bogale, and Korf 2008). Other regional bylaws have been designed to limit the renting of land: farmers in Oromiya are able to rent out only 50 percent of their total holdings for a maximum of 3 years if using traditional farming methods or 15 years if modern technologies are employed (Deininger et al. 2003). Some argue that although land tenure security has improved under the current government, the imprecise language of the regional regulations, as well as the seemingly non-transparent legal framework used in a variety of regional amendments, may increase the probability of corruption and political interference (Rahmato 2004).

In 2005, the central government issued a revised proclamation designed to increase subjective tenure security within the state-owned land law by emphasizing the importance of land measurement, registration, and certification of land plots (Rural Land Administration and Land Use Proclamation 456/2005). Piloted in Tigray region in 1998, and later in Amhara in 2003 and in Oromiya and SNNPR in 2004, land registration and certification aim to provide farmers with a legal document that outlines their perpetual user rights, along with the right to receive compensation for investments made in the land in case of loss, the right to bestow land on family members, and the right to lease out a defined share of the land for a limited period.

The Effects of the Current Land Policy on Growth and Investment

The certification program was organized at the village level through elected land use and administration committees in order to ensure participatory assessments within a short time frame. In addition, the cost of implementing a comprehensive land registration program (approximately $3.5 per household) was dramatically reduced given the decentralized nature of implementation and was significantly lower than the costs of other similar programs that have been evaluated previously (Deininger et al. 2008; Deininger, Ali, and Alemu 2009). Farmers' favorable evaluations of the process, their willingness to pay for certificates, and the perceived decrease in the risk of land redistribution suggest that the implementation was successful. According to Alemu (1999) and Holden and Yohannes (2002), these certificates have improved land tenure security. A survey conducted by Holden, Deininger, and Ghebru (2009) found that 84 percent of households felt less at risk of being evicted from their land after receiving a certificate.

According to economic theory, tenure security is linked to many positive spillovers, such as decreased land disputes, increased investment in land, more efficient land markets, and hence greater production yields.[6] Several recent studies in Ethiopia suggest that indeed, increased tenure security in the form of registration and certification enhances investment. Deininger, Ali, and Alemu (2009) evaluated the impact of the land certification program implemented in Tigray region on investments in soil and water conservation (SWC) and land productivity using farm-plot panel data. Their findings suggest that the effects of certification on SWC is positive and significant in that certification supports an increase of investment in trees, improved maintenance of soil conservation structures, and enhanced land productivity. Another study by Deininger et al. (2007) drew from a second-round nationwide panel survey of 2,300 households to look at the impact of certification on land investments between 2004 and 2006. The authors found that plots that had been certified at least a year before the second-round survey period were 5 percent more likely to receive new investment. In addition, the amount of new investment was 4.4 percent higher on those plots as compared to noncertified plots receiving investments.

Holden, Deininger, and Ghebru (2011) evaluated certification programs in terms of women's empowerment initiatives in Tigray using a panel dataset from 1997, with follow-up rounds from two, five, and eight years after certification started. Given that traditionally women move into their husband's home upon marriage and that they do not customarily engage in land management, female-headed households tend to rent out much of their land (Ghebru and Holden 2008). Prior to the registration and certification program, female-headed house-

6. Holden, Deininger, and Ghebru (2009) provide a comprehensive list of such studies in and on a variety of countries and continents.

holds confronted difficulties in staking a claim to their land due to their limited ability to till the land with oxen, which prompted land encroachment by male inlaws and blood relatives. After certification, Ghebru and Holden (2008) found that female-headed households rented out, on average, 1.1–1.6 more *tsimdi* if they had rented out land previously;[7] in addition, women who had not rented out land previously were more inclined to do so after receiving a land certificate. These findings suggest that female-headed households perceive that they have greater land security after certification and, in turn, are able to rent out land without risking the loss of possession.

Although many assessments of the current land policy and registration process suggest that there have been improvements in individuals' perception of their tenure security, other studies point to areas that could be improved or further researched. Teklu (2004) argues that increasing land scarcity, increasing rent costs, and fees incurred for rights to rent are distorting rental land markets. Given that land sale is prohibited in Ethiopia, rental markets pursued through sharecropping and cash rental are becoming increasingly important determinants of access to land. Land-constrained farmers who otherwise have the necessary assets, such as oxen, key inputs, and labor, seek to increase their area of operation through renting agricultural land. Conversely, farmers with large agricultural holdings but insufficient capital to buy farm implements or hire labor (for example, female heads of households) seek to rent out their land in exchange for labor or oxen. Akin to the empirical analysis of Teklu (2004), that of Deininger et al. (2003) suggests that land transfers in Ethiopia follow econometric theory in that large, less efficient producers rent out land to smaller, more efficient farmers, although many farmers who rent out land perceive that they have a higher risk of losing their land in a future redistribution.[8] Similarly, those who engage in off-farm labor have a 10–15 percent greater perception that they are at risk of future land loss. This suggests that the degree of land transaction that could take place in a secure market may be stifled by fears of ongoing tenure insecurity.

Other analyses have looked into the restrictive transferability rights in Ethiopia (no transfers are allowed through sales, exchanges, mortgages, and so on) in terms of off-farm labor development and rural–urban migration. Their hypotheses build on economic theories of property rights (Harris and Todaro 1970; Posner 1973) whereby privatization of land provides the underlying incentive for long-term investment, management, and maintenance in order to increase and sustain productivity, which in turn (given income disparities, among other issues) allows outmigration of less productive farmers to other off-farm and urban sectors of the economy. Current land policy states that the transfer of usufruct land rights is permissible only through bequests to family

7. A *tsimdi* is equivalent to 0.25 hectare.

8. The analysis of Deininger et al. (2003) was based on the Ethiopian Rural Household Survey of 1999.

members residing in the village who are engaged in or wish to engage in agriculture. This may be inhibiting rural–urban migration, because land cannot be sold to finance outmigration, and seasonal or temporary migrants risk losing access to land in their home village when they return. A recent analysis by Gete et al. (2008) in Amhara region found that most seasonal outmigrants are single young men with no land use rights or dependent family members. In addition, migrants cite lack of sufficient food, shortage of farmland, and lack of employment opportunities in the village as underlying reasons for seasonal migration. Ongoing studies continue to assess how rural–urban migration can help to reallocate labor from the agricultural sector to greater income-earning sectors and provide migrants with alternative income sources. Improving the mobility of rural farmers through transparent land tenure guidelines (and, in the future, possibly the privatization of land) may enhance the network effect of agglomeration economies as discussed previously, as well as reduce the burden of an extra person on the farm and increase household earnings through possible remittance income (De Brauw et al. 2010).

Further research assessing land tenure policy as it relates to land certification and tenure security will be important as Ethiopia continues to urbanize and as additional investments in connective infrastructure redefine the rural landscape. Deininger et al. (2007) outline a series of issues that should be resolved in order to maintain a legitimate certification program. These include the need to identify and promote clear updating procedures (especially in rapidly developing areas) to ensure that old certificates are voided prior to distributing updated documents. In addition, public access to land certification data and information, as well as clear guidelines that identify the varying responsibilities of institutions in registration and updating of documents, is important to secure trust and enhance land security. Finally, well-defined compensation definitions and procedures to use in case of land redistribution should allow farmers to better gauge their risk and investment decisions.

Conclusions

The underlying biophysical features and unique topographic environment of Ethiopia strongly influence but do not strictly determine the success of agricultural production and output in the country. Although natural endowments are significantly linked to agricultural suitability, the changing economic landscape is beginning to blur the boundaries between actual suitable areas and the potentially productive locations. Access to input and output markets, expanding urbanization, and improved technologies are transforming the landscape, as well as the activities and opportunities within previously constrained agro-ecological zones. Understanding the geographical expression of these factors is an important way to make sense of Ethiopia's agricultural and rural development options and to guide the definition of supporting policies.

Investments in connective infrastructure are facilitating the movement of ideas, technologies, goods and services, and labor to areas that demand specific products and distribute other outputs. Improving and restoring primary road infrastructure reinforces secondary and primary market interactions. Maintaining and constructing rural roads that connect agricultural surplus areas with small towns and urban centers also bolster inclusive geographic supply and demand networks. A continuum of population density creates a portfolio of interrelated places, and these places, when functioning properly, will bring about greater economic interaction and ultimately spur development within all spatial spheres.

Clearly, the transformations that have taken place in recent decades with regard to market access, technology investment, and urbanization have facilitated and influenced not only city development and productivity but rural economic growth and potential as well. This growth requires policy decisions that shape the rate of growth and integration between rural and urban areas, as well as a framework for how Ethiopia can best benefit from enhancing the already (actual) agriculturally productive areas while bolstering areas that have significant potential for greater output.

Land tenure policy in Ethiopia continues to be studied and debated as to how to best develop the agricultural sector in an efficient as well as an equitable manner. Recent evaluations of the ongoing land registration and certification programs suggest that farmers perceive that they have greater tenure security after receiving certificates. Although comparative studies argue that land privatization could be an important policy instrument to promote long-term investments and remove a major obstacle to rural–urban migration, such a major move toward a fully functioning land market appears to be unlikely in the current environment.

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3 Crop Production in Ethiopia: Regional Patterns and Trends

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Ethiopia's crop agriculture is complex, involving substantial variation in crops grown across the country's different regions and ecologies. Five major cereals (teff, wheat, maize, sorghum, and barley) are the core of Ethiopia's agriculture and food economy, accounting for about three-fourths of the total area cultivated, 29 percent of agricultural gross domestic product (GDP) in 2005/06 (14 percent of total GDP), and 64 percent of calories consumed (FAO various years). There has been substantial growth in cereals in terms of area cultivated, yields, and production since 2000, but yields are low by international standards, and overall production is highly susceptible to weather shocks, particularly droughts. Thus, raising production levels and reducing their variability are essential aspects of improving food security in Ethiopia, both to help ensure adequate food availability and to increase rural household incomes.

Ethiopia's crop agriculture in general, and the cereals subsector in particular, face serious challenges. We show in this chapter that, although a majority of production increases in the past occurred due to increases in the area cultivated, recent data on production (from 2000/01–2008/09) suggest that yield increases and intensification may be contributing to greater production. Given that little suitable uncultivated land remains in the highlands apart from pasture land, production gains in terms of yield increases are critical to meet agricultural growth goals. Sustaining increased yields in the productive areas of the highlands is fraught with challenges, however. Soil degradation from erosion and soil compaction threatens crop yields (Taddesse 2001; Hamza and Anderson 2005). Furthermore, uncertain rainfall and very low levels of irrigation make intensive cultivation with improved seeds and fertilizer financially risky (McCann 1995).

This chapter presents an overview of crop agriculture, focusing mainly on cereal production. The next section describes the area and production levels of the main agricultural crops, distribution of cultivated area by farm size, and the importance of seasonal differentiation. The following section presents data on growth and variability of area, yield, and production of cereals in general, as well as for each major cereal crop separately. The results of a decomposition analysis of cereal production changes are discussed then. An overview of the production of other major agricultural crops, including *enset,* oilseeds, pulses, and export crops (coffee and *chat*) is presented next. The following section covers major constraints to increasing agricultural production, providing some international productivity data to compare with Ethiopia's agricultural productivity. The final section summarizes the chapter and presents concluding observations.

Overview of Agricultural Crop Area and Production

Importance of Crop Categories

Cultivated crop area (13 million hectares in 2007/08) accounts for a relatively small share (about 13 percent) of the total area of Ethiopia, because most land is not suited for cultivation. Table 3.1 shows the average area and production levels of the main crops cultivated for the period 2004/05–2007/08. Cereals dominate Ethiopian crop production. Cereals were grown on 73.4 percent of the total area cultivated by a total of 11.2 million farmers. Together, these holders produce a yearly average of 12 million tons of cereals. Teff accounts for 28 percent of the total cereal area cultivated, while maize comprises 27 percent of total annual cereal production, but only 19 percent of cereal area cultivated.

After cereals, the second most important crop group (in terms of acreage) is pulses. In 2004/05–2007/08, 6.4 million holders grew pulses on 12.4 percent of the total area cultivated. Total pulse production averaged 1.5 million tons per year. Oilseeds form the third most important crop group. In 2004/05–2007/08, they were cultivated on 6.9 percent of the total area cultivated by 3.1 million holders who produced an average of 0.5 million tons of oilseeds yearly. Coffee is a major cash crop, accounting for 3.8 percent of GDP (and 19 and 35 percent of the quantity and value of exports, respectively, in the period) but occupied only 2.7 percent of total area cultivated (that is, 306,000 hectares). *Chat,* another stimulant crop, was cultivated by 2 million farmers on 1.3 percent of the total area cultivated, and it accounted for 5 percent of total export earnings. Vegetables and root crops together were cultivated on 281,000 hectares comprising 2.6 percent of the total area cultivated.

Distribution of Cultivated Land by Farm Size

The Central Statistical Agency (CSA) classifies Ethiopian farms into two major groups: smallholder "peasant" farms and large commercial farms. Smallholders and larger farms are defined as those that cultivate less and more than 25.2 hectares, respectively. The majority of farmers in Ethiopia are smallholders. Their farms are often fragmented, produce mostly for the farmers' own consumption, and generate only a small marketed surplus. Large farms (averaging 323 hectares per farm) are state or private property, and they sell agricultural products at local markets or abroad. These larger farms typically use more

TABLE 3.1 Crop area and production (smallholder farms, *meher* season), 2004/05–2007/08

	Average			
		Area cultivated		Production
Crop	Number of holders (thousands)	Level (thousands of hectares)	Share in total area cultivated (percent)	Level (thousands of tons)
Grain	11,519	10,382	92.7	14,090
Cereals	11,156	8,230	73.4	12,063
Teff	5,462	2,337	20.9	2,408
Barley	3,842	1,024	9.1	1,326
Wheat	4,118	1,439	12.8	2,293
Maize	7,287	1,595	14.2	3,314
Sorghum	4,253	1,429	12.8	2,216
Pulses	6,377	1,384	12.4	1,496
Oilseeds	3,127	767	6.9	532
Vegetables	4,936	106	1.0	425
Root crops	4,757	174	1.6	1,473
Fruit crops	2,658	51	0.5	403
Chat	2,068	141	1.3	126
Coffee	3,049	305	2.7	211
Hops	1,685	23	0.2	26
Total	30,675	11,186	100.0	16,755

SOURCE: Authors' computations using data from Ethiopia, CSA (2006, 2008a, 2008b).

NOTE: CSA defines a holder as "a person who exercises management control over the operation of the agricultural holding and makes the major decision regarding the utilization of the available resources. He/she has primary technical and economic responsibility for the holding. He/she may operate the holding directly as an owner or a manager. Under conditions of traditional agricultural holding the holder may be regarded as the person, who with or without the help of others, operates land and/or raises livestock in his/her own right, that is the person who decides on which, where, when, and how to grow crops or raise livestock or both and has the right to determine the utilization of the products" (Ethiopia, CSA 2008b).

modern farm management practices and inputs (for example, machinery, irrigation, fertilizers, pesticides, and improved seeds) than do smaller farms. Large farms are not widespread in Ethiopia, and the contribution of these farms to total agricultural output is limited. It is estimated that large farms make up less than 4 percent of total production in the country (Ethiopia, CSA 2009). A recent study, however, suggests that international investors are making large-scale acquisitions of farmland in lowland areas of Ethiopia. Of the approved documented projects, it is estimated that approximately 603,000 hectares are under contract, with government leases for up to 50 years (Cotula et al. 2009). Although foreign direct investment in land is still small, substantial further investment could change the agricultural landscape as farms associated with it begin production and as future partnerships develop.

Table 3.2 shows area cultivated by farm size for the smallholder farms only. Each farm-size interval includes 20 percent of Ethiopia's smallholder farms. Sixty percent of smallholders in Ethiopia cultivate less than 0.90 hectare of land. Forty percent of the farmers cultivate less than 0.52 hectare, accounting for only 11 percent of the total area cultivated. On the other hand, medium-size farms, defined as those cultivating 0.90–25.2 hectares, account for 75 percent of the total land cultivated.

Agricultural production varies widely across Ethiopia's agroecological regions, which are: moisture-reliable cereal areas, moisture-reliable *enset* areas, humid lowlands, drought-prone highlands, and pastoralist areas (see Chapter 2 and Table 3.2). Most smallholder farms are located in the moisture-reliable cereal-based highlands, which accounts for 59 percent of all farm area (that is, 48 percent cultivated by medium-sized farmers and 11 percent by small farmers [Figure 3.1]). The farm area in the drought-prone highlands represents 27 percent of the total area cultivated (that is, 20 percent on medium-sized farms and 7 percent on small farms).

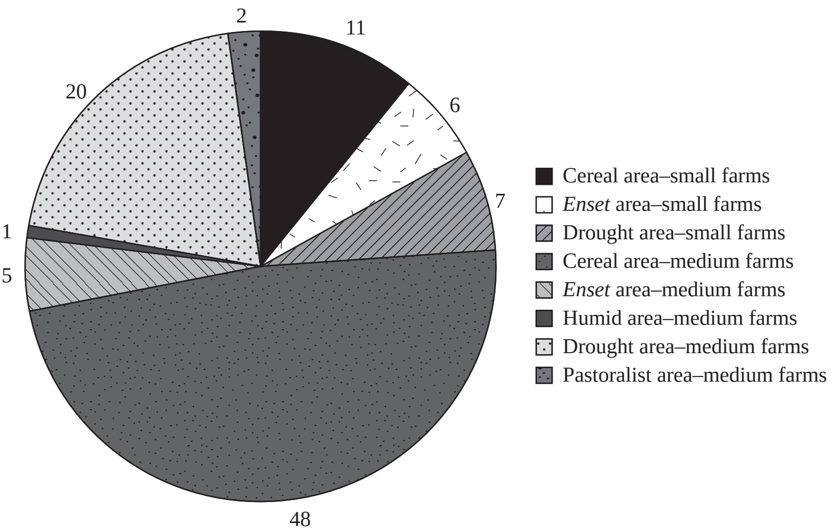
TABLE 3.2 Total area cultivated, by farm size and agroecology, 2007/08

	Area cultivated (thousands of hectares)					
Farm size (hectares)	Moisture-reliable cereal	Moisture-reliable *enset*	Humid lowland	Drought-prone	Pastoralist	Total
0.0–0.25	111.7	133.2	6.5	76.9	6.8	335.1
0.25–0.52	364.3	298.7	17.1	271.2	22.1	973.4
0.52–0.90	884.0	355.7	31.0	474.3	39.4	1,784.4
0.90–1.52	1,739.5	330.0	47.0	824.8	70.5	3,011.8
1.52–25.20	4,153.2	272.4	94.4	1,617.8	140.3	6,278.1
Total	7,252.7	1,390.0	196.0	3,265.0	279.1	12,382.8
	Area cultivated (percentage of national total)					
0.0–0.25	0.9	1.1	0.1	0.6	0.1	2.7
0.25–0.52	2.9	2.4	0.1	2.2	0.2	7.9
0.52–0.90	7.1	2.9	0.3	3.8	0.3	14.4
0.90–1.52	14.0	2.7	0.4	6.7	0.6	24.3
1.52–25.20	33.5	2.2	0.8	13.1	1.1	50.7
Total	58.6	11.2	1.6	26.4	2.3	100.0

SOURCE: Authors' calculations using data from Ethiopia, CSA (2008a, 2008b, 2009).

NOTE: Each farm-size interval (quintile) contains 20 percent of Ethiopia's small farms, approximately 2.57 million farms.

FIGURE 3.1 Shares of area cultivated, by farm size and agroecology, 2007/08



SOURCE: Ethiopia, CSA (2008a, 2008b, 2009).
NOTE: Small farms = farms with a size of less than 0.90 hectare (60 percent of all farms); medium farms = farms with a size of 0.90 or more hectares (40 percent of all farms).

Along with elevation and soil characteristics, reliable access to water is also an important determinant of agricultural productivity and incomes. However, in the moisture-reliable *enset*-based highlands (11 percent of total farm area, of which 5 percent are medium-sized and 6 percent are small farms), population pressure has diminished farm size to such an extent that outmigration has become a major pathway out of poverty. The farmers in the remaining two areas (humid lowlands and pastoralist areas) are relatively less important, accounting for only 3.9 percent of all smallholders in Ethiopia.[1]

Crop Area and Production by Farm Size

Tables 3.3 and 3.4 show the level of crop area and crop production by farm size for the year 2007/08 (Ethiopia, CSA 2008a, 2008b, 2009). That year, smallholder farmers (12.8 million farmers) cultivated a total of 13.0 million hectares of land (11.9 million hectares in the *meher* season and 1.1 million hectares in the *belg* season) or 96.6 percent of the total area cultivated. A total of 461,000 hectares was cultivated by large commercial farms. Smallholder farms generated 95 percent of the total production of the main crops (cereals, pulses, oil-

1. For an alternate estimate of the agropastoralist population in Ethiopia, see the Livelihoods Integration Unit database information in Chapter 7.

TABLE 3.3 Crop area, by season and size of farm, 2007/08

	Crop area (thousands of hectares)					Share of crop (percent)			
	Smallholders					Smallholders			
Crop	*Meher*	*Belg*	Larger farms	Total	Total share (percent)	*Meher*	*Belg*	Larger farms	Total share of crop (percent)
Cereals	8,730	865	158	9,753	72.4	89.5	8.9	1.6	100.0
Teff	2,565	69	5	2,639	19.6	97.2	2.6	0.2	100.0
Barley	985	142	1	1,127	8.4	87.4	12.6	0.1	100.0
Wheat	1,425	65	33	1,523	11.3	93.6	4.2	2.2	100.0
Maize	1,767	512	54	2,334	17.3	75.7	22.0	2.3	100.0
Sorghum	1,534	61	66	1,660	12.3	92.4	3.7	3.9	100.0
Pulses	1,518	188	20	1,725	12.8	88.0	10.9	1.2	100.0
Oilseeds	707	12	122	841	6.2	84.1	1.5	14.5	100.0
Sesame	186	6	118	309	2.3	60.1	1.9	38.0	100.0
Subtotal	10,955	1,065	300	12,319	91.5	88.9	8.6	2.4	100.0
Vegetables	119	n.a.	11	130	1.0	91.7	0.0	8.3	100.0
Root crops	184	n.a.	8	192	1.4	95.9	0.0	4.1	100.0
Other temporary crops	n.a.	n.a.	7	7	0.0	0.0	0.0	100.0	100.0
Fruit crops	63	n.a.	5	68	0.5	92.2	0.0	7.8	100.0
Cash crops	596	n.a.	59	655	4.9	91.0	0.0	9.0	100.0
Coffee	407	n.a.	54	461	3.4	88.2	0.0	11.8	100.0
Sugarcane	21	n.a.	23	45	0.3	47.8	0.0	52.2	100.0
Cotton	n.a.	n.a.	42	42	0.3	0.0	0.0	100.0	100.0
Other permanent crops	n.a.	n.a.	5	5	0.0	0.0	0.0	100.0	100.0
Total[a]	11,938	1,065	461	13,463	100.0	88.7	7.9	3.4	100.0

SOURCES: Ethiopia, CSA (2008a, 2008b, 2009).

NOTE: n.a. = not available.

[a]Does not include *enset* (279,000 hectares in 2008/09).

TABLE 3.4 Crop production, by season and size of farm, 2007/08

	Crop production (thousands of metric tons)				Share of production (percent)			
	Smallholders				Smallholders			
Crop	*Meher*	*Belg*	Larger farms	Total	*Meher*	*Belg*	Larger farms	Total
Cereals	13,717	668	381	14,766	92.9	4.5	2.6	100.0
Teff	2,993	33	8	3,033	98.7	1.1	0.3	100.0
Barley	1,355	112	1	1,468	92.3	7.6	0.1	100.0
Wheat	2,314	67	66	2,448	94.6	2.7	2.7	100.0
Maize	3,750	412	191	4,353	86.1	9.5	4.4	100.0
Sorghum	2,659	26	115	2,800	95.0	0.9	4.1	100.0
Pulses	1,783	87	26	1,896	94.0	4.6	1.4	100.0
Oilseeds	617	0	142	760	81.2	0.1	18.7	100.0
Sesame	187	n.a.	139	326	57.4	0.0	42.6	100.0
Subtotal major crops	16,117	755	550	17,421	92.5	4.3	3.2	100.0
Vegetables	472	n.a.	146	618	76.3	0.0	23.7	100.0
Root crops	1,531	n.a.	154	1,685	90.9	0.0	9.1	100.0
Other temporary crops	n.a.	n.a.	99	99	0.0	0.0	100.0	100.0
Fruit crops	462	n.a.	112	574	80.6	0.0	19.4	100.0
Cash crops	443	n.a.	74	517	85.7	0.0	14.3	100.0
Coffee	273	n.a.	64	338	80.9	0.0	19.1	100.0
Sugarcane	782	n.a.	2,782	3,564	21.9	0.0	78.1	100.0
Cotton	n.a.	n.a.	82	82	0.0	0.0	100.0	100.0
Subtotal other temporary crops	3,689	n.a.	3,449	7,139	51.7	n.a.	48.3	100.0
Total all crops	19,806	755	3,999	24,560	80.6	3.1	16.3	100.0

SOURCES: Ethiopia, CSA (2008a, 2008b, 2009).

NOTE: n.a. = not available.

seeds, vegetables, root crops, fruits, and cash crops). In contrast, large farms contributed only 5 percent of total production of these main crops and only 2.6 percent of cereal production.

However, large farms accounted for a much larger share of the coffee (19.1 percent), fruit (19.4 percent), and vegetable (23.7 percent) production. Even higher shares were reported for sesame and sugarcane: 42.6 percent and 78.1 percent, respectively, of total production were grown on large farms. Similarly, cotton was produced only on large farms.

Because yields are usually higher on large farms, their share of production is often higher than their share of acreage. For example, sugarcane cultivated on large farms accounted for 52.2 percent of total sugarcane acreage, though it accounted for 78.1 percent of total sugarcane production. The yields were three times as high on large farms (119 tons per hectare), as on small farms (36 tons per hectare) (Table 3.5). Other large differences between area and production shares, driven by significant yield gaps, are seen for coffee (large farms: 11.8 percent of total coffee acreage, 19.1 percent of total coffee production) and

TABLE 3.5 Crop yields, by season and size of farm, 2007/08

Crop	Crop yield (metric tons per hectare)				Yield proportion *meher*, large/small
	Smallholders, *meher*	Smallholders, *belg*	Larger farms, *meher*	Yield total	
Cereals	1.57	0.77	2.41	1.51	1.53
Teff	1.17	0.47	1.66	1.15	1.43
Barley	1.38	0.79	1.87	1.30	1.36
Wheat	1.62	1.04	1.97	1.61	1.22
Maize	2.12	0.80	3.55	1.87	1.67
Sorghum	1.73	0.42	1.76	1.69	1.01
Pulses	1.17	0.46	1.29	1.10	1.10
Oilseeds	0.87	0.04	1.17	0.90	1.34
Sesame	1.00	n.a.	1.18	1.05	1.17
Subtotal	1.47	0.71	1.83	1.41	1.25
Vegetables	3.96	n.a.	13.49	4.76	3.40
Root crops	8.31	n.a.	19.66	8.77	2.37
Other temporary crops	n.a.	n.a.	15.14	15.14	n.a.
Fruit crops	7.37	n.a.	20.90	8.43	2.84
Cash crops	0.74	n.a.	1.26	0.79	1.69
Coffee	0.67	n.a.	1.19	0.73	1.77
Sugarcane	36.39	n.a.	118.57	79.29	3.26
Cotton	n.a.	n.a.	1.96	1.96	n.a.

SOURCES: Ethiopia, CSA (2008a, 2008b, 2009).

NOTE: n.a. = not available.

maize (large farms: 2.3 percent of total maize acreage, 4.4 percent of total maize production).

Seasonal Variation

In the main agricultural regions of Ethiopia, there are two rainy seasons, the *meher* and the *belg* seasons, and consequently there are two crop seasons. The *meher* season is the main production season. It encompasses crops harvested between Meskerem (September) and Yekatit (February). Crops harvested between Megabit (March) and Nehase (August) are considered part of the *belg*-season crop. Tables 3.3, 3.4, and 3.5 present data on crop area, production, and yield by season for 2007/08 (CSA data). There are three important insights from these tables. First, only smallholder farmers cultivate crops during the *belg* season, as large farms concentrate their production entirely on the more productive *meher* season. Second, the *meher* season is overwhelmingly important. The area cultivated and crop production in the *meher* season account for 92.1 percent of the total area cultivated and 96.9 percent of the total crop production. Third, crop yields are usually smaller in the *belg* season than in the *meher* season.

Smallholder cereal production in the *meher* season dominates cereal production in Ethiopia and accounted for 93 percent of national cereal production in 2007/08. Although 8.9 percent of the total cereal area was cultivated during the *belg* season, only 4.5 percent of national cereal production was produced in the *belg* season, a reflection of the significantly lower yields in this season. The most important contribution of the *belg* season to total production is maize: 22.0 percent of the total maize area was cultivated in the *belg* season, producing 9.5 percent of total maize output.

Cereal Production Trends

Trends in Total Cereal Production

Data on national cereal production levels and trends are controversial. Changes in government and methodologies have coincided with distinct breaks in the data, making it difficult to distinguish between actual changes and statistical artifacts. Moreover, beginning in 1981/82, there have been two alternative data sources for each year, one from the Ministry of Agriculture and Rural Development (or its predecessors) and one from the CSA. We present the descriptive statistics of agricultural production and areas in Table 3.1.

Data from the Food and Agricultural Organization (FAO), generally derived from the Ministry of Agriculture and Rural Development or its predecessors, indicate a steady but slow 1.9 percent average growth in cereal production in the 1960s, due almost equally to modest area (1.1 percent per year) and yield (0.8 percent per year) increases (Table 3.6). Given a population growth rate estimated at 2.3 percent per year in this period, it is estimated that per capita production declined by an average of 0.4 percent per year. Due to the poor state of infrastructure and weak statistical capacity in the country in the 1960s, the degree of uncertainty in this data is rather high, however.

Cereal production showed high variability at the beginning of the 1970s. Cereal production decreased from 5.17 million tons in 1972/73 to 4.37 and 4.35 million tons in 1973/74 and 1974/75, respectively, before falling even more dramatically, to only 3.81 million tons in 1975/76, that is, 31 percent below the production in 1972/73. Food aid and other net imports of cereals increased more than 10-fold between 1972/73 and 1974/75, from 8,000 to 112,000 tons, but they were nonetheless far too small to offset the decline in production. As a result, per capita availability of food fell from 138 kilograms per person per year in 1972/73 to only 113 kilograms per person per year in 1973/74 and 1974/75, then plummeted to only 96 kilograms per person per year in 1975/76 (Figure 3.2).[2]

The major cause of the reported production fall between 1972/73 and 1975/76 was a steep 31 percent decrease in the cultivated area of cereals, a decline equal to the decline in production. Two factors may have contributed to the change in cultivated area in that period: the revolution of 1973 (that is, the fall of the imperial regime of Haile Selassie) and the subsequent land reform and the regulation of cereal prices beginning in 1975, which may have reduced incentives for production (or even led to major incentives to under-report production). In addition, parts of Ethiopia experienced major droughts during this time, which contributed to famine conditions. The *meher* rains of 1972 and the *belg* rains of 1973 failed or were insignificant in large areas of the country, leading to what has been described by many as the 1972–74 famine, in which Wollo and parts of Tigray experienced repeated crop failures. According to Kloos and Lindtjorn (1993), by 1975 five regions were affected by the inadequate rains. Estimates suggest that cattle herds were reduced by 72 percent in Afar region during the 1972–74 famine (Devereux 2000). However, some of the decline in reported cultivated area may also have been due to differences in methodology and in the implementation of production surveys under the Derg regime.

2. The figure for availability of food includes an adjustment for postharvest production losses of about 5 percent, as well as feed, seed, and other nonfood uses. Data on the FAO Food Balance Sheets (FAO various years) show almost no decline in food availability per capita in this period (from 116.7 kilograms per person per year in 1972/73 to 113.3 kilograms per person per year in 1975/76) due to very large changes in stocks. From 1961/62 through 1972/73, stocks rose each year, with a cumulative buildup of 4.46 million tons. Thus, per capita food availability for these years was reduced accordingly. The FAO data then show a drawdown of stocks of 50,000 tons per year in 1973/74 and 1974/75, followed by a drawdown of 650,000 tons in 1975/76, which raised per capita food availability in these years (see Figure 3.2).

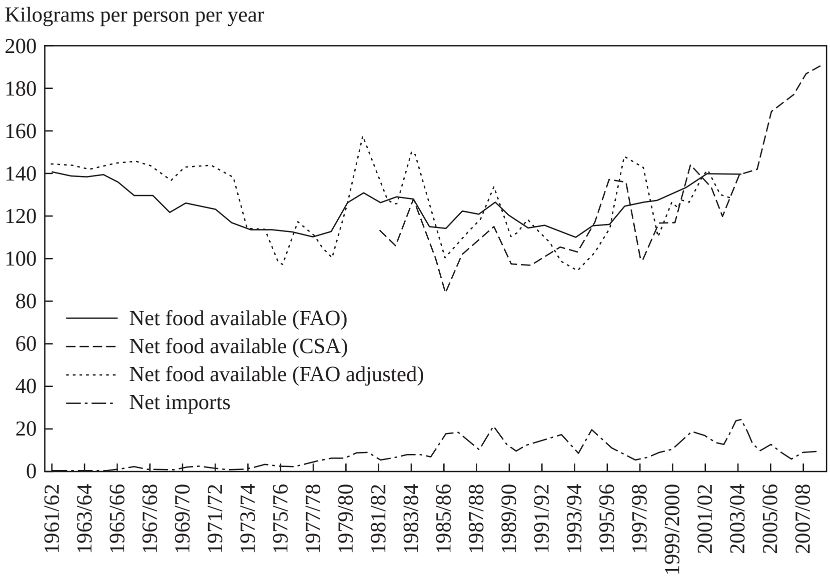
TABLE 3.6 Cereal area, yield, and production, decade averages and growth rates, 1961/62–2008/09

	Food and Agriculture Organization (FAO) figures			Central Statistical Agency (CSA) figures		
Decade	Area (millions of hectares)	Yield (metric tons per hectare)	Production (millions of metric tons)	Area (millions of hectares)	Yield (metric tons per hectare)	Production (millions of metric tons)
1961/62–1969/70	6.23	0.73	4.53	n.a.	n.a.	n.a.
1970/71–1979/80	5.25	0.90	4.63	n.a.	n.a.	n.a.
1980/81–1989/90	4.89	1.15	5.63	4.30	1.14	4.89
1990/91–1999/2000	5.87	1.18	6.88	5.60	1.20	6.67
2000/01–2008/09	8.24	1.30	10.68	7.72	1.41	10.94
	Average growth rates (from logarithmic regressions, percent)					
1961/62–1969/70	1.1	0.8	1.9	n.a.	n.a.	n.a.
1970/71–1979/80	–4.9	3.7	–1.4	n.a.	n.a.	n.a.
1980/81–1989/90	0.5	–0.8	–0.3	2.4	–1.7	0.6
1990/91–1999/2000	5.9	–0.7	5.1	5.8	–0.5	5.2
2000/01–2008/09	2.7	3.6	6.5	3.1	3.5	7.0

SOURCES: FAO (various years); Ethiopia, CSA (various years).

NOTES: FAO data are for 2000/01–2007/08 (2000–07). FAO denotes 2007/08 as 2007. CSA data are for smallholders in *meher* season only. CSA 1980/81–1989/90 data are for 1981/82–1989/90. CSA levels and growth rates are based on interpolated data (constant logarithmic growth rates). n.a. = not available.

FIGURE 3.2 Per capita cereal consumption and imports, 1961/62–2008/09



SOURCE: FAO (various years; Ethiopia, CSA (various years).
NOTE: CSA = Central Statistical Agency; FAO = Food and Agriculture Organization.

There were wide fluctuations in food production and net availability in the second half of the 1970s and the 1980s, but overall, cereal production stagnated in this period (see Figure 3.2 and Table 3.6). The average growth rate of production from 1979/80 to 1989/90 was –0.3 percent according to FAO data; CSA data for 1981/82–1989/90 indicate that the growth rate was 0.6 percent. In the 1990s, growth in cereal production accelerated to about 5 percent per year (according to both FAO and CSA data). The rise during the 1990s was entirely due to increases in the area cultivated (by almost 6 percent per year, as reflected in both the FAO and CSA data; see Table 3.6), while yields continued to decline by 0.5–0.7 percent per year. A shift then occurred in the 2000s, whereby the growth in area cultivated was reduced to nearly half of the growth rate experienced during the 1990s, while yield growth became positive and increased three-fold.

According to CSA data, growth in cereal production further accelerated to 7.0 percent per year from 1999/2000 to 2008/09. Average cereal production increased to 10.94 million tons per year during this period. Though growth in the area cultivated slowed to 3.1 percent per year, yields increased by 3.5 percent per year. Cereal production and yield growth were particularly rapid from 2004/05 to 2008/09 (12.2 and 6.2 percent, respectively), while cereal acreage showed a slower annual growth rate of 4.8 percent (significantly lower than the previous growth in area expansion, but relatively high given the area constraints within productive areas in Ethiopia) (Table 3.7). During the same period, cereal production on average involved 11 million holders. Cereal acreage and cereal output averaged 8.2 million hectares and 12.1 million tons, respectively.

Trends in the Production of the Major Cereals

Since the collection of national agricultural statistics began in the 1960s, teff has always accounted for the largest share of cereal area cultivated (Table 3.8). However, over the past five decades the share of teff has declined gradually (a decrease of 5.8 percentage points from the 1960s to the first decade of the 2000s), while the share of maize has increased by 7.8 percentage points. Compared to teff and maize, the share of other cereals stayed relatively stable over time.

During the first decade of the 2000s, production of the major cereals increased, with teff (8.9 percent), sorghum (8.6 percent), and wheat (8.3 percent) having the fastest annual growth rates. Growth in maize production, at 6.8 percent per year in the 1980s and 5.5 percent per year in the 1990s, slowed to 4.2 percent in the early 2000s. This reduced growth figure was caused in part by a collapse in domestic maize prices, which induced slow adoption, or even disadoption, of hybrid maize technology.

Compared to the 1990s, the area cultivated in wheat and sorghum grew fastest (by 4.9 and 4.6 percent per year, respectively) during 2000/01–2008/09, while the area cultivated in maize increased by only 1.6 percent per year. Yields of all five major cereals increased rapidly in the first decade of the 2000s, with growth rates averaging between 2.9 and 3.0 percent per year for maize and wheat and between 4.3 and 4.8 percent per year for sorghum and teff.[3]

Because the total growth of cereal production was particularly rapid from 2004/05 to 2008/09, it is worth examining the growth rates of the five cereals separately in this period (see Table 3.7). The speed of growth was somewhat varied across crops. The average annual growth in output was fastest in maize production (18.9 percent), closely followed by sorghum production (18.3 percent). Teff production rose by 15.9 percent per year. The slowest output growth was recorded in barley production (0.7 percent) due to a decline in barley acreage. It is interesting to note that, for the main cereals, yield growth was faster than acreage expansion during the period, so the increased production rates were the result more of increased yields than of increased acreages. An excep-

3. At first glance it is surprising that sorghum and teff have had greater growth rates given that maize and wheat yields have been more responsive to the use of fertilizer and modern seeds (as discussed later in this chapter). However, expansion of modern input use proved insufficient as an explanation for the growth in yields recorded in the CSA data. Further discussion of this issue can be found in Asrat, Getachew, and Taffesse (2010).

TABLE 3.7 Average cereal production, area covered, and yield, by crop, 2004/05–2007/08 (1997–2000 E.C.)

Crop	Number of holders	Production		Area cultivated		Yield	
		Level (million tons)	Annual growth rate (percent)	Level (million hectares)	Annual growth rate (percent)	Level (tons per hectare)	Annual growth rate (percent)
Grain	11,519,148	14.090	11.8	10.38	3.9		
Cereals	11,156,837	12.063	12.2	8.23	4.8	14.0	6.2
Teff	5,462,782	2.408	15.9	2.34	6.7	10.2	7.7
Barley	3,842,462	1.326	0.7	1.02	–3.4	13.0	4.5
Wheat	4,118,164	2.293	2.1	1.44	0.6	15.9	1.5
Maize	7,287,931	3.314	18.9	1.60	9.0	20.6	7.8
Sorghum	4,253,534	2.216	18.3	1.43	7.4	15.4	8.9

SOURCES: Authors' computations using data from Ethiopia, CSA (2006, 2007, 2008a, 2008b).

NOTES: Cereal yield is calculated as the acreage-share-weighted average of the yields of the five major cereals listed in the table; these cereals account for more than 95 percent of cereal acreage and cereal output. E.C. = Ethiopian calendar.

TABLE 3.8 Cereal area cultivated, decade averages, 1961/62–2008/09

Decade	Teff	Wheat	Maize	Sorghum	Barley	Other	Total
	Cereal and area cultivated (millions of hectares)						
1961/62–1969/70	2.11	0.97	0.80	1.09	0.96	0.30	6.23
1970/71–1979/80	1.67	0.78	0.83	0.87	0.84	0.27	5.25
1980/81–1989/90	1.23	0.52	0.84	0.71	0.86	0.15	4.30
1990/91–1999/2000	1.76	0.75	1.12	0.95	0.73	0.29	5.60
2000/01–2008/09	2.17	1.27	1.59	1.35	0.96	0.38	7.72
	Shares of total cereal area cultivated (percent)						
1961/62–1969/70	33.9	15.6	12.8	17.4	15.4	4.9	100.0
1970/71–1979/80	31.8	14.8	15.7	16.6	15.9	5.1	100.0
1980/81–1989/90	28.7	12.0	19.5	16.4	19.9	3.4	100.0
1990/91–1999/2000	31.3	13.4	20.0	17.0	13.1	5.2	100.0
2000/01–2008/09	28.1	16.5	20.6	17.5	12.5	4.9	100.0

SOURCES: 1961/62–1979/80 data are from the Food and Agriculture Organization; 1980/81–2008/09 data are from Central Statistical Agency Agricultural Sample Surveys.

tion to this was maize, a crop considered to have the highest potential for yield increases. Over this four-year period, the yield of maize increased by 7.8 percent, while its area grew by 9 percent.

Decomposition Analysis of Cereal Production

Methodology

Agroecology and market infrastructure, the key components of the development domains, are important determinants of crop production and revenue. In this section we decompose changes in cereal output into changes in area and yield across various development domains and time periods. We also examine changes in gross crop revenues by total output and price.

The quantity of output of crop i (Q_t^i) is the product of yield (y_t^i) and acreage allocated to its production (A_t^i). Decomposition can thus take the following approximate form:

$$dQ_i \cong A_i dy_i + y_i dA_i.$$

The decomposition reveals the relative contribution of changes in acreage and yield to the overall change in the quantity of output. This is a policy-relevant issue to the extent that acreage and, to a certain degree, yield reflect government interventions in agriculture and the wider economy and are not determined simply by variations in weather and the severity of pest attacks.

A more informative decomposition involves crop revenues. Such a decomposition can highlight, in addition to the relative contributions of changes in acreage and yield as quantity decomposition, changes in prices and the pattern of allocation of acreage. Changes in prices reflect in part market development, while patterns of acreage allocation are partly driven by differences in returns to the cultivation of alternative crops. Both are relevant to policy decisions.

The total revenue from cereal cultivation (R) is given by the sum of revenues from each cereal type i:

$$R = \sum_{i=1}^{n} p_i Q_i = \sum_{i=1}^{n} p_i (A_i y_i),$$

where p_i = price of cereal i and the other variables are as defined earlier. Defining total cereal acreage as $A = \sum_{i=1}^{n} A_i$ and the share of each cereal in total acreage as $a_i = \frac{A_i}{A}$, cereal revenue can be computed as

$$R = \sum_{i=1}^{n} p_i (a_i A y_i) = A\left(\sum_{i=1}^{n} p_i a_i y_i\right).$$

The expression shows that there are four potential sources of growth—changes in total acreage, changes in the shares of crops in total acreage, changes in crop yields, and changes in crop prices. Thus, approximately

$$dR \cong \left(\sum_{i=1}^{n} a_i y_i p_i\right) dA + A\sum_{i=1}^{n} a_i y_i \, dp_i + A\sum_{i=1}^{n} a_i p_i \, dy_i + \sum_{i=1}^{n} y_i p_i \, da_i.$$ [4]

The first term on the right hand side of the equation denotes the change in the gross crop income due to changes in total cropped area; the second term gives the effect of changes in real prices; the third term captures the effect of change in crop yields; and the fourth term describes the change in gross crop income associated with changes in the area composition of crops over time. If the fourth term is positive, this indicates a reallocation of cropland from lower-value crops to higher-value crops, so this term represents the effect of crop diversification on gross crop income. Dividing both sides of the equation by the overall change in gross crop income (dR) gives the proportional contribution of each component of the growth.

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4. For a single crop, the expression reduces to

$$dR_i \cong y_i p_i dA_i + y_i A dp_i + p_i A_i dy_i.$$

A more detailed description of the decomposition approach and its application can be found in Taffesse (2009).

Decomposition of Changes in Total Cereal Revenue

Tables 3.9 and 3.10 show the results of a decomposition of changes in cereal output and cereal revenue across various development domains for the four main administrative regions—Amhara, Oromiya, the Southern Nations, Nationalities, and People's Region, and Tigray. The data used in this analysis are derived from CSA Agricultural Sample Surveys at the administrative zone level for the period 1996/97–2007/08 (1989–2000 E.C. [Ethiopian calendar]). Four development domains are considered: low market access (LMA) with low agricultural potential (LAP), LMA with high agricultural potential (HAP), high market access (HMA) with LAP, and HMA with HAP.

For cereal production, the broad story is very clear (see Table 3.9). During the study period, acreage expansion was the more important source of growth in output for four of the five major cereals (the exception is teff) in almost all development domains. Out of the 60 crop–domain–period specific pairs of yield and acreage contribution shares, for only 12 was the share of yield higher. Moreover, no statistically significant correlation can be detected between the acreage share of a crop and yield changes as a source of growth in that crop's output. Likewise, the relative contributions of acreage and yield changes to output growth were not statistically significantly different across development domains or time periods, except in the case of sorghum (see Taffesse 2009). Similar findings were discussed in Chapter 2; development domain classification was not a strong indicator of yield increases, but good market access and high labor to land density were good indicators.

The average picture for the decomposition of cereal revenues across development domains is also relatively simple (Table 3.10). For all cereals, acreage expansion was the top source of revenue change. This is to be expected because acreage increase generated the bulk of output growth during the period. Increases in yield were the second-largest contributor to revenue growth in the cases of maize, sorghum, and wheat. Real price rises and acreage expansion were the top two sources of growth only for barley and teff revenue (in fact, price and acreage contributed equally to teff revenue growth).

This general picture holds across development domains and periods. As in the case of output change, it was not possible to detect statistically significant differences across development domains in the pattern of contributions to the growth of each crop's revenue (with the exception of teff).[5] In contrast, differences across periods are statistically significant (with the exceptions of yield contributions to the growth in barley revenue, sorghum revenue, and wheat revenue). A closer look at these time differences revealed the following. During

5. Note that there are 5 significant differences (out of a possible 15), with levels of significance falling between 5 percent and 10 percent. These are yield contributions in the cases of sorghum, wheat, and teff and area and price contributions in the case of teff.

TABLE 3.9 Median contributions to changes in quantity of cereal production, by crop and year, 1998/99–2007/08 (percent)

	Barley		Maize		Sorghum		Teff		Wheat	
	Change in crop area	Change in crop yield	Change in crop area	Change in crop yield	Change in crop area	Change in crop yield	Change in crop area	Change in crop yield	Change in crop area	Change in crop yield
Multiple years										
1998/99–2000/01	72.6	35.1	74.5	34.2	69.8	32.7	56.0	49.1	71.7	42.4
2001/02–2004/05	73.3	28.7	49.8	45.2	57.3	39.6	54.8	47.8	67.2	35.7
2005/06–2007/08	58.6	39.3	64.4	39.7	67.5	39.1	55.6	49.1	67.3	48.7
Individual years										
1998/99	59.3	49.2	78.6	36.8	51.0	53.2	61.1	48.6	77.6	30.5
1999/2000	95.0	8.1	74.8	25.7	72.5	19.2	64.5	39.2	78.0	39.9
2000/01	63.4	48.0	70.0	40.0	85.9	25.6	42.5	59.5	59.6	56.8
2001/02	57.9	37.1	62.6	31.1	67.4	26.9	68.4	25.3	71.1	33.1
2003/04	99.1	–0.3	60.7	29.6	55.6	36.7	56.2	38.8	76.8	21.9
2004/05	62.8	49.2	26.2	75.0	48.8	55.1	39.7	79.4	53.6	52.1
2005/06	32.2	57.1	44.6	67.4	69.0	48.9	37.4	60.7	37.9	60.1
2006/07	85.2	19.2	84.3	21.4	79.9	26.6	86.8	16.8	92.7	42.9
2007/08	58.4	41.5	64.3	30.3	53.7	41.9	42.5	69.7	71.3	43.2

SOURCES: Calculated from Central Statistical Agency data and Taffesse (2009).

NOTE: Here *median contribution* captures the median of the zone-level contribution of change in crop area and crop yield to change in crop production.

TABLE 3.10 Median contributions to changes in cereal revenue, by crop and development domain, all periods, 1998/99–2007/08 (percent)

Development domain	Crop	Change in crop area	Change in crop yield	Change in crop price	Actual change minus estimated change
LMA, LAP	Barley	54.6	14.7	20.5	10.2
	Maize	47.2	14.1	24.9	13.9
	Sorghum	30.6	29.9	26.7	12.8
	Teff	51.8	25.2	15.7	7.3
	Wheat	55.7	38.7	7.5	–1.9
LMA, HAP	Barley	38.4	13.1	37.6	10.9
	Maize	51.7	35.0	17.1	–3.9
	Sorghum	48.0	14.6	15.2	22.2
	Teff	38.4	9.3	73.8	–21.5
	Wheat	47.5	30.7	35.3	–13.5
HMA, LAP	Barley	54.6	21.3	28.5	–4.4
	Maize	41.8	50.7	–3.9	11.5
	Sorghum	42.4	33.0	28.6	–4.0
	Teff	27.7	29.4	42.1	0.8
	Wheat	50.2	32.7	23.0	–6.0
HMA, HAP	Barley	53.7	17.2	25.4	3.7
	Maize	53.5	15.6	13.5	17.4
	Sorghum	60.5	19.4	11.3	8.7
	Teff	41.8	21.0	27.9	9.3
	Wheat	41.5	26.8	17.2	14.4
Average	Barley	50.3	16.6	28	5.1
	Maize	48.6	28.9	12.9	9.7
	Sorghum	45.4	24.2	20.5	9.9
	Teff	39.9	21.2	39.9	–1.0
	Wheat	48.7	32.2	20.8	–1.8

SOURCE: Authors' computations using Central Statistical Agency data (Ethiopia, CSA, various years).

NOTE: HAP = high agricultural potential; HMA = high market access; LAP = low agricultural potential; LMA = low market access.

the first period (1998/99–2000/01), acreage expansion was the dominant source of change in cereal revenue, followed by yield (see Table 3.11). Price increases became the top contributor to revenue growth in the second period, with acreage change taking second place. Yield improvements played a limited role during this period. The third period was characterized by more mixed outcomes. Increases in acreage generated the largest contribution to revenue growth in the cases of barley, maize, sorghum, and teff, while yield change did so for wheat revenue. Crop prices also made significant contributions to revenue growth in this third period.

TABLE 3.11 Median contributions to changes in cereal revenue, by crop and period, 1998/99–2007/08 (percent)

		Period		
Crop revenue	Source of revenue growth	1998/99–2000/01	2001/02–2004/05	2005/06–2007/08
Barley revenue	Change in crop area	75.9	31.2	43.1
	Change in crop yield	21.0	6.4	24.6
	Change in crop price	7.9	55.7	36.0
Maize revenue	Change in crop area	72.5	25.0	49.2
	Change in crop yield	29.4	0.5	31.2
	Change in crop price	6.4	53.1	13.2
Sorghum revenue	Change in crop area	69.7	28.2	40.1
	Change in crop yield	25.1	10.5	34.4
	Change in crop price	5.8	41.3	25.3
Teff revenue	Change in crop area	58.9	28.0	43.5
	Change in crop yield	42.9	5.7	21.4
	Change in crop price	14.0	47.7	37.0
Wheat revenue	Change in crop area	64.6	26.4	32.6
	Change in crop yield	41.5	16.3	43.0
	Change in crop price	6.1	53.3	25.8
Total cereal revenue	Change in crop total cereal area	60.6	28.0	41.7
	Change in crop yield	19.6	–1.3	30.8
	Change in acreage shares	3.3	0.1	–0.2
	Change in crop price	15.3	64.0	27.5

SOURCE: Authors' computations using Central Statistical Agency data (Ethiopia, CSA, various years).

NOTE: The annual Agricultural Sample Survey for 2002/03 was not implemented. Thus, 2002/03 is not included; that is, the period 2001/02–2004/05 includes 2001/02, 2003/04, and 2004/05.

Finally, we examine changes in total cereal revenue, calculated as the sum of the value of output of the five major cereals covered. As noted earlier, consumer price index–deflated real prices are used in computing the value of crop output. Aggregation across crops leads to a fourth source of revenue growth, namely the share of each crop in total cereal acreage. In other words, change in a specific crop's acreage has two components—change in total acreage and change in its share of total acreage.

The results of the decomposition exercise for total cereals are reported in Table 3.11 (bottom four rows for periods 1998/99–2000/01, 2001/02–2004/05, and 2005/06–2007/08) and Table 3.12.

Consistent with previous results, change in total cereal acreage was a primary source of growth in total cereal revenue. That price changes were a competing source in this case is an interesting variation. Change in allocation of cereal acreage was rather limited and thus contributed very little to revenue

TABLE 3.12 Median contributions to changes in cereal revenue by development domain and period, 1998/99–2007/08 (percent)

Development domain	Period	Change in total area under cereals	Change in cereal yields	Change in the allocation of total area under cereals	Change in the price of cereals	Actual change minus estimated change
HMA, HAP	1998/99–2000/01	58.98	34.39	2.30	22.44	–18.12
	2001/02–2004/05	29.59	0.10	0.94	53.14	16.24
	2005/06–2007/08	17.15	32.71	–0.39	45.68	4.85
HMA, LAP	1998/99–2000/01	61.12	36.45	0.58	–28.55	30.40
	2001/02–2004/05	34.77	–22.94	–0.25	87.15	1.26
	2005/06–2007/08	–0.81	20.64	–1.26	56.56	24.87
LMA, HAP	1998/99–2000/01	56.19	9.86	5.75	26.43	1.77
	2001/02–2004/05	26.54	–12.64	–0.07	87.46	–1.30
	2005/06–2007/08	18.67	34.39	0.14	74.31	–27.51
LMA, LAP	1998/99–2000/01	69.04	18.68	4.29	8.50	–0.51
	2001/02–2004/05	25.96	7.77	–0.09	59.45	6.91
	2005/06–2007/08	19.92	39.03	–0.17	36.95	4.27

SOURCE: Authors' computations using Central Statistical Agency data (Ethiopia, CSA, various years).

NOTES: The annual Agricultural Sample Survey for 2002/03 was not implemented. Thus, 2002/03 is not included; that is, the period 2001/02–2004/05 includes 2001/02, 2003/04, and 2004/05. HAP = high agricultural potential; HMA = high market access; LAP = low agricultural potential; LMA = low market access.

expansion. Its role is likely to be more prominent when a more inclusive set of crops is considered (if pulses and oilseeds are added, for example).

As before, a statistically significant difference in the pattern of contributions to revenue growth could not be ascertained across development domains. The opposite is true across time periods, however (see Tables 3.11 and 3.12). A clear dominance of acreage expansions is found for the first period (1998/99–2000/01), while a considerable rise in the contribution of price changes is found for 2001/02–2004/05. In a reversal of outcomes, changes in yield were positive and considerable, though second to price changes, as a source of revenue growth in the last period (2005/06–2007/08).

Other Crop Agriculture

Although the production of cereals is by far the most important sector in Ethiopian agriculture, it is also important to discuss the other crops given that the area cultivated with these crops is increasing more rapidly than cereal area. The other main crops discussed here are pulses, oilseeds, coffee, and *enset.* Table 3.13 presents the area cultivated in these crops in the periods 1994/95–2000/01 and 2003/04–2008/09, also giving the acreage growth rates within each of these two periods.[6]

Pulses

In the periods 1994/95–2000/01 and 2003/04–2008/09, pulse area was 12.0 percent and 12.4 percent of the total area cultivated, respectively. Annual production averaged 1.5 million tons; this represents 8.5 percent of total yearly production (in the period 2004/05–2007/08; see Table 3.1). The share of the area cultivated in pulses is increasing, since pulse area is increasing faster than total area cultivated with cereals. In the period 2003/04–2008/09, this was 6.6 percent per year, which was faster than the yearly growth in cereals (4.6 percent). The main pulses are horse beans (*Vicia faba* var. minor), field peas (*Pisum arvense*), haricot beans (*Phaseolus vulgaris*), and chickpeas (*Cicer arietinum*). They form an important basis for nonmeat national dishes and are principal protein sources.

Oilseeds

The main oilseeds are *neug* (*Guizotia abyssinica,* also known as *noug* or niger seed), linseed (*Linum usitatissimum,* also known as flax), and sesame (*Sesamum indicum*), with sesame increasing in importance over time. The cultivation of *neug* is found mostly in the northern and central highlands at elevations between 1,800 and 2,500 meters. Linseed is cultivated in the same areas as niger seed. Sesame grows at elevations from sea level to about l,500 meters. Oilseeds are the third major crop category according to acreage: 5.4 percent and 6.8 percent

6. Note that no data at the administrative zone levels are available for either 2001/02 or 2002/03.

TABLE 3.13 Area cultivated, share of all crops, and growth rate (smallholders, *meher* season), 1994/95–2008/09

	1994/95–2000/01			2003/04–2008/09		
Crop	Area (thousands of hectares)	Share of area (percent)	Area growth (percent)	Area (thousands of hectares)	Share of area (percent)	Area growth (percent)
Cereals	6,545	82.6	3.2	8,115	73.5	4.6
Pulses	954	12.0	4.7	1,370	12.4	6.6
Horse beans	336	4.2	2.4	470	4.2	6.1
Field peas	159	2.0	1.4	227	2.1	–0.5
Haricot beans	122	1.5	15.9	219	2.0	5.9
Chickpeas	172	2.2	4.3	197	1.8	8.9
Other	165	2.1	5.9	257	2.3	13.7
Oilseeds	426	5.4	5.6	749	6.8	4.3
Neug	240	3.0	6.4	303	2.8	–0.8
Linseed	115	1.5	–3.0	186	1.7	–1.5
Sesame	23	0.3	33.1[a]	185	1.6	20.5
Other	48	0.6	7.8	75	0.7	7.2
Subtotal	7,926	100.0	3.5	10,235	92.7	4.8
Vegetables	n.a.	n.a.	n.a.	112	1.0	11.7
Root crops	n.a.	n.a.	n.a.	167	1.5	0.5
Fruit crops	n.a.	n.a.	n.a.	49	0.4	4.1
Cash crops	n.a.	n.a.	n.a.	485	4.4	9.8
Chat	n.a.	n.a.	n.a.	136	1.2	6.1
Coffee	n.a.	n.a.	n.a.	308	2.8	12.3
Hops	n.a.	n.a.	n.a.	23	0.2	3.7
Sugarcane	n.a.	n.a.	n.a.	18	0.2	2.3
Total[b]	7,926	100.0	100.0	11,048	100.0	5.1

SOURCE: Central Statistical Agency production data (Ethiopia, CSA, various years).

NOTE: n.a. = not available.

[a]The sesame growth rate is for 1995/96–2000/01.

[b]Does not include *enset* (279,000 hectares in 2008/09). Data on vegetables, root crops, fruit crops, and cash crops were not available for 1994/95–2000/01. Thus, the total for 1994/95–2000/01 is not comparable to the total for 2003/04–2008/09.

of the total area cultivated was occupied by oilseeds in the periods 1994/95–2000/01 and 2003/04–2008/09, respectively (see Table 3.13). The area's growth rate was 5.6 percent per year in the first period, though it declined to 4.3 percent per year in the second period. This slower growth was mainly due to negative yearly growth rates in the *neug* and linseed areas. These were balanced by fast growth in the sesame area. Sesame grew from essentially zero in 1994/95 to 288,000 hectares in 2008/09, with an impressive growth rate of 33.1 percent per year in the first half of that period and a growth rate of 20.5 percent per year in 2003/04–2008/09.

In 2007/08, a total of 760,000 tons of oilseeds were produced; this was 3 percent of total annual production. Smallholder farms produced 81.3 percent of total oilseed production, while large farms produced 18.7 percent. However, large farms produced 42.6 percent of total sesame output. Sesame seed has the highest value per ton of Ethiopian oilseeds, more than twice the value of linseed.[7] According to market value, oilseeds are much more important than pulses.

Coffee

In 2003/04–2008/09, coffee was cultivated by 3 million farmers on a total of 308,000 ha, which was only 2.8 percent of the total cultivated area. However, the share of the area cultivated in coffee increased by 12.3 percent per year from 2003/04 to 2008/09. In 2008/09, 337,000 tons were produced, 1.3 percent of the total production; 19 percent of the total coffee output was produced by large farms. Coffee is Ethiopia's major export product, and Ethiopia is the world's fifth-largest producer of coffee.

Enset

Enset (*Ensete ventricosum*) is commonly known as "false banana" for its close resemblance to the domesticated banana plant, but its fruit is not edible. *Enset* grows best at altitudes higher than 1,600 meters above sea level, not because it cannot withstand heat but because it needs adequate soil moisture. It can survive seasonal rainfall shortages but succumbs to prolonged droughts.[8]

In 2008/09, *enset* was cultivated on 279,000 hectares, 2.5 percent of the total cultivated area. As many as 7 million people consume carbohydrate-rich, low-protein *enset* roots as a staple or co-staple food. For many households it forms an important food security reserve against failures of other crops. Besides being used as a staple food, *enset* is also used for animal fodder, fiber production, and construction materials and for its medicinal value.

Other Crops

Only 1 percent of the total area cultivated, the equivalent of 112,000 hectares, is used to grow vegetables. However, the importance of vegetables is growing; there was 11.7 percent per year growth in acreage from 2003/04 to 2008/09 (see Table 3.13). This increase in growth rate is comparable to that of coffee (12.3 percent). Vegetables, together with sesame and coffee, are the crops with the largest acreage increases in recent years.

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7. Ethiopia is the fifth-largest world producer of linseed and the sixth-largest producer of sesame seed; it is the third-largest world exporter of sesame seed and an important exporter of *neug* (niger seed).

8. Each plant takes four to seven years to mature. The plant is cut before flowering, and the pseudostem (stalk or base) and leaf midribs are scraped to collect the pulpy white juice. The pulp is then fermented for 10–25 days in the soil, followed by another 20 days of sun drying. Finally, *enset*-based food, in the form of a steam-baked flatbread or a kind of porridge, can be prepared.

Chat is an important cash crop, and its significance is increasing. Only 1.2 percent of the total area cultivated is used for *chat* production; however, the area cultivated is increasing rapidly—by 6.1 percent per year in 2003/04–2008/09 (see Table 3.13).

Constraints and Opportunities in Crop Agriculture

Much of the increase in crop production in the past decade has been due to increases in area cultivated. To what extent the area cultivated can continue to expand remains an important question. It is probable that in the highland areas, expansion of cultivated area will have to come almost exclusively from reduction in pastureland. In most instances, this land is likely to be less fertile than existing cropland. Increased use of intercropping or double cropping may allow some expansion of the area cultivated as well. Expansion of the area cultivated outside of the highland regions will require major investments in infrastructure and might involve reductions in forest areas, with important negative environmental implications. As a consequence, it seems that obtaining higher yield rates is the challenge of Ethiopia's agricultural system.

Numerous constraints to yield and productivity growth have been identified, including relatively low levels of use of inputs (fertilizer, pesticide, improved seeds), low levels of irrigation, soil degradation and soil erosion, inadequate agricultural research and extension, and constraints to market development.

The limited use of modern inputs is a major characteristic of crop production in Ethiopia, and it seems to be a major explanation for its current low productivity. Table 3.14 shows that in 2007/08 only about 40 percent of cereal acreage benefited from chemical fertilizers, with the highest level of application in wheat areas. It is remarkable that the share of fertilizer-applied area in cereal cultivation declined from 2001/02 to 2007/08 after an increase in 2001/02 compared to 1997/98. The opposite is seen when the amount of fertilizer used per hectare of fertilizer-applied cereal area is considered. In that case, the levels used in 2001/02 were lower than in 1997/98, but an increase was noted in 2007/08 compared to 2001/02. In general, the intensity of fertilizer use is relatively low when estimated as the quantity of fertilizer per hectare of total cereal acreage. However, it is broadly comparable to the intensity in Asia when measured as the quantity of fertilizer per hectare of fertilizer-applied cereal area (Agwe, Morris, and Fernandez 2007).

Though increasing, the use of other modern inputs is even more limited (Table 3.15). In 2007/08, improved seeds were applied over about 5 percent of cereal acreage.[9] The highest rate was in maize production (19.5 percent), with negligible rates in the production of other cereals. Improved irrigation techniques are even less applied. Only 1 percent of cereal acreage was irrigated in

9. Note that the estimate of the use of improved seeds is substantially higher if replanting of improved seed from own production is included (see Chapter 4).

TABLE 3.14 Fertilizer application, by crop, private holdings, 1997/98, 2001/02, 2007/08

	Fertilizer application area (share of total area cultivated, percent)			Fertilizer application[a] (total kilograms / total hectares)			Fertilizer application[b] (kilograms per hectare)		
Crop	1997/98	2001/02	2007/08	1997/98	2001/02	2007/08	1997/98	2001/02	2007/08
Cereals	32.3	42.8	39.0	37	30	45	115	100	116
Teff	44.9	49.9	54.3	50	40	52	111	91	95
Barley	34.4	39.6	30.5	33	20	30	97	79	99
Wheat	57.0	56.7	62.1	75	56	85	132	112	136
Maize	18.0	45.7	32.8	25	28	54	139	133	163
Sorghum	2.9	16.9	3.1	4	1	3	126	54	105

SOURCE: Authors' computations using data from Ethiopia, CSA (1998, 2003, 2008b).

[a]Average for all farmers, including farms which do not use fertilizer.

[b]Average for farms which use fertilizer.

TABLE 3.15 Area under improved farm management, by practice and crop, private holdings, 1997/98, 2001/02, 2007/08

	Share of crop area (percent)									
	Improved seed applied			Pesticide applied			Irrigated			Extension package covered
Crop	1997/98	2001/02	2007/08	1997/98	2001/02	2007/08	1997/98	2001/02	2007/08	2007/08
Cereals	2.4	3.5	4.7	12.0	10.8	20.8	0.64	1.3	1.1	14.5
Teff	1.7	0.6	0.7	17.7	16.6	30.5	0.66	0.7	0.7	13.8
Barley	0.1	0.4	0.6	9.6	9.07	20.7	0.62	0.8	1.2	11.0
Wheat	5.6	2.0	2.9	31.3	28.11	43.6	0.32	0.4	0.5	21.9
Maize	5.2	12.5	19.5	1.3	1.93	2.9	1.10	3.2	2.2	21.3
Sorghum	0.2	0.4	0.1	3.1	1.69	5.4	0.39	1.1	1.2	1.4

SOURCE: Authors' computations using data from Ethiopia, CSA (1998, 2003, 2008b).

2007/08. Pesticides were applied to 20.8 percent of the total cereal acreage in 2007/08. Furthermore, the use of improved seeds, pesticides, and irrigation has been increasing only slowly in the past decade. The constraints related to cereal production are similar to the ones associated with crop production more broadly.

Several policy initiatives have been taken to stimulate productivity. In the 1990s, the Ethiopian government tried to improve Ethiopian agriculture through a range of measures. In 1993 Sasakawa Global 2000 (SG2000), an international nongovernmental organization for assisting small-scale farmers in Sub-Saharan African countries to increase staple foodcrop production, began work in Ethiopia in partnership with the government.[10] In 1994/1995 the government introduced PADETES (the Participatory Demonstration and Training Extension System) with SG2000 principles as a model.[11]

However, there are concerns that these state-led cereal intensification programs are not consistently generating the desired effects (Spielman 2008). For example, distribution of improved maize seeds is a main focus, but adoption of improved seeds has generally been disappointing. Shortfalls in supply, decreasing seed quality, and delayed deliveries may explain this. Similarly, there is evidence suggesting that many farmers have stopped using seed and fertilizer inputs over time due to poor extension service, cost, the unavailability of preferred varieties and other inputs from suppliers, a preference for local varieties, or other such factors (Bonger, Ayele, and Kumsa 2004; EEA/EEPRI 2006; Spielman 2008).

To illustrate the international position of Ethiopia and to indicate its potential for growth, Table 3.16 presents the cereal yields of different countries in eastern Africa for the period 2006–08. FAOSTAT (FAO Statistical Database) data (FAO various years) show that Ethiopia has cereal yields similar to those of Uganda; Kenya and Malawi have higher cereal yields; and Rwanda, Sudan, and Tanzania have much lower yields. Although Ethiopia achieves a higher cereal yield than the average for eastern Africa, it has a lower yield than the average for the least developed countries. Looking in more detail at individual

10. SG2000 advocated high-external-input technologies. The program provided credit, inputs (fertilizer and improved maize seeds), and extension assistance to participants willing to establish half-hectare demonstration plots on their own land. Data from the SG2000 demonstration plots revealed that the use of improved seeds and fertilizer is strongly associated with higher yields, but medium input levels were as profitable as or more profitable than high input levels. Other factors affecting yields were soil type, frequency of plowing, planting time, plant spacing, and weeding (Howard et al. 2003). However, the authors found no evidence of a successful expansion of the pilot program. Two factors playing a plausible role were these: (1) scaling up took the program into areas with less favorable production and/or market conditions and (2) scaling up required local organizations to take over from the special authorities.

11. PADETES reached about 40 percent of the smallholder farms over a 10-year period. Initially, the program generated positive impacts in Ethiopia.

TABLE 3.16 Cereal yield, by country and year, 2006–08

Country	Cereal yield (kilograms per hectare) 2006	2007	2008	Average	Average as a percentage of Ethiopia's average yield (percent)
Ethiopia	1,652	1,392	1,422	1,489	100.0
Kenya	1,647	1,773	1,417	1,612	108.3
Malawi	1,445	2,467	1,599	1,837	123.4
Rwanda	1,118	1,126	1,126	1,123	75.5
Sudan	645	729	567	647	43.5
Tanzania	1,148	1,238	1,224	1,203	80.8
Uganda	1,523	1,525	1,534	1,528	102.6
Eastern Africa	1,394	1,389	1,302	1,362	91.5
Least developed countries	1,744	1,780	1,768	1,764	118.5
World	3,284	3,382	3,539	3,402	228.5

SOURCE: FAO (various years).

crops (Table 3.17), we find that Ethiopia, compared to the other countries in the region, has higher yields for maize and sorghum but lower yields for wheat.

Conclusions

Ethiopia's crop agriculture continues to be dominated by the country's numerous small farms, which cultivate mainly cereals for both their own consumption and sales: smallholders account for 96 percent of the total area cultivated. The five major cereals (teff, wheat, maize, sorghum, and barley) occupy almost three-fourths of the total area cultivated and represent almost 70 percent of the total value-added in recent years. Moreover, the cereal acreage is still increasing, though not as fast as the area planted to other crops such as sesame, coffee, *chat,* vegetables, and pulses.

During the 1990s, most of the increase in cereal production came from increases in area. However, in the 2000s area and yield increases each accounted for about half of production growth, and we thus see an initial start of increasing intensification. Although growth in the area cultivated reached close to 6 percent in the 1990s, with insignificant yield increases, in the 2000s growth in area decreased to approximately 3 percent, with yield growth reaching 3.5 percent. With little suitable land available for the expansion of crop cultivation, especially in the highlands, future cereal production growth will need to come increasingly from yield improvements. The current use of improved inputs is relatively low, suggesting that there is substantial scope for raising productivity through the increasing adoption of improved seeds and both chemical and

TABLE 3.17 Yields of maize, wheat, and sorghum by country and year, 2006–08 (kilograms per hectare)

	Maize			Wheat			Sorghum		
Country	2006	2007	2008	2006	2007	2008	2006	2007	2008
Ethiopia	2,640	1,969	2,137	1,904	1,506	1,729	1,576	1,484	1,510
Kenya	1,720	1,813	1,392	2,188	3,094	2,272	801	947	522
Malawi	1,481	2,655	1,650	1,207	2,297	1,613	769	859	831
Rwanda	800	818	818	851	870	870	1,100	1,098	1,098
Sudan	1,046	1,909	2,021	3,832	2,826	1,946	667	766	585
Tanzania	1,141	1,180	1,180	2,750	2,760	939	800	1,000	1,000
Uganda	1,536	1,495	1,469	1,800	1,727	1,727	1,429	1,452	1,486
Eastern Africa	1,424	1,481	1,519	1,702	1,820	1,614	769	792	751
Least developed countries	1,414	1,461	1,301	2,005	1,691	1,748	1,002	1,077	1,069
World	4,753	4,969	5,109	2,857	2,857	3,086	1,328	1,403	1,459

SOURCE: FAO (various years).

organic fertilizers, at least in the rainfall-sufficient ecologies (and on irrigated farms). However, it appears that growth in real agricultural incomes will also require more diversification and a shift to higher-value crops to respond to changing consumption baskets driven by the increasing per capita income in the country.

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4 Seed, Fertilizer, and Agricultural Extension in Ethiopia

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Over the past two decades, decisionmakers in Ethiopia have pursued a range of policies and investments to boost agricultural production and productivity, particularly with respect to the food staple crops that are critical to reducing poverty in the country. A central aim of this process has been to increase the availability of improved seed, chemical fertilizers, and extension services for small-scale, resource-poor farmers, particularly those cultivating food staple crops. Although there is some evidence to suggest that the process has led to improvements in both output and yields during this period, decisionmakers still recognize that there is extensive room for improvement. And given the persistent food security issues facing Ethiopia year to year, there is a sense of urgency underlying the need for improvement.

This chapter begins with a brief overview of efforts to promote improved seed, chemical fertilizers, and extension services in Ethiopia. Following a brief review of sequential programs aiming to promote agricultural development and intensification, we focus this discussion of history to three policy "episodes" that have occurred over the past two decades.

We then examine the systems and markets for seed, fertilizer, and extension. We do so by exploring both the theoretical and practical roles of the public and private sectors as they relate to seed, fertilizer, extension systems, and markets. We conclude by offering several policy suggestions that aim to encourage investment, improve incentives, and strengthen the institutions necessary to improve smallholder access to improved seed, chemical fertilizers, and extension services in Ethiopia.

Note that this chapter abstracts from the wider political economy issues relating to the governance of systems and markets for agricultural inputs. These are acutely important issues in Ethiopia's growth and development trajectory. However, elucidation of Ethiopia's complex political economy demands separate and distinct treatment to address the topic in an insightful and constructive manner.[1]

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1. Examples include studies by Aalen (2002); Pausewang, Tronvoll, and Aalen (2003); Vaughan and Tronvoll (2003); Gebre-Egziabher and Berhanu (2007); and Segers et al. (2008) on

Ethiopia's Input Systems and Markets in Historical Perspective

Ethiopia presents one of the most important global challenges in agricultural development. It is among the poorest countries in the world, and its agricultural sector accounts for about 47 percent of national gross domestic product (GDP) and three-fourths of employment; 90 percent of the poor reside in rural areas. Rural poverty is further compounded by extreme land shortages in the highlands (where per capita land area fell from 0.5 hectare in the 1960s to only 0.2 hectare by 2008), low food productivity (with cereal yields averaging around 1.5 tons per hectare), recurrent droughts and variable rainfall, and, as a consequence, high variability in agricultural production (World Bank 2005).

Accordingly, the Government of Ethiopia (GoE) has consistently emphasized agricultural productivity growth and food security in its long-term development strategies. Key components of these strategies date back to the 1950s and the introduction of policies and programs specifically aimed at increasing access to modern inputs and extension services for the country's largely smallholder-based agricultural sector (Table 4.1).

The first such programs were organized as comprehensive integrated package projects (CIPPs) and promoted by the imperial regime during the period 1968–73. On-the-ground implementation focused on the promotion of modern inputs, credit, and extension services and the formation of cooperative societies, and these were highlighted by area development programs—the Chilalo Agricultural Development Unit (1967), the Wolaita Agricultural Development Unit (1970), and the Ada'a District Development Project (1972). Although these programs helped to develop Ethiopia's expertise in agricultural intensification, their scale was too small to boost output or productivity. Thus, by the end of the imperial era Ethiopia's extension services reached only about 16 percent of the farming population, while input and credit provision catered largely to the feudal class rather than the smallholder population engaged in food production (Rahmato 2004).

The first Minimum Package Program (1971–79) attempted to expand access to modern inputs such as improved seed and fertilizer while simultaneously reducing the level and cost of services provided to smallholders. A minimum package area comprised about 10,000 farm households residing along a main all-weather road for 50–75 kilometers and away from the road for 5–10 kilometers on both sides.

Although the program was designed during the imperial era, its implementation continued into the military Derg regime that followed (1974–91). During this latter regime, economic reforms led to significant changes in Ethiopia's rural landscape. The feudal system was summarily dismantled; agricultural pro-

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administrative decentralization and the concentration of political power in Ethiopia; Dom and Mussa (2006a, 2006b) on the influence of decentralization on extension services; Keeley and Scoones (2000) on environmental policymaking; or Spielman, Cohen, and Mogues (2009) on governance and cooperatives in Ethiopia.

TABLE 4.1 Policy regimes and development programs in agricultural input systems and markets, 1957–95

Period	Intervention/event	Focus/objectives	Remarks
1957–67	First and Second Five-Year Development Plans	Develop large-scale commercial farms and coffee exports.	Subsistence farming was neglected.
1968–73	Third Five-Year Development Plan (Comprehensive Integrated Package Projects)	Develop transportation infrastructure; disseminate high-input technologies, credit, and extension; form cooperative societies.	Implementation revolved around three comprehensive extension programs that focused on high-potential areas only.
1971–79	Minimum Package Program I (MPP-I)	Expand geographic coverage of the comprehensive extension programs; provide fertilizer, credit, and extension to “minimum package areas.”	Fertilizer procurement was managed by the Agricultural and Industrial Development Bank, distribution by the Ministry of Agriculture (MoA).
1978	Agricultural Marketing Corporation (AMC)	Improve the management of agricultural input importation, storage, and transport by handing over control of these tasks to the AMC.	MoA maintained the role of distributing fertilizer to farmers, disbursing credit, and estimating fertilizer demand through approximately 18,000 peasant associations.

1980–85	Minimum Package Program II (MPP-II)	Expand input supply and extension service coverage three-fold.	Actual provision of inputs and extension was limited due to a lack of financial support for MPP-II, increasing inefficiency in MoA and AMC, fertilizer overstocking due to inaccurate demand estimates, and poor institutional coordination of input deliveries.
1984	Agricultural Input Supply Corporation (AISCO)	Improve the importation and distribution of fertilizer and the marketing of other agricultural inputs.	As a successor to AMC, AISCO was limited by the lengthy bureaucratic process needed to secure foreign exchange, high freight costs, lack of proper port facilities, high inland transport costs, inaccurate demand estimates, and organizational inefficiency.
1986–95	Peasant Agricultural Development Program (PADEP)	Provide inputs, credit, and extension services to smallholders organized into approximately 2,900 farmer service cooperatives using a training and visit extension approach.	As a successor to MPP-II, PADEP aimed to cover eight development zones across the country but received financing sufficient for only three zones, all located in high-potential areas.

SOURCES: Demeke et al. (1998); Stepanek (1999); Gebremedhin, Hoekstra, and Tegegne (2006); Abate (2008); authors.

duction was organized around peasant cooperatives, state-owned farms, and collectives; and the formal research and extension systems were expanded throughout the country. But by the end of the Derg regime, the extension services had been reduced to instruments of political control over the peasantry, while input and credit provision was largely focused on covering the inefficiencies of large state farms and peasant collectives (Wubneh 2007).

Since the end of the Derg regime in 1991, the GoE has introduced new policies to intensify cereal production, accelerate agricultural growth, and achieve food security under a national economic strategy known as Agricultural Development–Led Industrialization (ADLI) (FDRE 1993, 2002, 2006). During the 1990s, ADLI set in motion a series of reforms that sought to generate a more supportive macroeconomic framework, liberalize markets for agricultural products, and promote the intensification of food staple production through the use of modern inputs, especially seed and fertilizer packages (FDRE 2002, 2006). The intensification campaign focused on cereals in the moisture-reliable highlands, where 60 percent of the rural population lives and where the strategy had the best chance of success.

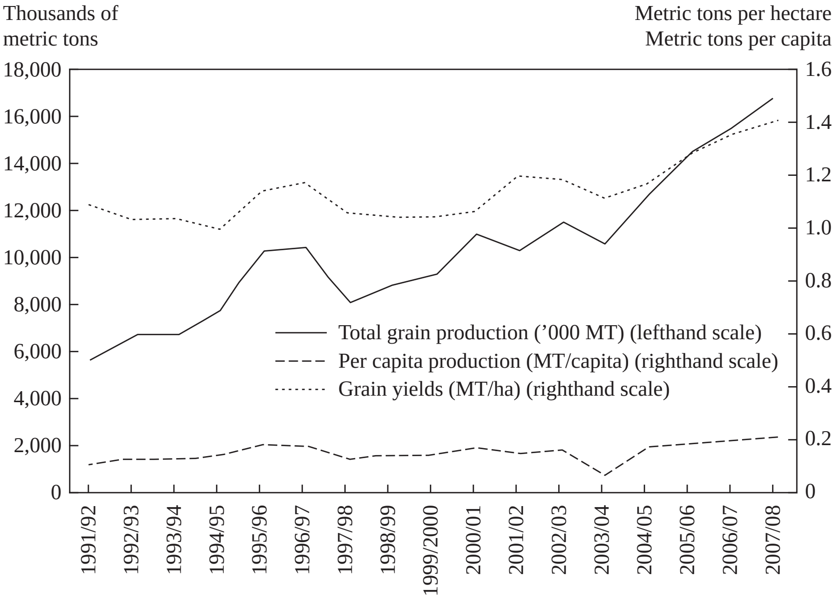
By and large, the GoE's macroeconomic reforms have been successful, resulting in more than a decade of sustained economic growth. Similarly, the GoE's cereal intensification efforts have experienced a somewhat similar degree of success, although growth has been more episodic than continuous, with fairly stagnant per capita production of grain (Figure 4.1).[2]

The first episode of success ran from about 1994/95–2000/01 and hinged on the achievements of the National Agricultural Extension Intervention Program (NAEIP) (Table 4.2). The NAEIP was a scale-up of the Participatory Demonstration and Training Extension System (PADETES), an integrated program of extension, seed, fertilizer, and credit that was piloted by Sasakawa Global 2000 (SG2000), an international nongovernmental organization. The NAEIP reached about 40 percent of the roughly 10 million farm households in Ethiopia over the 10-year period beginning in the mid-1990s. The extensive data from millions of demonstrations carried out through PADETES (3.6 million in 1999 alone) indicated that the adoption of seed-fertilizer technologies could more than double cereal yields (Table 4.3) and would be profitable to farmers in moisture-reliable areas (Howard et al. 2003).

This episode was succeeded by a period of volatility (2001/02–2002/03) that demonstrated just how susceptible Ethiopia's agricultural economy is to weather and price shocks. First, maize prices collapsed in 2001, partly as a consequence of a glut that resulted from intensification of maize production in the 1990s. A drought soon followed, contributing to further reductions in cereal production (DSA 2006).

2. See Dercon and Hill (2009) and Dercon, Hill, and Zeitlin (2009) for further analysis of Ethiopia's recent growth episodes and long-term perspectives on this growth. Other chapters of this volume similarly deal with this topic.

FIGURE 4.1 Total and per capita grain production and grain yields, 1991/92–2007/08



SOURCE: Ethiopia, CSA (various years).
NOTE: *Grain* refers to all cereals, legumes, and pulses cultivated in Ethiopia.

The next episode might be described as a period of rapid agricultural growth. Following a recovery from the drought, agricultural GDP growth averaged 12 percent per annum between 2003/04 and 2007/08. But this growth period was paradoxically accompanied by a surge in food price inflation, which escalated from 2 percent in 2003/04 to 78 percent in 2007/08 (Mishra 2008; Ulimwengu, Workneh, and Paulos 2009) and raises a number of questions, including some pertaining to the quality of agricultural production statistics (Taffesse 2008; IFPRI 2009; Minot 2009).

These episodes raise the question of to what extent the policies governing Ethiopia's input markets and extension services have helped or hindered the country's agricultural intensification efforts over the past 15 years. Although the use of chemical fertilizer and improved seed has generally increased across these episodes (albeit from a low base level), the gains have been inconsistent and volatile. Part of this volatility may be attributable to the shifting roles of the public and private sectors and the occasional policy changes that have influenced their respective roles in different ways. Ethiopia's experiences over the past 15 years and the issues raised by these experiences are summarized in the next section for each of the major components of the country's agricultural input system and market—seed, fertilizer, and extension.

TABLE 4.2 Policy regimes and development programs in agricultural input systems and markets, 1995–present

Period	Intervention/event	Focus/objectives	Remarks
1991–95	Partial liberalization of the fertilizer market	Open the importation, wholesaling, and retailing of fertilizers to private companies.	Undertaken by the Transitional Government of Ethiopia. Fertilizer prices remained panterritorial and subsidized.
1993–99	Participatory Demonstration and Training Extension System (PADETES)	Promote improved seed-fertilizer-credit packages (primarily for maize and wheat) through a training and visit approach piloted by Sasakawa Global 2000.	PADETES demonstrated on a pilot basis that yields could be doubled with the application of modern inputs in Ethiopia.
1995–present	National Agricultural Extension Intervention Program	Scale up the PADETES approach to the national level as a means of boosting cereal yields and output.	Efforts to scale up the PADETES approach were less successful than the piloting demonstrated by Sasakawa Global 2000.
1997–98	Fertilizer price liberalization	Eliminate subsidies and deregulate the price of fertilizer at the wholesale and retail levels.	Liberal prices did not result in a competitive market due to the government's continued control over marketing and credit.
2000–07	Shifting industry structure	Private companies withdraw from the fertilizer market in 2000, succeeded by "holding" companies; cooperative unions enter the market in 2005, followed by the withdrawal of "holding" companies in 2007.	The Agricultural Input Supply Enterprise and cooperative unions emerged as the only actors engaged in fertilizer importation and were also the largest players in the wholesale and retail markets, in conjunction with the regional input supply and extension systems.

SOURCES: Demeke et al. (1998); Stepanek (1999); Gebremedhin, Hoekstra, and Tegegne (2006); Abate (2008); authors.

TABLE 4.3 Yields in on-farm field trials using improved seed and fertilizer versus farmers' yields using traditional cultivation practices, 1993–2008 (metric tons per hectare)

	SG2000 (1993–99)		NAEIP (1995–99)		Current farm yields (2000–08)
	Improved	Traditional	Improved	Traditional	
Maize	4.60	1.57	4.73	1.57	1.98
Wheat	2.31	0.95	2.93	1.17	1.47
Sorghum	2.08	0.92	2.79	1.12	1.40
Teff	1.62	0.64	1.43	0.85	0.93
Barley	n.a.	n.a.	2.15	1.00	1.19

SOURCE: World Bank 2006a.

NOTE: NAEIP = National Agricultural Extension Intervention Program; SG2000 = Sasakawa Global 2000 program; n.a. = not available.

Seed Systems and Markets

From a conceptual perspective, seed systems and markets are subject to at least three unique constraints that complicate early stages of seed market development. These constraints are contestable property rights relating to the improvement of cultivated varieties (cultivars), the absence of institutions for improved cultivars, and information asymmetries in the exchange of seed between buyers and sellers (Tripp and Louwaars 1997; Morris 1998; Gisselquist and Van Der Meer 2001; Hassan, Mekuria, and Mwangi 2001).

The first constraint emerges from the public goods nature of research embodied in improved cultivars and the inherent market failure that accompanies cultivar improvement. Consider a scenario in which a farmer saves and replants seed from an improved cultivar across seasons and, in doing so, avoids paying the private innovator who improved the cultivar for his or her investment in research and development (R&D). In other words, the innovator cannot recoup his investments in R&D due to the public good nature of the technology embedded in modern seed. This suggests that the public sector must play a continuous role in cultivar improvement by investing in agricultural R&D.

The second constraint is associated with mechanisms designed to increase the private innovator's capacity to recoup his or her investment in R&D and overcome the market failure described earlier. Biological mechanisms such as hybridization (common in the case of maize and increasingly in the cases of rice, millet, and sorghum) imply that farmers must purchase seed each season to reap the yield benefits of hybrids—the vigor conferred by heterosis. Institutional mechanisms such as intellectual property rights (plant-variety protection certificates, patents, and trade secrecy laws) similarly allow the innovator to recoup investment costs through litigation when a farmer plants improved cultivars without paying some fee to the innovator for use of the seed. The inability to leverage the biological properties of hybrids, enforce intellectual property rights, or prevent farmers from saving seed can discourage private investment in cultivar improvements that have potentially significant social impacts, thus signaling another difficulty in correcting this market failure.

A third constraint emerges where the characteristics of improved seeds are known only by the innovator, implying that farmers are unable to make accurate ex ante assessments of quality, giving unscrupulous sellers an advantage over their customers. Remedies include strong regulation of the seed certification process or truth-in-labeling laws. Importantly, the absence of such regulations—or, worse yet, the wholesale deregulation of the seed sector as part of a wider market liberalization program—can inhibit smallholder adoption of improved cultivars (Tripp and Louwaars 1997).

In short, seed is a tricky good to manage due to inherent market failures that are difficult to overcome. We examine these issues in the context of Ethiopia's seed system and market, focusing on (1) the adoption of improved seed, (2) the demand for and supply of improved seed, and (3) the seed industry structure.

Improved Seed Adoption

Official estimates from the Central Statistical Agency (CSA) show that although the total quantity of improved seed supplied nationally has been increasing since 1996–97, farmers' use of improved seed covered an average of only 4.7 percent of cropped area in 2007–08 (Figure 4.2).

Various surveys similarly report low adoption rates, for example, just 3 percent according to the nationally representative Ethiopia Rural Smallholder Survey (ERSS) conducted in 2005.[3]

To be sure, most farmers still rely primarily on farmer-to-farmer exchanges or on saved seed (Belay 2004). However, surveys such as these are often unable to provide real insights into improved seed adoption due to problems in their design. The question that should be asked is: what type of variety is a farmer cultivating, and when did he or she purchase the seed? For improved open-pollinated varieties such as wheat and teff, farmers do not necessarily need to purchase seed each season as they would hybrid maize. Rather, they might purchase seed every four to five years to replace their stocks of saved seed with

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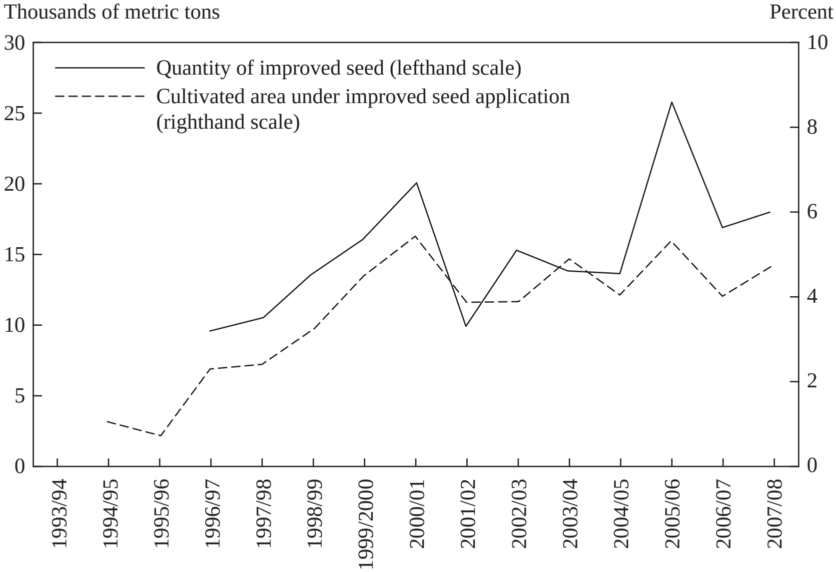
3. The ERSS was conducted by the International Food Policy Research Institute (IFPRI), Ethiopian Development Research Institute, and the CSA. Data were collected mid-2005 from 7,186 households randomly drawn from 293 enumeration areas (EAs, each roughly mapping to a *kebele*) based on a stratified two-stage cluster sample design. The sample is considered representative at the national level as well as at the regional level for four regions: Amhara, Oromiya, Tigray, and the Southern Nations, Nationalities, and People's Region (SNNPR). The ERSS survey was based on the CSA's Annual Agricultural Sample Survey, which used a sampling frame of 25 agricultural households selected from each EA and covered all of rural Ethiopia except Gambella region and the nonsedentary populations of three zones of Afar region and six zones of Somali region.

FIGURE 4.2 Area under improved seed application and quantity of improved seed distributed, cereals only, 1993/94–2007/08



SOURCE: Ethiopia, CSA (various years).

seed that has a higher level of purity and thus better performance when cultivated (Doss et al. 2003).[4]

To be sure, a large portion of wheat cultivated in Ethiopia is improved wheat. Lantican, Dubin, and Morris (2005) reported that in 2002, 71 percent of all wheat area in the country was sown with improved varieties. Beyene, Verkuijl, and Mwangi (1998); Kotu et al. (2000); and Zegeye (2001) reported that improved wheat adoption in selected *woredas* ranged from 42 to 80 percent during various years in the 1990s. Yet, as an indication of just how common long-term seed recycling is among Ethiopian smallholders, Lantican, Dubin, and Morris (2005) found that only 43 percent of the area under improved wheat varieties was sown with varieties released since 1995.

With respect to maize, CSA reports that the area under improved varieties and hybrids has grown from 5 percent in 1998 to 20 percent in 2008. Lantican, Dubin, and Morris (2005) report that, as of 2001, the majority of the improved maize was accounted for by hybrids. Degu et al. (2000); Zegeye and Haileye (2001); Zegeye, Tadesse, and Tesfaye (2001a, 2001b); and Zegeye et al. (2001)

4. Interestingly, a study by Bishaw (2004) indicates that the purity of and germination rates for farmer-saved wheat seed, seed purchased in local markets, and seed purchased or traded from neighbors is comparable to seed supplied by the government (R. Tripp, pers. comm.).

report that improved maize adoption in selected *woredas* ranged from 6 to 47 percent during various years in the 1990s. With respect to teff, barley, and sorghum, the other main cereal crops cultivated in Ethiopia, adoption rates have been relatively lower than for both wheat and maize (Figure 4.3).

In short, the conventionally cited figures—3 percent adoption of improved varieties and 4–5 percent of cropped area under improved varieties—obscure the extensive uptake of improved wheat and, to a lesser extent, improved maize, in Ethiopia. Moreover, these figures obscure the high rates of seed recycling and low rates of seed replacement, suggesting challenges for the promotion and adoption of new cultivars among smallholders.

Seed Demand and Supply

Estimates of market demand for improved seed in Ethiopia are based on official projections that are developed at the local (*kebele*) level and then transmitted through official channels to the zonal and regional levels, after which they are aggregated nationally to produce estimates of the type and quantity (but not preferences for specific varieties or traits) of seed that needs to be supplied in the coming season (Alemu et al. 2007).

The responsibility of responding to these demand estimates lies primarily with the state-owned Ethiopian Seed Enterprise (ESE). On the supply side, production and distribution of improved seed has been stagnant since about 2000. At about this same time, the supply of improved seed channeled through the regional extension and input supply system began to fall short of official estimates of demand (with a 72 percent shortfall in 2008 for the five major cereals). Limited production capacity at the ESE for certified seed, combined with insufficient provision of breeder and pre-basic seed from the research system, contributes much to these shortfalls.

Assuming that demand estimates are not wholly inaccurate, supply has consistently fallen short of demand, as shown in Table 4.4.[5]

Shortcomings in seed quality and timeliness of delivery have also been long-standing issues in Ethiopia. Poor cleaning, broken seeds, low germination rates, and the presence of mixed seeds have been reported in ESE-supplied seed (DSA 2006). In addition, reports are common of seed being distributed after the optimal planting time or of varieties being distributed that are not appropriate to changes in farmers' expectations of seasonal weather conditions at the local level (Sahlu and Kahsay 2002; DSA 2006; EEA/EEPRI 2006).

Seed Industry Structure

Low adoption rates and shortfalls in the supply of improved cultivars can be partly attributed to bottlenecks emerging from the structure of the seed industry and the regulatory agencies that oversee it. We discuss the structure of the seed

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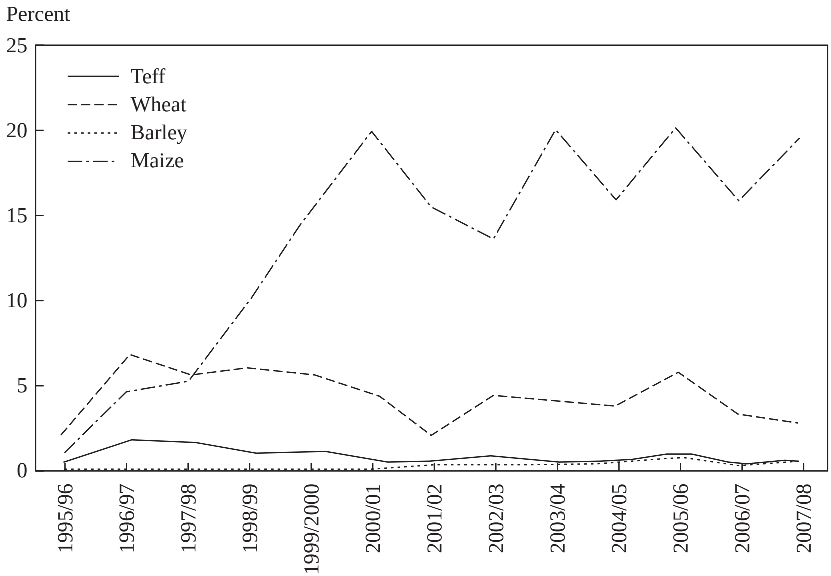
5. More recently, supply has actually exceeded demand for hybrid maize seed due to changes in farmers' preferences at planting time, resulting in large carryover stocks of seed at ESE.

FIGURE 4.3 Area under improved seed application, main cereal crops, 1995/96–2007/08



SOURCE: Ethiopia, CSA (various years).

TABLE 4.4 Seed supply shortfalls in Ethiopia, 2005–08

	Supply as a percentage of official demand			
Crop	2005	2006	2007	2008
Wheat	20	38	23	24
Maize	53	28	60	48
Teff	5	12	22	19
Barley	16	18	10	7
Sorghum	n.a.	7	16	48

SOURCE: Ethiopia, MoARD (various years).

NOTE: n.a. = not available.

industry here in the context of hybrid maize, because experience from other industrialized and developing countries has shown that the hybrid maize business is one of the most lucrative seed businesses available to private innovators and investors, primarily due to the ability of innovators to recoup their investments in breeding due to the biological properties associated with hybridization, which make farmers' saving seed a relatively undesirable practice. That said, many other cereal crops are critical to food security in Ethiopia, particularly wheat, teff, barley, and sorghum. To a great extent, the development and delivery of improved varieties of these crops rely on very different mechanisms within the seed system—systems that are more reliant on public-sector research and extension. But even with these crops, research, regulatory, production, and distribution bottlenecks are not insignificant, and many analytical insights from the maize seed system readily carry over to seed systems for these other crops.

The seed industry in Ethiopia involves a range of both public- and private-sector organizations (Figure 4.4; see also Bishaw, Sahlu, and Simane 2008). The national research system—headed by the Ethiopian Institute of Agricultural Research (EIAR) and comprised of a range of federal research centers, regional research centers, and agricultural universities and faculties—is charged with developing improved varieties and the breeder and pre-basic seed needed by other players in the industry. Regulatory functions such as varietal release reviews and seed certification are performed by various departments of the federal Ministry of Agriculture and Rural Development (MoARD).

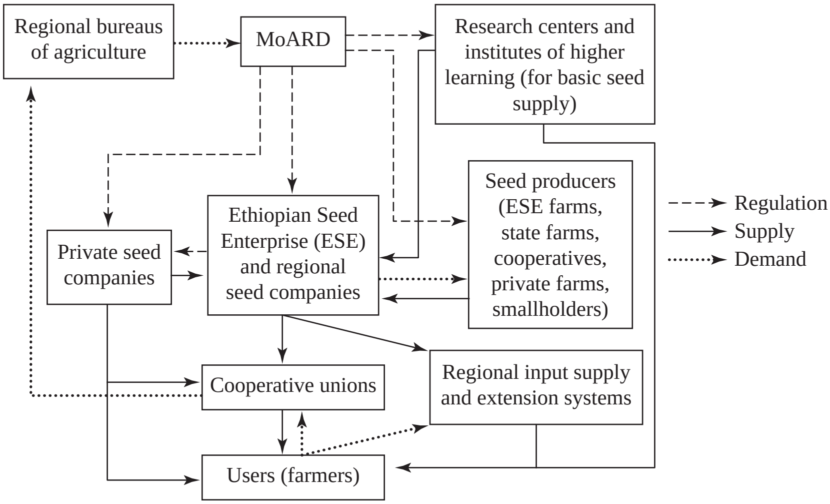
Basic and certified seed production is carried out by the ESE, which relies on its own farms alongside private companies, private subcontractors, state farms, and cooperatives to bulk up seed that is supplied to the regional extension and input supply systems. More recently, state-owned regional seed enterprises have also emerged in Oromiya and SNNPR (in 2008) and in Amhara (in 2009).

Improved certified seed is supplied to Ethiopian smallholders primarily through regional, state-run extension and input supply systems that operate with a degree of guidance from the MoARD. This regional system is made up of regional bureaus of agriculture and rural development (BoARDs), their *woreda* (district) offices, and extension agents (termed development agents in Ethiopia) working at the *kebele* level. These organizations collaborate closely with farmers' cooperatives and regional credit and savings institutions in both supplying inputs and disbursing credit.

Following market reforms in the 1990s, seed production and distribution were opened to the private sector (Figure 4.5). In 2004, 8 firms were active in seed production, with most of them involved specifically in hybrid maize seed, though primarily as ESE subcontractors (Alemu et al. 2007; Langyintuo et al. 2008). By 2008, the number of firms had increased to 11, although most were again operating primarily as ESE subcontractors. In some cases, these subcontractors also multiply seed for cooperatives, cooperative unions, and regional seed companies, although very few actually sell seed directly to farmers (with the exception of Pioneer Hi-Bred International and a few others).

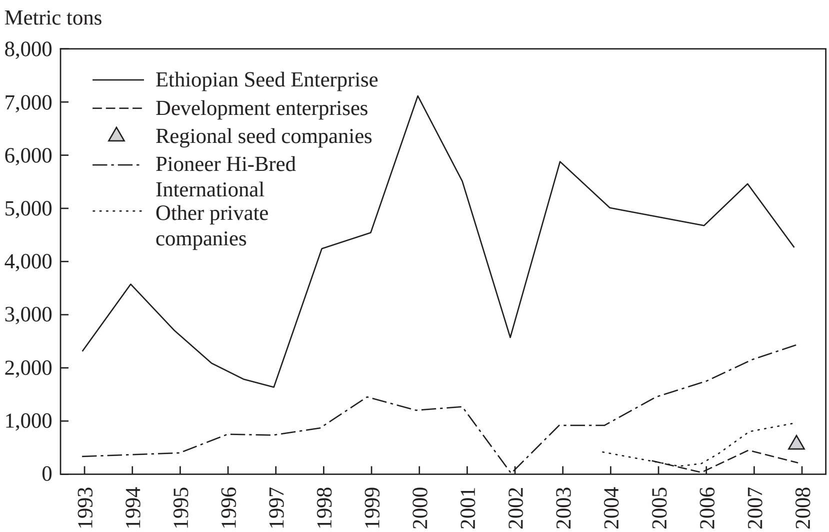
Despite the lucrative potential of the hybrid maize seed market—a potential that private seed companies have realized in other Sub-Saharan African countries—approximately 60 percent of maize seed was still controlled by the public sector (primarily the ESE and state-owned development enterprises), with an additional 10 percent serving as subcontractors to the public sector and

FIGURE 4.4 A schematic of the Ethiopian seed system



SOURCE: Authors.
NOTE: MoARD = Ministry of Agriculture and Rural Development.

FIGURE 4.5 Hybrid maize seed distribution, by type of supplier, 1993–2008



SOURCE: Ethiopia, MoARD (various years).

30 percent (Pioneer and a few small private companies) operating independent of the public sector's seed production system.

An even lower level of private-sector activity is seen on the distribution and retail side of the seed market. The public sector, including the regional extension and input supply systems, accounts for 80 percent of total sales of improved seeds, mostly paid for with credit disbursed against public guarantees (World Bank 2006b). Even Pioneer relies on the public sector to distribute about half of its seed, initially through the regional input and extension systems and, more recently, through cooperative unions. Most other seed firms simply produce as subcontractors to the ESE, which then distributes seed through the regional extension and input supply systems, cooperative unions, and its own branch offices, satellite stores, and sales points.

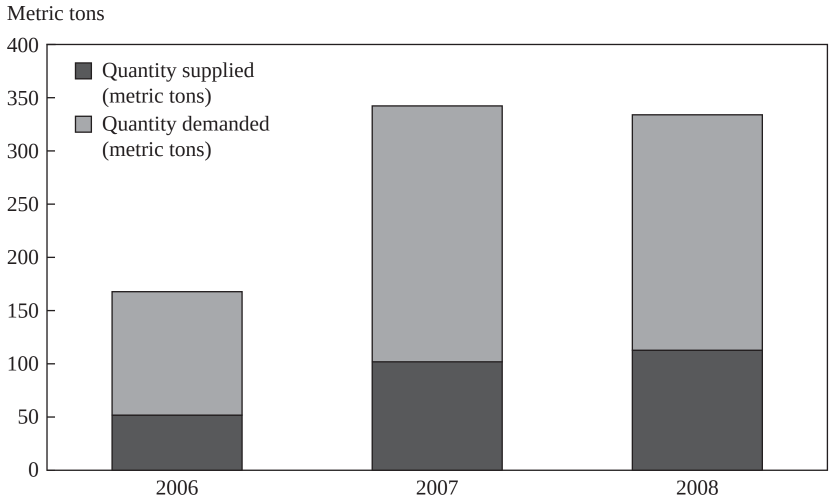
Why is the seed business so difficult to break into in Ethiopia? Here we examine the key barriers to entry.

First and foremost, the market failures that characterize seed markets (described earlier) constrain the potential for profitability. Hybrid maize stands out as the exception to this rule, because the gains conferred by hybridization can be secured by the farmer year by year only by purchasing new hybrid seed, while saving hybrid maize seed can result in yield losses of as much as 50 percent, depending on the hybrid type.

Second, the seed business depends on the availability of a good supply of high-quality pre-basic and basic seed for the production of certified seed that can then be distributed to farmers. The main sources of pre-basic and basic seed in Ethiopia are the federal and regional research centers and universities (with basic seed also produced by the ESE), and bottlenecks at these institutions create significant shortfalls in the availability of these key inputs (Figure 4.6). In some instances, these shortfalls have been exacerbated by research centers that are engaged not only in producing pre-basic and basic seed, but also in producing certified seed for farmers in areas surrounding the centers. Although the MoARD has taken action to rectify these problematic allocations of scarce seed system resources—for instance, by involving the ESE, private firms, and regional seed enterprises in the business of basic seed production—the pressure on the entire seed industry is not easily resolved (Ethiopia, MoARD 2008; A. Beshir, pers. comm.).

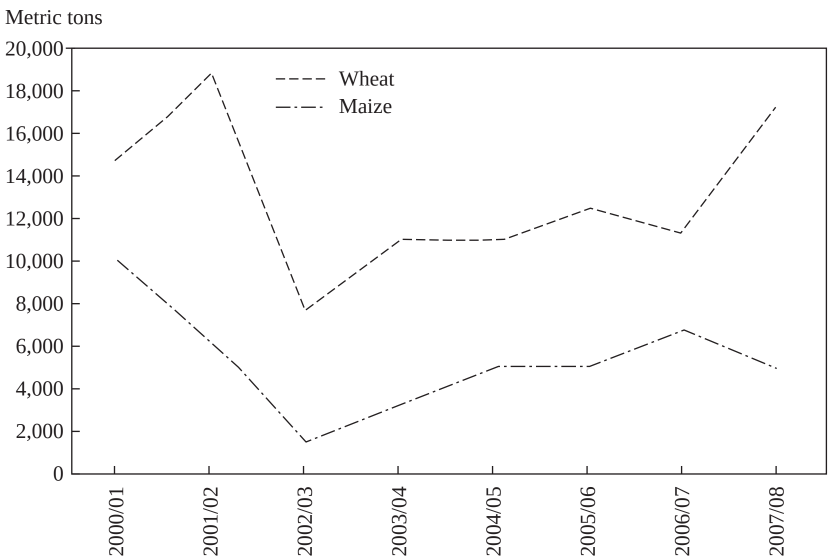
Third, the seed business is risky because seed production is closely correlated to the same weather risks faced by farmers. Hence, seed production in Ethiopia drops during drought periods just as crop production does (Figure 4.7). Having said this, seed production on irrigated land can mitigate this risk to some extent, and much of the ESE's maize seed production and subcontracted production currently take place on irrigated land in the Awash River basin. However, the shortage of irrigated land in Ethiopia makes reliable seed production a real challenge for both the public and the private sectors (Ethiopia, MoARD 2008).

FIGURE 4.6 Basic seed demand and supply for maize hybrid multiplication, 2006–08



SOURCE: Ethiopia, MoARD (various years).

FIGURE 4.7 Raw seed production, Ethiopian Seed Enterprise, 2000–08



SOURCE: Ethiopia, ESE (various years).

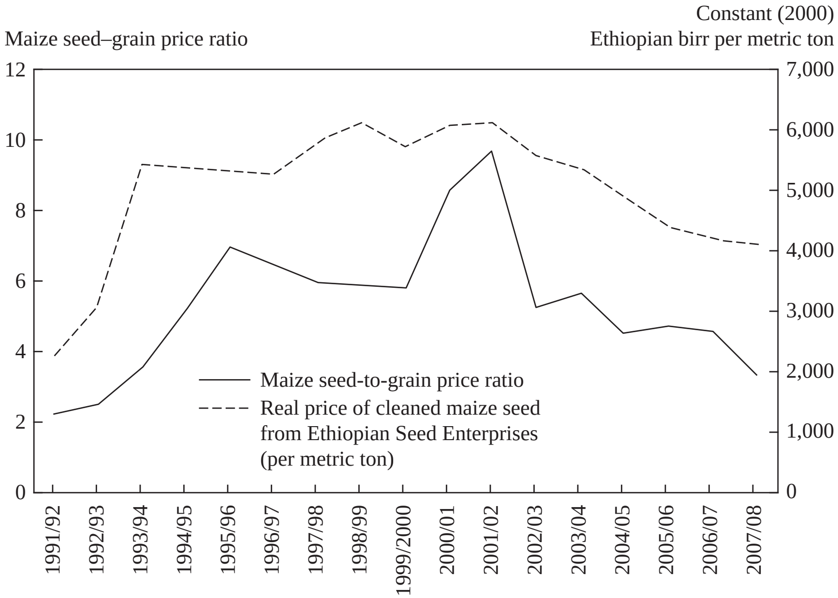
Fourth, the seed business is often dependent on smallholders themselves as contract growers for the ESE's seed multiplication activities, at least for open-pollinated crops such as lentils, chickpeas, haricot beans, and linseed (but not hybrids due to the technical complexity of hybrid seed production). In 2004/05, the ESE produced nearly 8,000 tons of seed through approximately 6,700 contract growers (Beshir 2005). The ESE pays a 15 percent premium over grain prices for quality seed grown by smallholders. However, changing grain prices—particularly low prices at harvesting time and higher prices at planting time—tempt farmers to default on their seed supply contracts with the ESE and hold the seed over for sale as grain to local traders and farmers at planting time. This frustrates the ESE's attempt to bulk up seed for certain crops.

Fifth is the issue of price. The ESE, the largest seed supplier in Ethiopia, prices its seed at a 5 percent profit margin. But for the industry to be viable, seed prices have to be high enough for private seed firms to recoup their investments in seed production without making seed unaffordable both to farmers who regularly use improved seed and to new adopters. Thus, the optimal seed price is based on the demand derived for the grain that is produced from that seed. A useful benchmark is the seed–grain price ratio which, in an emerging maize seed market such as Ethiopia's, might approach 5:1, eventually increasing to 10:1 as the market matures (Morris 1998). Moreover, seed–grain price ratios have fluctuated tremendously: upward with the collapse of maize prices in 2001–02, downward with the drought in 2002–03, and downward again to a ratio of 3.42:1 in 2007–08 (Figure 4.8). The volatility of these ratios suggests similarly volatile returns to investing in the maize seed business in Ethiopia, exacerbated by falling real prices for maize seed in the country.

Related to this volatility is the issue of retail pricing to farmers. In each region, cooperative unions are currently charged with distribution of seed sourced from ESE and other seed providers. Regional BoARDs set the price at cost plus transportation and a set profit margin, with some interregional variations in pricing policies. For example, Oromiya region's BoARD set a profit margin in 2008–09 at 2.5 percent for the cooperative union and 2.5 percent for the primary cooperative. This put the retail price of hybrid maize seed in Oromiya at approximately Ethiopian birr (ETB) 11,000 per ton, which, by comparison, was just 43 percent of Pioneer's price for hybrid maize seed, which was sold at ETB 19,200 per ton.

Yet, even Pioneer is marketing its products at relatively low prices by regional standards. This raises the issue of whether Pioneer or another competitor can develop and market a profitable product in Ethiopia. Anecdotal evidence from several sources indicates that the implicit rationing of hybrid maize seed has given rise to a black market in which repackaged (and potentially adulterated) seed sells for two to four times the retail price. This suggests that the market can bear a higher price, whether for hybrids suitable for the highlands, such as the ever-popular BH 660 produced by ESE and its subcontractors, or the hybrids suitable for mid-altitudes produced by Pioneer.

FIGURE 4.8 Hybrid maize seed–grain price ratios and real seed prices, 1991/92–2007/08



SOURCES: Ethiopia, ESE (various years); Ethiopia, MoARD (various years).

Efforts to use smallholders themselves as private agents in the multiplication of seed have met with limited success.[6] Though the technical requirements of maize hybrid multiplication (for example, the need for relatively large fields and means of controlling cross-pollination) might limit its applicability to small farmers in Ethiopia, there is potential for smallholders to play a larger role in multiplying open-pollinated crops (such as improved wheat varieties). Both the GoE and nongovernmental organizations have invested in various projects aimed at strengthening farmers' skills in seed multiplication, with the goal of increasing the supply of seed for improved varieties, both within communities and to the formal seed system. The outcomes to date have been mixed, partly due to poor incentives offered to farmers, insufficient capacity on both sides, and the constant threat of food insecurity, which causes farmers to use their seed stocks for food.

Finally, there is the issue of competitiveness. The public sector remains the main seed supplier in Ethiopia partly because it enjoys an implicit subsidy on both the production end (where high administrative costs do not figure into

6. For a review of Ethiopia's informal seed system and the role of farmer-based seed multiplication programs, see Thijssen et al. (2008).

calculations of the ESE's financial viability) and the marketing end (where cooperatives and regional, state-run extension and input supply systems handle distribution and retailing). To compete effectively with the public sector, private companies would have to build their own distribution and marketing networks, develop unique product lines that rival ESE products such as BH 660, establish their brand identities and reputations, provide agronomic services to support their customers, and price their products competitively. At present, only Pioneer markets its own product lines through a network of 15 dealers and through direct sales to state farms, commercial farms, cooperative unions, nongovernmental organizations, and warehouses (M. Admassu, pers. comm.).

Necessarily, as the maize seed industry in Ethiopia matures and companies begin releasing their own cultivars (rather than multiplying the cultivars already released by the EIAR), they will also have to contend with significant indirect costs. These costs include the costs associated with navigating the regulatory system, accessing financing from the formal banking sector, and meeting the banks' high collateral requirements. Thus, it is not surprising that Pioneer sells much of its output through official channels (formerly through the regional extension and input supply systems and more recently through the cooperative unions). Nor is it surprising that other, smaller private seed companies prefer to operate as ESE subcontractors or suppliers to cooperative unions rather than competitors.

In summary, the most lucrative of seed businesses—the hybrid maize business—has seen very little investment activity in Ethiopia, with far less investment flowing to seed businesses for other crops for which the challenges are even greater. Since the introduction of the National Seed Industry Policy in 1992, the GoE has pursued several policies favorable to private-sector development, such as the basic introduction of a legal framework for seed system operations (Proclamation 206/2000), the inclusion of commercial seed production as a sector under the Investment Code, and the enactment of legislation on breeders' rights and plant variety protection in 2006 (Proclamation 481/2006) (see Bishaw, Sahlu, and Simane 2008).

However, there is little likelihood that these policies will have the desired impact.[7] Opening commercial seed production to investors, for example, is a policy improvement that can go only so far in the absence of regulations allowing investors to access credit without nonagricultural collateral. Further, plant breeders' rights are only as effective as the sector they are meant to protect and only as strong as the commercial codes and the judicial system's capacity to enforce these rights. Moreover, there is only mixed empirical evidence from other developing countries to suggest that breeders' rights actually stimulate private-sector investment (see, for example, Butler and Marion 1985; Pray

7. For example, the administrative procedures necessary to implement the 2006 legislation on breeders' rights and plan variety protection have yet to be implemented.

1992; Alston and Venner 2000; Pray, Ramaswami, and Kelley 2001; Gerpacio 2003).

Finally, it is important to recognize that varietal improvement of many crops in Ethiopia, particularly open-pollinated crops such as wheat, will continue to depend on public breeding and seed production efforts, making the need for organizational reforms in the research system and seed sector as urgent as reforms in the policies governing the seed market itself. Improvement in the maize seed system may have positive spillover effects with respect to greater private investment in seed for these open-pollinated crops, but only to the extent that the public sector's breeding, seed production, and seed distribution systems are improved first.

Fertilizer Markets

Chemical fertilizer, a more obvious private good than seed, also possesses several features that complicate early stages of market development (Crawford et al. 2003; Morris et al. 2007). On the demand side, the cost of creating fertilizer markets is high where final consumers are widely dispersed geographically or where their small landholdings and limited cash resources mean that they purchase only small quantities of fertilizer, which are more costly for retailers to sell (Jayne et al. 2003; Harrigan 2008). Furthermore, in rainfed areas, fertilizer consumption is highly seasonal (with a two- to three-month market window), and year-to-year fluctuations in rainfall patterns contribute to high interyear variability in demand for fertilizer, with corresponding risks to dealers of high carryover stocks from year to year. On the supply side, the considerable economies of scale in international procurement and shipping imply that fertilizer importers require a high degree of liquidity to procure for the supply chain.

These characteristics suggest that although fertilizer may be a tradable private good, development of fertilizer markets may require some degree of public intervention in financing and market infrastructure development until markets mature. We examine these issues in the context of Ethiopia's fertilizer market, focusing on (1) the uptake of fertilizer, (2) fertilizer prices and profitability, and (3) the fertilizer industry structure.

Fertilizer Uptake

The uptake and use of chemical fertilizer in Ethiopia (primarily diammonium phosphate [DAP] and urea) can be assessed in several ways—in terms of total fertilizer imported, percentage of farmers using fertilizer and improved seed-fertilizer packages, percentage of cultivated land under fertilizer application, and household-level estimates of fertilizer application per hectare. We examine these indicators next.

When measured in terms of quantity imported, fertilizer markets in Ethiopia responded remarkably well following the liberalization in the early 1990s.

Total consumption jumped from about 100,000 tons in 1993 to 300,000 tons in 2000, making the growth of Ethiopia's fertilizer consumption much faster than that in the average of Sub-Saharan African countries (Jayne et al. 2003; Crawford, Jayne, and Kelly 2006). Although it is now largely controlled by the Agricultural Input Supply Corporation (AISCO) and the cooperative unions, fertilizer imports in recent years have increased even faster—from their level in 2000 to 625,000 tons in 2009 (Figure 4.9).

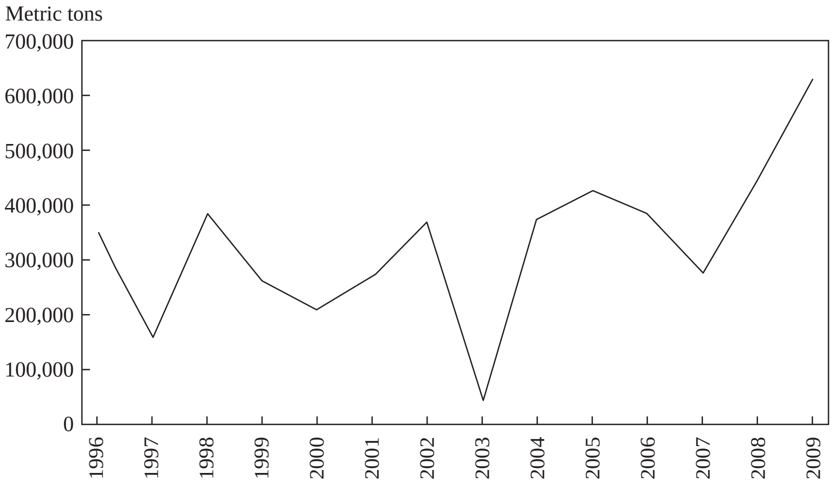
Data on fertilizer use suggest that a significant portion of smallholders use fertilizer: 39 percent according to CSA and 32 percent according to the 2005 ERSS. Teff, wheat, and maize cultivation account for the majority of fertilizer use.

However, data on application rates tell a slightly different, and often confusing, story about the intensity of fertilizer use in Ethiopia (Figure 4.10). Fertilizer use intensity, when measured in terms of kilograms per hectare of arable and permanent cropland, is currently estimated at 17 kilograms per hectare of nutrients (about 29 kilograms per hectare of commercial product), which is similar to application rates elsewhere in the region but considerably below the rates for comparable smallholder highland farms in neighboring Kenya (where fertilizer is applied to 70 percent of maize fields at an average dose for all fields of 45 kilograms per hectare) (Ariga et al. 2008). When measured in terms of kilograms/hectare of land under grain production, the figure increases to 21 kilograms per hectare of nutrients (about 37 kilograms per hectare of commercial product). And when measured in terms of kilograms per hectare of land under grain cultivation where fertilizer is applied (which accounts for 89 percent of all land cultivated in Ethiopia), the figure increases to 48 kilograms per hectare of nutrients (about 83 kilograms per hectare of commercial product), which begins to approach the application rates in Asia.

There is also evidence of increasing fertilizer use over time. Data from the 2004 and 2009 survey rounds of the Ethiopian Rural Household Survey (ERHS) (ERHS 2011), for example, show that between 2004 and 2009, the share of farmers who had used fertilizer at least once in the previous five years increased from 54.4 to 67.5 percent.[8]

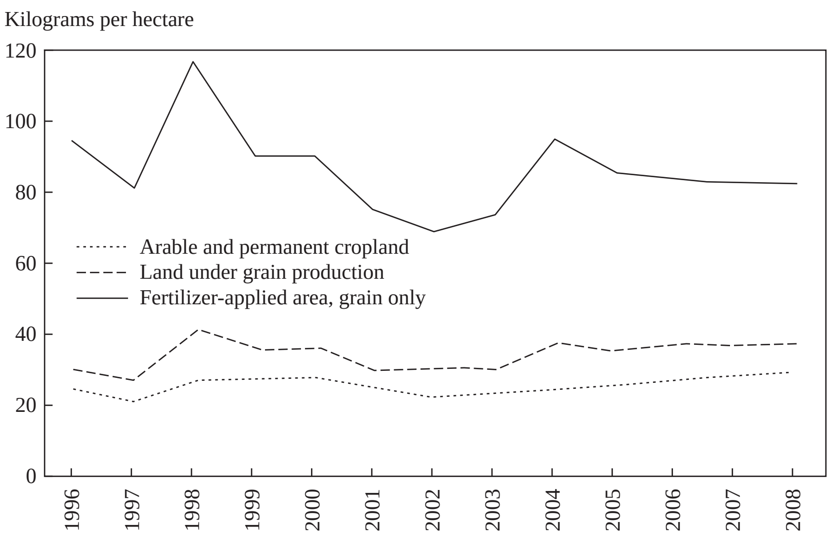
8. The ERHS is a longitudinal household survey that was first conducted in 1989 in seven peasant associations located in the regions Amhara, Oromiya, and the SNNPR. The survey collected consumption, asset, and income data on about 450 households and expanded its sample to cover 15 villages in 1994. Further rounds were conducted in 1995, 1997, 1999, 2004, and 2009, with coverage expanded to include 9 additional villages to capture the diversity in the country's farming system. The sample includes a total of 1,477 households. Topics addressed in the survey now include household characteristics, agriculture and livestock, food consumption, health, and women's activities, community-level electricity and water, sewage and toilet facilities, health services, education, nongovernmental organization activity, migration, wages, and production and marketing. The data were collected by the Economics Department, Addis Ababa University (AAU), the Centre for the Study of African Economies (CSAE), the University of Oxford, and IFPRI. See ERHS (2011).

FIGURE 4.9 Fertilizer imports, 1996–2008



SOURCE: Ethiopia, MoARD (various years).

FIGURE 4.10 Fertilizer use intensity, 1996–2008



SOURCES: Ethiopia, CSA (various years); Ethiopia, MoARD (various years).

However, there is also some evidence suggesting that these high fertilizer use intensity figures may be overstating the case. A study conducted by EEA/EEPRI (2006) notes that up to a third of farmers covered by PADETES have disadopted the seed-fertilizer technology packages over time, likely due to the high cost of inputs, insufficient credit and credit rationing, a lack of varieties with traits appropriate to farmers' needs, and other factors.

Fertilizer Prices and Profitability

We explore here the issue of fertilizer demand and supply in terms of the returns to fertilizer use, a subject of extensive discussion in Ethiopia. Estimates of the value–cost ratio (VCR) for four years between 1992 and 2008 are shown in Figure 4.11.[9] Assuming that fertilizer use is profitable where the VCR is greater than 2, the return to fertilizer use has been generally positive in recent years, with a VCR around the threshold of 2. And this holds true even when disaggregated by regional markets, except for the Arsi/Bale zone for teff and the Welega/Keffa zone for maize (Table 4.5).

However, given the high level of risk associated with rainfed agriculture and the variance of yield among farmers, it is likely that the VCR of fertilizer use needs to be significantly higher than the threshold level of 2 for fertilizer use to be profitable for most farmers. Furthermore, the VCR values themselves are accurate only to the extent that the 1989 and 1991 data on fertilizer trials, on which the VCR calculations are based, are robust case controls for all the relevant agricultural practices.

Still, these figures may broadly suggest that fertilizer prices in Ethiopia are competitive. Although the margin between domestic and international prices is higher in Ethiopia than in Asian and Latin American countries, it is still comparable to the margin in other Sub-Saharan African countries, including South Africa. And although the price buildup from port to farmgate is estimated at 26 percent (S. Rashid, pers. comm.), comparisons with other African countries indicate that marketing margins in Ethiopia are somewhat lower.[10]

In addition, fertilizer prices represent only one dimension of market performance. As in the case of seed, the ability to provide the right type of input of good quality to farmers in a timely manner is equally important. The distribution system in Ethiopia is inflexible, providing only two types of fertilizer (DAP and urea), both in 50-kilogram bags. Moreover, in recent years numerous farmers (as many as half in some regions) have consistently reported late delivery of fertilizer.

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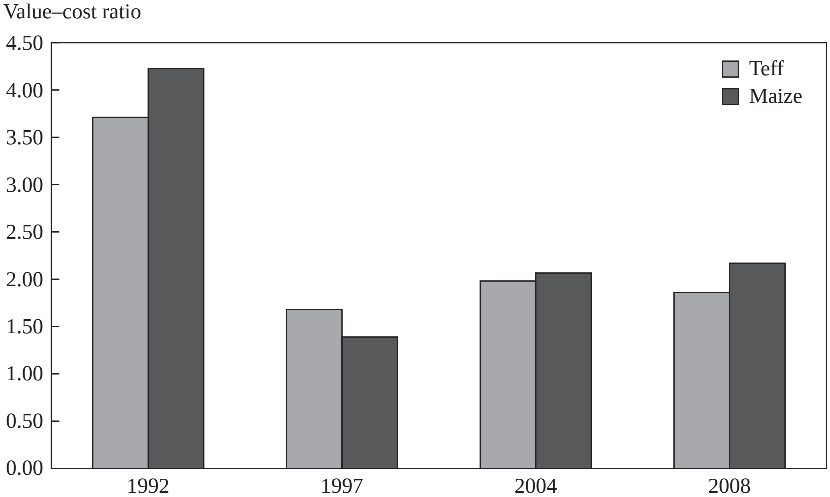
9. Value–cost ratio (VCR) is the change in revenue due to fertilizer use at the recommended level in a given plot of land. In notation it is given by $VCR = (\Delta y \cdot p)/Cf$, where Δy denotes incremental yield gains resulting from fertilizer use, p denotes output price per kilogram, and Cf denotes the cost of fertilizer.

10. The price buildup for fertilizer estimated here is specifically for fertilizer imported through Djibouti, transported to Adama, distributed to cooperative unions, distributed onward to primary cooperatives, and eventually sold to farmers.

FIGURE 4.11 Fertilizer value–cost ratios, 1992, 1997, 2004, and 2008



SOURCES: For 1992 and 1997, Demeke (1997); for 2004 and 2008, authors' calculations.

A study of Ethiopian smallholders by Bonger, Ayele, and Kuma (2004) found that half of the farmers surveyed for the study reported that fertilizer arrived after planting, while 32 percent reported underweight bags, 25 percent complained of poor quality, and almost 40 percent reported that their planting was delayed by fertilizer problems. Studies by DSA (2006) and EEA/EEPRI (2006) found that although fertilizer quality problems had been reduced in recent years, delays in delivery were still common, with 25 percent or more of farmers complaining of late delivery.

Data from the 2004 and 2009 rounds of the ERHS (ERHS 2011) provide further insight into these problems, with surveyed farmers ranking the four major problems in Ethiopia's fertilizer supply system as follows: high price, late arrival, shortage of supply, and lack of credit (Table 4.6). Analysis of these results also provides a reflection on farmers' perceptions of the link between fertilizer use and output: in 2004, 30 percent of the 1,350 surveyed farmers in 15 villages reported that their output was affected by not being able to obtain fertilizer at the right time. This figure decreased to 20 percent in the 2009 survey round.

Still, other problems remain. Unlike neighboring countries such as Kenya, Ethiopia does not offer fertilizer in smaller packages that could be used by smallholders or in different formulations needed for different types of agro-climates, soils, and crops.

In addition, input distribution tied to credit tends to limit the space available for the emergence of private-sector retailers. The state's guaranteed loan program with preferential interest rates creates an uneven playing field in the rural finance sector by undermining efforts to set up alternative institutions such

TABLE 4.5 Fertilizer value–cost ratios, 1992–2008

	1992				1997				2004				2008			
Crop, zone	C_f (ETB/ dose)	Δy (kg/ ha)	P (ETB/ kg)	*VCR*	C_f (ETB/ dose)	Δy (kg/ ha)	P (ETB/ kg)	*VCR*	C_f (ETB/ dose)	Δy (kg/ ha)	P (ETB/ kg)	*VCR*	C_f (ETB/ dose)	Δy (kg/ ha)	P (ETB/ kg)	*VCR*
Teff																
Shewa	212	641	1.22	3.69	516	641	1.35	1.67	601	641	1.80	1.92	1,465	641	4.36	1.91
Gojam	197	592	1.22	3.66	480	592	1.35	1.66	587	592	2.10	2.12	1,387	592	4.67	1.99
Arsi/Bale	160	473	1.22	3.6	391	473	1.35	1.63	459	473	1.80	1.85	1,224	473	4.36	1.69
Across the country	192	590	1.22	3.74	468	590	1.35	1.69	565	590	1.93	2.02	1,374	590	4.44	1.91
Maize																
Shewa	194	1,325	0.65	4.44	472	1,325	0.53	1.48	548	1,325	0.95	2.30	1,346	1,325	2.32	2.28
Gojam	296	1,932	0.65	4.24	720	1,932	0.53	1.41	874	1,932	1.22	2.69	2,084	1,932	2.61	2.42
Welega/Kefa	314	1,855	0.65	3.84	765	1,855	0.53	1.28	974	1,855	0.95	1.81	2,347	1,855	2.32	1.83
Gamu Gofa/Sidamo	191	1,212	0.65	4.13	463	1,212	0.53	1.38	543	1,212	0.77	1.73	n.a.	1,212	2.30	n.a.
Across the country	216	1,410	0.65	4.24	526	1,410	0.53	1.41	633	1,410	0.95	2.12	1,556	1,410	2.41	2.18

SOURCES: For 1992 and 1997, Demeke (1997); for 2004 and 2008, authors' calculations.

NOTES: The value–cost ratio is calculated as $VCR = (\Delta y \cdot p)/Cf$, where Δy denotes incremental yield gains resulting from fertilizer use, p denotes output price per kilogram, and Cf denotes the cost per recommended dose of fertilizer for 1 hectare of land. Fertilizer recommendation (dose) and response rate were taken from fertilizer trials conducted in 1989 and 1991 by the Ministry of Agriculture and the National Fertilizer and Inputs Unit. ETB = Ethiopian birr; ha = hectares; kg = kilograms; n.a. = not available.

TABLE 4.6 Major problems of the fertilizer supply system, 2004 and 2009

Problem with the fertilizer supply system	2004 Percentage of people who ranked the problem:			2009 Percentage of people who ranked the problem:		
	1st	2nd	3rd	1st	2nd	3rd
High price	47.6	30.6	32.3	50.3	30.9	13.3
Late arrival	9.6	34.6	12.2	11.7	30.0	25.4
Shortage of supply	15.2	11.1	22.9	11.1	13.2	18.3
Lack of credit	3.2	17.7	27.12	5.0	31.0	35.4

SOURCE: Authors' computations based on the 2004 and 2009 rounds of the Ethiopian Rural Household Survey (ERHS 2011).

as microfinance organizations, branches of commercial banks, or independent financial cooperatives.

Loan recovery with the use of extension agents and a degree of coercion by local administrative officials were generally successful until the collapse of maize prices in 2001 and the subsequent drought. In Oromiya region, for example, credit recoveries had averaged above 80 percent up to 2001, but this figure dropped to 60 percent in 2002, forcing a major rescheduling of loans. This has resulted in high fiscal costs and fiscal risks associated with the loan guarantee program. The write-off to loan guarantees amounted to ETB 84 million in 2001, but by 2005 liabilities had again accumulated to ETB 183 million (DSA 2006). Also in 2005, Oromiya region was obliged to pay approximately ETB 84 million to the Commercial Bank of Ethiopia to honor its guarantees for the previous three-year period. The guarantee thus becomes a subsidy that is not accounted for in government budgeting.

Beyond fiscal costs, there are also considerable but nonquantifiable implicit costs in the system, many of which are borne by the government through its regional extension and input supply systems. These include the costs resulting from the "central planning" system of demand estimation, which is similar to that described earlier for seed. The indirect costs also include the costs of storage and quality deterioration incurred because closing stocks have comprised 50 percent or more of total consumption in most years except 2004 and 2005. Finally, the implicit costs include those resulting from damage done to extension–farmer relationships when harsh measures have been employed to ensure loan repayment.

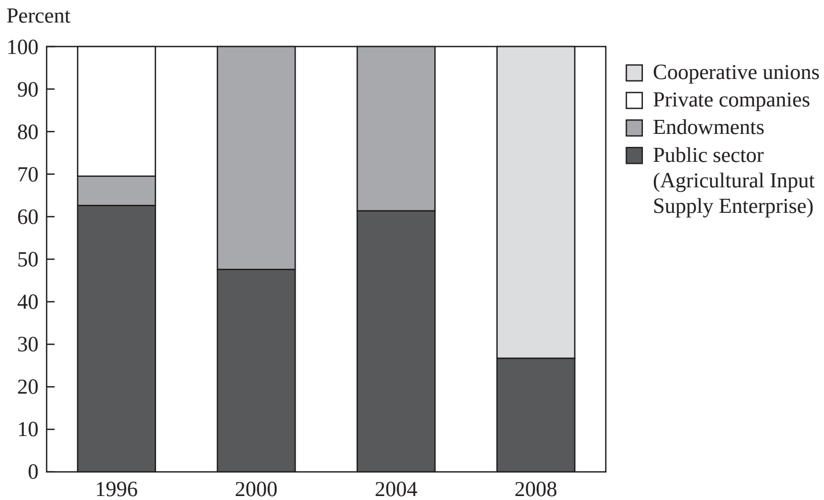
Fertilizer Market Structure

Fertilizer use intensity, demand, and supply, discussed earlier, are closely tied to the changing structure of Ethiopia's fertilizer market. The GoE liberalized the fertilizer sector soon after the end of the Derg regime. The first reforms occurred in the early 1990s with the privatization and abolishment of the monopoly on fertilizer importation and distribution held by the state-owned AISCO, later renamed the Agricultural Input Supply Enterprise (AISE). Policy changes that fully liberalized fertilizer pricing and the removal of subsidies followed in 1997–98. The private sector's initial response to market liberalization was rapid. Although there were only three large importers, there was very rapid growth in private wholesalers and retailers in the country. One company, Ambassel, had 103 wholesalers, 901 retailers, and 860 service cooperatives by 1996 (Demeke et al. 1998).

Unfortunately, there are few empirical data and little analysis against which to assess the private sector's performance during this initial round of reforms. This is due to the fact that the independent private sector rapidly exited the fertilizer market within a few years of its entry. In the case of imports, the share of private firms operating in the market went from 33 percent in 1995 to zero in 1999. These firms were first replaced by "private" holding companies with strong ties to government (Jayne et al. 2003). Since 2007, fertilizer imports have been controlled by the AISE and cooperative unions (Figure 4.12).

The market share trends are similar in the case of wholesalers. Although the AISE had a market share of less than 50 percent during the middle and late 1990s, it had regained the majority share by 2001, when private-sector wholesalers, except for the holding companies, had disappeared from the scene. In

FIGURE 4.12 Fertilizer import shares, by type of importer, 1996–2008



SOURCE: Ethiopia, MoARD (various years).
NOTE: *Endowments* denotes the holding companies described in the text and by Jayne et al. (2003).

the retail market, the decline was even more dramatic. Although private retailers held a majority share of the market in the early 1990s, the public sector and cooperative unions have become almost the sole distributors of fertilizer since 2000 (DSA 2006). As of 2004, the public sector accounted for over 70 percent of distribution, with private dealers accounting for only 7 percent of sales nationwide (EEA/EEPRI 2006). The public-sector supply channels have also changed; whereas extension agents initially managed distribution, the responsibility was shifted to *woreda* input supply offices and cooperatives in more recent years.

The decline in private-sector participation in fertilizer markets reflects several factors, including difficulties in the import process itself. Importing fertilizer requires that the importer obtain a license that is allocated by the GoE through a tendering process and that fertilizer be imported in lots of 25,000 tons. The importer almost always requires financing given that a single shipment of fertilizer alone requires over $5–10 million over several months. A private-sector buyer is currently required to deposit 100 percent of the value of the fertilizer to be imported at the time a line of credit is opened. What remains to be clearly understood is whether these same requirements apply to the AISE, holding companies, and cooperative unions. If these actors in the fertilizer market enjoy privileged collateral requirements, this would suggest an uneven playing field and would be a clear indicator of the private sector's total exit from the fertilizer market.

Agricultural Extension Services

In effect, agricultural extension services are what tie improved seed, chemical fertilizers, and credit together for the Ethiopian smallholder. Extension services were first introduced in 1953 by the Imperial Ethiopian College of Agricultural and Mechanical Arts (also known as Alemaya University and recently renamed Haramaya University) in the style of a US land grant university. Extension services were later provided to a larger number of farmers in the 1960s under the comprehensive integrated package projects, described earlier. In the 1980s, the extension system jumped on the bandwagon and transformed itself into a training and visit (T&V)–style system that was favored by the international donor community at the time (Abate 2008).

The PADETES program described earlier worked with this T&V approach to specifically promote improved seed and chemical fertilizer and succeeded in convincing the GoE to expand its coverage under the NAEIP in 1995. The PADETES/NAEIP programs are credited with expanding the reach of Ethiopia's extension services to some 9 million farmers by 2007–08 (Adugna 2008).

Over the past five years, the federal and regional extension programs have increased the number of public extension staff three-fold—from approximately 15,000 development agents (DAs) during the PADETES/NAEIP period to more

TABLE 4.7 Development agents and farmer training centers, 2008

Region	Farmer training centers (FTCs)			Development agents (DAs)								
	FTCs required (number of *kebeles*)	FTCs established as of 2008	Total fully functional FTCs	Crop development		Livestock		Natural resource management		Other		Total DAs
				Male	Female	Male	Female	Male	Female	Male	Female	
Tigray	602	588	55	544	65	526	52	574	29	235	42	2,067
Oromiya	6,420	2,549	1,147	5,885		6,021		6,080		1,668		19,654
Amhara	3,150	1,725	318	2,407	464	2,438	493	2,597	318	90	1,389	10,196
SNNPR	3,681	1,610	857	13,448[a]								13,448
Afar	558	n.a.	n.a.	240		241		209		58		748
Somali	n.a.	2	n.a.	422	26	376	32	334	40	35	4	1,269
Harari	17	5	3	15	n.a.	15	3	15	2	2	n.a.	52
Dire Dawa	25	7	n.a.	22	2	14	4	18	4	19	5	88
Total	14,453	6,486	2,380	3,410	557	3,369	584	3,538	393	381	1,440	47,522

SOURCE: MoARD 2009.

NOTE: SNNPR = Southern Nations, Nationalities, and People's Region; n.a. = not available.

[a]Data for the SNNPR are based on figures from 2006–07.

than 47,500 in 2008 (Table 4.7). This rapid expansion has been the linchpin of the GoE's effort to accelerate agricultural production and productivity growth, and it has been accompanied by the establishment of farmer training centers (FTCs), each of which is meant to house three DAs with a range of technical skills and to provide a broad range of demand-responsive extension and short-term training services.

Agricultural extension services in Ethiopia have traditionally been financed and provided almost entirely by the public sector. Thus, these programs represent a significant public investment, amounting to over $50 million dollars, which is roughly equivalent to 2 percent of total annual government expenditure.

Real progress on the ground has been mixed with respect to DA deployment and FTC start-ups (see Table 4.7). DA recruitment and training have largely succeeded in meeting their numeric targets, although FTC start-ups have lagged behind. Meanwhile, the expected impact of DAs and FTCs remains unclear, due in part to the near absence of any rigorous impact evaluation, even though the significant amount of resources dedicated to the extension system warrants such evaluation.

All this said, four previous studies that evaluate the contribution of agricultural extension in Ethiopia are worth noting. First is the EEA/EEPRI (2006) evaluation of PADETES, which is referred to throughout this chapter. Second is Bonger, Ayele, and Kuma (2004), also referred to herein. Third is a recent impact evaluation of Ethiopia's Productive Safety Net Programme (PSNP) by Gilligan, Hoddinott, and Taffesse (2008), which reports the positive impact on a range of food security and poverty indicators of income earned from public works activities undertaken by food-insecure households through the PSNP when combined with the "Other Food Security Program," which provides access to improved seed, extension services, and natural resource management schemes. Fourth is a study based on panel data from the Ethiopian Rural Household Survey by Dercon et al. (2009) that reports the significant effect of extension workers' visits on poverty headcounts and consumption growth between 1994 and 2004.

Nonetheless, the entire body of evidence on agricultural extension suggests that its impact on productivity and poverty has been mixed to date. Although many farmers seem to have adopted the packages promoted by the extension system, up to a third of the farmers who have tried a package have discontinued its use (Bonger, Ayele, and Kuma 2004; EEA/EEPRI 2006). Indeed, Bonger, Ayele, and Kuma (2004) also find that poor extension services were ranked as the top reason for nonadoption.

Part of the problem is that the success of the extension services has traditionally been measured in terms of numeric targets for physical input use, instead of emphasizing the efficiency and profitability of input use. In fact, most extension agents view their role primarily as distributing fertilizer and credit, a role that hampers the provision of technical advice (EEA/EEPRI 2006).

The hierarchical "culture" underlying the extension system does little to encourage and exploit the inherent resourcefulness of those who work closely with farmers and rural communities (Gebremedhin, Hoekstra, and Tegegne 2006; Davis et al. 2007). And although extension has been decentralized to the administrative control of regional governments and *woreda* administrations, continued imposition of targets from above and weak local capacity have not yet permitted the emergence of a dynamic demand-driven system.

On the positive side, several reforms have been introduced to address these deficiencies. First, in an effort to get beyond a focus on cereals, new packages have been developed to support other crop and livestock enterprises, improve postharvest technology adoption, and encourage natural resource management. Second, in recognition of the diversity of smallholder farming systems in Ethiopia, classifications have been developed to divide the country into several distinct agroecological zones to aid in the development of more appropriate zone-specific packages (Ibrahim 2004). Third, input distribution is being shifted away from extension services to cooperatives, thus freeing extension agents to provide more technical advice. Finally, moves are being made to strengthen and diversify the curriculum provided by the 25 Agricultural Technical and Vocational Education and Training colleges that are responsible for preparing DAs for deployment throughout the country (Table 4.8).

Some small improvements in the extension system have been recorded in recent years. Data from the 2004 and 2009 survey rounds of the ERHS (ERHS 2011) suggest that although only 25 percent of the farmers surveyed in 2004 had been visited by a development agent at least once in the previous (main) growing season, this figure had increased to 46 percent in 2009 (Table 4.9). Of course, the frequency of extension contact says little about the nature, quality, and effectiveness of the extension system itself, further suggesting the need for in-depth evaluation.

Conclusions

After nearly two decades of policies that placed a high priority on boosting agricultural production and productivity, Ethiopia has seen some amount of success. But many persistent and unsolved challenges remain. There is little doubt that intensification and commercialization of agriculture are needed in Ethiopia given its precarious food situation and acute land scarcity. The challenge is finding ways to strengthen smallholders' access to inputs, technology, and information and improving the incentives for their use and adoption, all within highly heterogeneous agroecologies characterized by high risks.

State-led policies to promote improved seed and fertilizer through regional state-run input supply and extension systems initially generated some positive impacts in Ethiopia over the past two decades. But experience to date suggests that increasing the role of the state will not provide the intended growth stimu-

TABLE 4.8 Agricultural Technical and Vocational Education and Training (ATVET) college graduates, 2003–04 to 2007–08

Year	Number of ATVET graduates
2003–04	9,368
2004–05	13,899
2005–06	11,095
2006–07	15,099
2007–08	9,404
Total	59,364

SOURCE: Ethiopia, MoARD (2009).

TABLE 4.9 Frequency of visits by an extension agent during the previous main growing season, 2004 and 2009

	2004			2009		
Number of times visited	Number of farmers	Percent	Cumulative	Number of farmers	Percent	Cumulative
0	910	75.3	75.3	841	53.5	53.5
1	58	4.8	80.1	180	11.5	65.0
2	89	7.4	87.5	235	15.0	79.9
3	54	4.5	92.0	160	10.2	90.9
≥ 4	97	8.0	100.0	58	9.2	100.0
Total number of farmers	1,208			1,570		

SOURCE: Authors' computations based on the 2004 and 2009 rounds of the Ethiopian Rural Household Survey (ERHS 2011).

lus to the agricultural sector. The current approach reduces the quality of input services to smallholders, incurs many hidden costs to the government, and generates significant risks to both smallholders and the government.

This is not to say that the public provision of information, input, credit, and administration is unnecessary. Rather, public-sector involvement in Ethiopia's agricultural sector will remain critical where smallholders have poor access to markets, weak purchasing power, and asymmetrical access to market information. Moreover, public leadership in encouraging private investment in market-based systems remains necessary in Ethiopia, where modern market institutions are still underdeveloped.

Nonetheless, more consideration should be given to long-term policies designed to build a dynamic private sector to promote fertilizer, seed, credit, and market information systems. A greater degree of flexibility in how inputs and services are provided and a greater degree of choice for smallholders can open up new market and technological opportunities in the agricultural sector.

Thus, the development of an efficient input marketing and rural financial system will be a difficult, time-consuming, and expensive undertaking that will require significant support for institution-building activities, capacity strengthening and training, and financial-sector infrastructure development. Several measures would facilitate the transition.

First, policies to open the market (and pricing) for hybrid maize seed—taking a page from successful experiences in the region—should be explored more actively. This transition would have to be gradual. The ESE's capacity to produce seed during a transition into privatization could drop dramatically, while private seed multipliers aiming to fill the gap would struggle to expand into upstream breeding activities, scale up multiplication, and build their distribution and retailing networks. But if reforms were accompanied by new procurement procedures that encouraged cooperatives and the regional extension and input supply systems to purchase seed more extensively from the private sector and if commercial lending was made more readily available to encourage private seed companies to expand their production and distribution, smallholders could benefit from a larger choice and a better quality of maize seed. There are positive signs suggesting that both the government and other stakeholders are pursuing such reforms with support from the donor community; however, close monitoring of the reform's progress remains vital to success.

Second, policies to liberalize the fertilizer market should be pursued. These should include policies for liberalizing collateral requirements for fertilizer imports and reducing the credit guarantee to 50 percent, then gradually lowering it further until an eventual phase-out; opening the credit guarantee to other certified financial institutions; and liberalizing interest rates. In the short term, risk-averse commercial banks might shy away from financing fertilizer imports and distribution. However, with the long-run development of a liberalized and competitive financial sector, these short-term issues would likely give way to greater investment in fertilizer importation and distribution.

Third, deep reforms in the extension system should be explored sooner rather than later. Such reforms would need to move the system away from single-minded, top-down, package approaches to cereal intensification to more dynamic, responsive, and competitive service provision. These approaches will require greater flexibility within the current system, which can be accomplished only by investing time, effort, and resources in changing the cultures and practices of the extension system, and they are likely to yield results over a much longer-term period. However, without such changes, the extension and education system in Ethiopia will become increasingly irrelevant to the needs of intensive commercial smallholder production systems. Again, the signs suggest that the government is pursuing reforms in this area, although close monitoring of progress is vital to success.

Fourth, innovative programs should be continually explored. Given the risks posed by production and price variability in Ethiopia, price risk mitigation based on a combination of market and nonmarket management tools should also be a major policy priority for the country. Nonmarket-based options will work in the short term only if combined with long-term improvements in physical infrastructure, information and communications technology, contract enforcement, and strengthening of the markets for credit and insurance. Innovative programs would include investments to scale up the weather insurance schemes currently being piloted, develop a comprehensive market information system to support the new commodity exchange, and liberalize the telecommunications sector to improve rural access to information and communications technologies.

Finally, significantly more resources should be invested in regular and methodical assessments of the impact of the extension and input supply system. The near absence of independent impact assessment makes it difficult to evaluate where in the system there are disincentives, bottlenecks, and structural issues and how they can be remedied.

These findings reinforce those of other studies conducted in the region of the need for complete rather than half-hearted liberalization of input supply markets to support smallholders' efforts to intensify cereal production. Moreover, these recommendations detail the intricacies of the liberalization process and the need to be deeply aware of the peculiarities—both the inherent market failures and the potential profit opportunities—that describe input markets and extension services. Finally, the findings recognize the necessity of both continuing public engagement in input markets and extension services and carving out new space for private investment in providing goods and services for smallholders in a potentially efficient manner.

In conclusion, although Ethiopia has an admirable record of supporting agriculture, the continued state-led policies to boost agricultural production and productivity have now outlived their usefulness. A rethinking of approaches is needed, one that reallocates the roles of the public and private sectors in the promotion and regulation of the agricultural input sector. This rethinking requires a nuanced understanding of the complex issues involved, evidence-based analysis and policy recommendations, and continuous debate on the pros and cons of alternatives and options. Lessons learned from this process can do much to inform Ethiopia's long-term development strategy.

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5 Policies and Performance of Ethiopian Cereal Markets

SHAHIDUR RASHID AND ASFAW NEGASSA

Cereal is the single largest subsector of Ethiopia's agriculture. It dominates in terms of its share in rural employment, agricultural land use, and calorie intake, as well as its contribution to national income. The subsector accounts for roughly 60 percent of rural employment, about 73 percent of total cultivated land, more than 40 percent of a typical household's food expenditure, and more than 60 percent of total calorie intake.[1] The contribution of cereals to the national income is also large. According to available estimates, cereals' contribution to agricultural value-added is 65 percent, which translates to about 30 percent of gross domestic product (GDP).[2]

Thus it is no surprise that, despite differing political ideologies, all agricultural production and marketing policies since the 1960s have focused on the cereals subsector. Since 1991, both growth strategies and poverty reduction strategies have placed a heavy emphasis on cereal production and marketing. The Agricultural Development–Led Industrialization strategy, the Sustainable Development and Poverty Reduction Plan, and the Plan for Accelerated and Sustained Development to End Poverty all highlight the importance of cereals in Ethiopia's overall economic development. The Participatory Demonstration and Training Extension System, instituted in the mid-1990s, was specifically designed to increase cereal production through demonstration of seed–fertilizer technology. As part of these strategies, the Government of Ethiopia has undertaken substantial market reforms, accelerated investments in road and communication networks, and initiated programs to increase cereal production.

The structure of Ethiopian cereal markets has undergone massive changes due to these shifts in government agricultural production and market policies along with vast improvements in marketing infrastructure and major increases in domestic production. This chapter documents these experiences. It begins by giving a historical overview of policies that have directly or indirectly affected cereal production and marketing, followed by a discussion of public invest-

1. These numbers are estimated from Ethiopia, CSA (1998, 2001, 2003, 2007).
2. This calculation is based on the fact that agriculture accounts for 47 percent of GDP.

ments in infrastructure and information. Analytical results on market structure and performances are presented next. The chapter concludes with a summary of key results and their policy implications.

Evolution of Cereal Market Policies

The structure of Ethiopian cereal markets has undergone dramatic changes over the past several decades. To a large extent, these shifts mirror the underlying ideological positions of successive governments, from the feudalistic system of the 1950s and 1960s to the pervasive state interventions under the Derg regime to an extended period of major investments in road and communication infrastructure, accompanied by considerable liberalization of markets, under the Meles government. This section describes these policy shifts, highlighting changes in the roles of the state and in the size and structure of cereal markets over time.[3]

The Imperial Regime (1960–74)

Under Emperor Haile Selassie in the 1960s, Ethiopia's cereal markets were characterized by a high share of marketed cereals in total production, limited government intervention, and very high transport costs because of the minimal road and telecommunication infrastructure. During this period, most land cultivated by small farmers was leased from large landholders or from local political and religious authorities. Because rents to landlords and tributes to the state or the church were paid in kind, the marketed "surplus" of cereals is estimated to have been fairly high (25–30 percent of production), even though the production of most farmers was near subsistence levels (Ghose 1985).

Government interventions in this period centered on the Ethiopian Grain Board (EGB), established in 1950, which was reformed and renamed the Ethiopian Grain Council in 1960.[4] The EGB was given the mandate to perform a wide range of activities, including the export licensing of oilseeds and pulses, quality control, the supervision of marketing intelligence, and the regulation of domestic and export purchases and sales. Available studies suggest that it did not live up to expectations in performing all of its mandated activities. The agency was plagued with inefficiencies due to its low capital base and inadequate storage network, and its interventions were geared almost exclusively toward providing services to feudal landlords, private exporting organizations, and private traders (Lirenso 1987; Gutema 1988).

The EGB was able to control and set prices for exported grains, oilseeds, and pulses but failed to stabilize domestic prices because it did not hold stocks

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3. See the appendix for a summary of major government policy measures related to cereal markets from 1950 to 2007.

4. Ethiopian Grain Board Proclamation 113/1950.

and was thus unable to buy and sell significant quantities in domestic markets. To correct these institutional drawbacks, the government established the Ethiopian Grain Council (EGC) in 1960.[5] The objectives of the EGC were to hold stocks, stabilize grain prices (particularly in urban areas), and improve the production of cereals, oilseeds, and pulses for export. However, the EGC was ultimately ineffective in achieving this wide range of objectives. Furthermore, EGC interventions were concentrated in a limited number of production regions and urban areas but neglected in much of the country (particularly remote areas). As a result, as Holmberg (1977) argues, the policy interventions did not contribute to the development of interregional grain trade.

State-Controlled Markets (1975–90)

Consistent with its ideology, the socialist government of Ethiopia (1975–90) instituted a wide range of controls over all grain production and marketing. These included determination of annual quotas, restriction of private grain trade and interregional grain movement, determination of days on which the local markets were to be held, and rationing of grain to urban consumers.[6] Wholesale prices of cereals were administratively set for many provincial markets and changed little between 1976 and the late 1980s (Webb and von Braun 1994).

Land reforms under the Derg regime had assigned ownership of land to the state but operational control to smallholders, who were no longer obligated to pay large rents in kind. When this system failed to generate sufficient marketed surplus to supply urban consumption needs, the government established the Agricultural Marketing Corporation (AMC) in 1976 to procure grain for public distribution and price stabilization.[7] The agency was made responsible for handling almost all aspects of agricultural input and output markets. It was involved in exporting and importing agricultural products, buying and selling inputs, and processing and marketing finished products. In addition, the AMC was engaged in the construction of storage facilities, such as silos, and other structures and machinery. By 1987, the AMC had 104 purchase and sales centers, 630,000 tons of storage capacity in 81 locations in the country, and a fleet of 225 trucks that handled 25–30 percent of its annual transport.[8] However, cereal procurement by the AMC was concentrated in the major grain-producing regions. For example, more than 80 percent of the AMC's grain supplies came from three grain-producing areas, Shewa, Gojam, and Arsi (Lirenso 1987; Gutema 1988).

There is a large body of literature documenting various negative consequences of these policies on the grain markets' structure and performance.

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5. General Notice 267/1960.
6. For details, see Lirenso 1987; Franzel, Colburn, and Degu 1989; Lemma 1996.
7. Agricultural Marketing Corporation Establishment Proclamation 105/1976.
8. In subsequent years, the resources and the extent of activities of the AMC increased. During the period from 1989 to 1990, the AMC had 8 regional offices, 27 branch offices, 121 purchasing or selling centers, and 2,013 grain collection points (Lirenso 1994).

Small farmers were badly affected by the delivery quota, because the quota set by the peasant associations often did not take into consideration the capacity constraints and consumption requirements of the poor peasants. Farmers allegedly had to buy from the market to meet the quota requirement. Moreover, the forced delivery of a quota at a fixed price had other negative impacts on farmers, reducing their production and incomes (Taffesse 1997),[9] promoting the marketing of low-quality produce, increasing farmers' dependence on local markets, and decreasing regional grain market integration (Franzel, Colburn, and Degu 1989).

Trading was also hampered by a plethora of government restrictions. Although grain traders were allowed to operate, they had to sell a significant proportion of their purchases to the AMC at prices that were substantially lower than open market prices for both purchases from farmers and sales to consumers. Individual traders were also not allowed to transport more than 100 kilograms of grain; this was strongly enforced until the area's quota had been fulfilled (Franzel, Colburn, and Degu 1989). Public grain marketing also hindered spatial arbitrage, adversely affecting the efficiency of the grain trade. Regional governments were considerable impediments to the interregional grain trade. In some regions, the private sector was completely banned from engaging in trade. Whenever private-sector businesses were allowed to operate, they were asked to meet several conditions in order to stay in the grain marketing business. These conditions included meeting licensing requirements, delivering quality grain to the AMC under a quota (accounting for at least 50 percent of traders' purchases), meeting the quota within a specified time limit, respecting fixed producer prices, not engaging in hoarding, and avoiding the illegal movement of grain (Lirenso 1987).

The socialist government started introducing changes in its grain marketing policies in 1987 due to pressure from international donors for reforms, internal political pressure, worsening economic conditions, and ideological and economic policy changes in the former USSR and Eastern European countries (Lirenso 1994; Amha 1999). The AMC was revamped in 1987, giving it a new organizational structure and removing its mandates for direct export of grains, import of agricultural products, and purchase and sale of inputs.[10] In 1988, the government allowed private traders to acquire permits to move grain as long as the traders agreed to sell half of their grain to the AMC at AMC-specified prices

9. The quota assigned to each farmer could be adjusted according to the farmer's level of production, however. Because an increase in production could lead to an increase in the amount a farmer was required to sell to the peasant association, a profit-maximizing farmer could, in theory, base his production decisions on a weighted average of the quota sales price and the market price, not simply on the market price, as in the case of an inframarginal quota. Econometric estimates for the 1980s suggest that, because of these disincentive effects of the quota system, teff production was reduced by about 4 percent (Taffesse 1997).

10. Legal Notice 103/1987.

(Franzel, Colburn, and Degu 1989). In March 1990, the government undertook major grain-marketing policy reforms that included the removal of movement restrictions, the abolition of forced quota delivery, and the elimination of the AMC's monopoly power. The Derg regime fell soon after that.

Liberalization and Rapid Growth (1991–2009)

After the Derg regime was overthrown in May 1991, various economic reform programs were launched, including major cereal market reforms. As part of the reorganization and restructuring of government parastatals that began in 1992, the AMC was reorganized as a public enterprise and allowed to operate in the open market in competition with the private sector.[11] The name of the agency was changed to the Ethiopian Grain Trade Enterprise (EGTE), and its mandates included (1) stabilizing prices with objectives of encouraging production and protecting consumers from price shocks, (2) earning foreign exchange through exporting grains to the world market, and (3) maintaining a strategic food reserve for disaster response and emergency food security operations.

However, the EGTE encountered at least three major problems in subsequent years. First, there was a constant tension between fulfilling its mandate of price stabilization and fulfilling that of competitiveness and profitability (Bekele 2002). Second, the EGTE was not effective in stabilizing grain prices due to its limited grain purchases and sales network and its shortage of working capital. The closure of branch offices and procurement and sales centers resulted in shrinkage of the EGTE's grain-marketing network, which reduced public procurement and led to underuse of the EGTE's resources (Lirenso 1994). Finally, the EGTE was often unable to guarantee purchases at preannounced prices due to logistic and capital constraints, which led to a decline in farmers' confidence and a loss of policy credibility (Rashid and Assefa 2006).

The EGTE's mandates were substantially revised through a series of proclamations and regulations in 1999 and 2000. These proclamations and regulations required the EGTE to gradually move away from price stabilization and focus on promoting exports, facilitate the development of emergency food security reserves, and help national disaster prevention and preparedness programs. At the same time, the EGTE was also merged with the Ethiopian Oilseeds and Pulses Export Corporation in 1999 in order to increase its logistical capability.[12] With these reforms, the public sector's market shares diminished from about 40 percent (purchased by the AMC) in the 1980s to about 4 percent (purchased by the EGTE) in the early 2000s as the EGTE greatly diminished its efforts at price stabilization.

With increasing adoption of new technology and favorable rainfall, Ethiopia enjoyed two consecutive years of bumper crops in 2000/01 and 2001/02.

11. Council of Ministers Regulation 25/1992; Council of Ministers Regulation 104/1992.
12. Council of Ministers Regulation 58/1999.

But the blessings of technology and good weather did not translate into improvements in maize farm households' well-being. The farmgate price of maize declined by an unprecedented 80 percent in early 2002, making maize farming highly unprofitable—so much so that some farmers allegedly did not find it worthwhile to harvest their maize crops. The ratio of input prices to producers' prices increased from 1.7 in 2000 to about 9.0 in 2002, and fertilizer application declined by 22 percent in the next cropping year.[13] Although price stabilization was no longer part of its mandate, the EGTE was directed to buy maize in order to boost farmers' confidence. The EGTE procured 18,000 tons of maize, of which 11,000 tons were exported. The situation took a turn for the worse in mid-2002, however. When expected rains did not come in time for the main cropping season (*meher*), farmers reduced their application of modern inputs, and it became evident that cereal production would be significantly lower than the previous year. The production forecasts for maize were revised downward by as much as 52 percent, making both the government and its development partners nervous about a looming food security crisis, with potentially 15 million people facing food shortage. The crisis was eventually averted by generous donor support that included more than 1 million tons of food aid.

The EGTE faced quite the opposite challenge in 2005–08. Despite consecutive years of reported good harvests, the prices of major cereals started rising sharply in late 2005, as did overall macroinflation. Local grain procurement by the World Food Programme (WFP) and the EGTE fell to almost zero, and strategic cereal reserves declined to an unprecedented low level of only 17,000 tons in the third quarter of 2008 (Rashid and Lemma 2011), posing a significant risk of increased vulnerability for poor households. Furthermore, although many rural households had access to the large-scale Productive Safety Net Programme, there was no such program for urban households. Therefore, rising nominal prices in the main urban centers became a major policy concern, leading the government to implement an urban food rationing program in April 2007. Actual distribution of wheat under this program began in Addis Ababa in June 2007; 11 other urban centers were added by August 2008. Between June 2007 and June 2008, the program distributed about 249,000 tons of wheat at a subsidized rate of Ethiopian birr (ETB) 1,800 (or about $180) per ton, which was 41 percent lower than the wholesale price in June 2007 of $308 per ton and 76 percent lower than the wholesale price in June 2008 of $763 per ton in the Addis Ababa market.[14]

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13. These are the authors' estimates based on Agricultural Input Supply Enterprise data.

14. Because of the high price differentials, urban food rationing served as an income transfer program. According to data from an urban household survey administered by the World Food Programme in June and July 2008, about 93 percent of recipient households immediately sold their ration on the open market, either to buy other cereals or to meet other consumption needs.

Public Investments in Infrastructure and Information

Efficient functioning of commodity markets depends on the adequacy of infrastructure, information, and institutions. Most of the market studies in Ethiopia in the 1980s highlighted the inadequacy of rural infrastructure as a fundamental reason for interregional price spikes and inefficient price formation, as well as a main cause of famine (Webb and von Braun 1994). In the 1980s, more than 90 percent of the country's population lived more than 48 hours' walk from a paved road (WFP 1989); transport was largely controlled by the government, telecommunication was thin, and mobile phone technology was nonexistent. Since the early 1990s, however, there has been significant improvement in physical infrastructure in Ethiopia, with implications for growth, poverty reduction, and functioning of markets. A summary of historical data regarding the indicators of development of key infrastructure are presented in Table 5.1; each of these is discussed in further detail below.

The Road Network

Given the country's wide dispersion of production and consumption centers, the development of roads is critical for the interregional grain trade. However, public investment in developing roads, especially rural roads, was limited for a long time. As shown in Figure 5.1, the road network in Ethiopia expanded substantially after 1951, with the most rapid growth occurring after 1990. The total length of roads (asphalt and gravel) was 6,400 kilometers in 1951, growing to only 9,100 kilometers by the early 1970s and to about 16,100 kilometers by the mid-1980s. There was no official figure on rural roads until about 1976. The Derg regime focused on rural roads but added only about 5,500 kilometers by the time the regime was overthrown. When the transitional government came to power in 1991, the country had about 4,100 kilometers of asphalt roads, 9,300 kilometers of gravel roads, and about 5,600 kilometers of rural roads. Things then started changing quite rapidly—the length of rural roads jumped from about 5,600 kilometers to 15,500 kilometers by 2000, while gravel and asphalt roads grew by about 36.6 and 8.0 percent, respectively. In 2008, Ethiopia had almost 24,000 kilometers of rural roads, almost five times the length of rural roads that had existed in 1992 (excluding Eritrea). Understandably, asphalt and gravel roads did not increase as quickly, though they registered growth rates of 71 and 60 percent, respectively, between 1992 and 2008.[15]

Although focusing on rural infrastructure in the early 1990s was necessary, cereal marketing will continue to face problems unless these rural roads are converted into modern, all-weather roads. Three issues are worth noting. First, because rural and gravel roads are the major road types across the country,

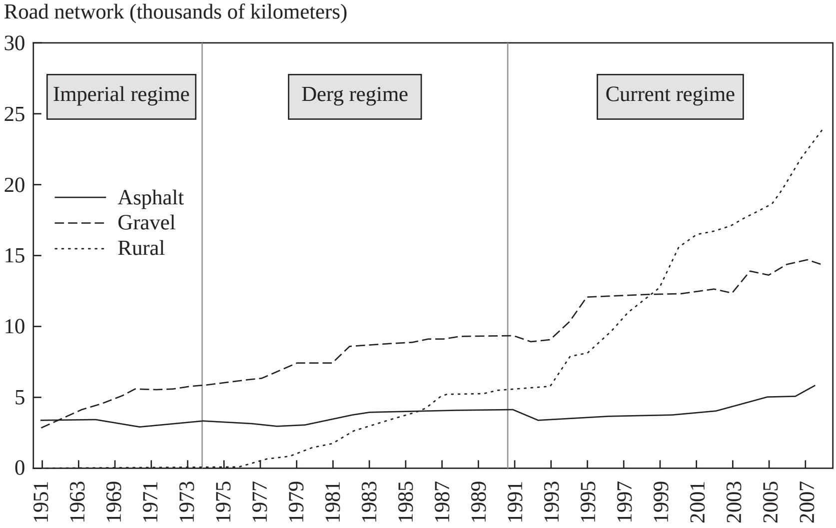
15. As discussed in Chapter 2, these road investments resulted in substantial reductions in travel time.

TABLE 5.1 Number of trucks and telephone subscriptions and kilometers of road network, by type (thousands)

	Number of trucks			Number of subscriptions			Kilometers of road network		
Year	3–7 metric tons	7–18 metric tons	Trailer	Landline	Mobile	Internet	Asphalt	Gravel	Rural
Average 1993–99	10.42	10.67	4.81	153.80	6.74	1.76	3.68	11.41	9.40
2000	24.42	10.11	5.60	231.95	17.76	2.46	3.82	12.25	15.48
2001	27.07	10.52	5.67	283.68	27.53	4.07	3.92	12.47	16.48
2002	25.33	12.91	5.65	353.82	42.91	6.74	4.05	12.56	16.68
2003	25.39	13.82	6.13	404.79	51.23	9.53	4.36	12.34	17.15
2004	32.52	10.72	6.01	484.37	155.53	12.16	4.64	13.91	17.96
2005	32.60	11.28	7.13	610.35	410.63	17.71	4.97	13.64	18.41
2006	39.72	11.38	6.89	725.05	866.70	25.72	5.00	14.31	20.16
2007	43.96	11.57	7.31	880.09	1,208.50	31.40	5.45	14.63	22.35
2008	48.20	11.76	7.73	897.29	1,954.33	34.11	6.07	14.36	23.93
Average 2000–08	33.25	11.56	6.46	541.26	526.12	15.99	4.70	13.39	18.73
Average 1993–2008	21.89	10.52	5.40	349.91	431.13	11.48	4.00	11.79	13.79
Yearly growth (percent)	14.16	0.82	4.27	14.39	64.06	32.76	3.26	2.33	8.50

SOURCE: Trucks, Ethiopia, MoTC (2008); subscriptions, Ethiopia, ETC (2009); roads, Ethiopia, ERA (various years).

FIGURE 5.1 Trends in road development in Ethiopia, 1951–2007



SOURCE: Ethiopia, ERA (various years).

the majority of grain transport from production areas to consumption centers can take place only during the dry season. This prevents producers and regional grain traders from taking advantage of higher prices during the lean season. Second, with the shortened time period for road access, there is increased pressure on the limited marketing infrastructure to transport grain to consumption centers, which might increase the demand for marketing services and hence increase marketing costs. Third, the cost of operating trucks on gravel and rural roads is also higher than operating them on all-weather roads, which in turn results in an increase in transportation cost. Thus, converting many of these rural roads into all-weather roads can be an important part of the country's long-term strategy for market development.

Telephone and Telecommunication Services

The availability and quality of telecommunication services affects marketing costs by influencing market agents' access to price information and by enhancing their ability to find and negotiate transactions with trading partners. During the socialist regime, access to telephone lines was extremely difficult. The waiting time for a phone connection was long. Under the present regime, there has been steady improvement in the number of telephone lines and telephone sets in the country. The number of landline telephones has increased more than eight-fold, from 148,739 in 1988 to 897,000 in 2008.

Cellular phone ownership in Ethiopia has grown from practically zero in 1999 to about 2 million in 2008. This is clearly an indication of progress, but the available data suggest that the country is rapidly falling behind its neighbors in terms of cellular connectivity. Figure 5.2 presents historical data on the ownership of cellular phones per 100 people in Ethiopia and three of its neighbors—Kenya, Rwanda, and Uganda. The figure clearly shows that although all four countries were at the same level in 2000, Ethiopia's neighbors started rapidly outpacing it. By 2008, almost one out of every two people in Kenya, one out of every three people in Uganda, and one out of every seven people in Rwanda had a cell phone. By contrast, the number was only one out of every 50 people in Ethiopia. In other words, only 2 percent of the country's population had access to a cell phone in 2008. This is because, unlike in neighboring countries, in Ethiopia cellular phones continue to be under a government monopoly. Until very recently, although people in most other African countries could obtain a subscriber identity module (SIM) card from kiosks on street corners, Ethiopians required government permission to own a cell phone. That process has become easier now, and the subscription is subsequently picking up. However, the country still lags far behind its neighbors.

Trucks and Transport Services

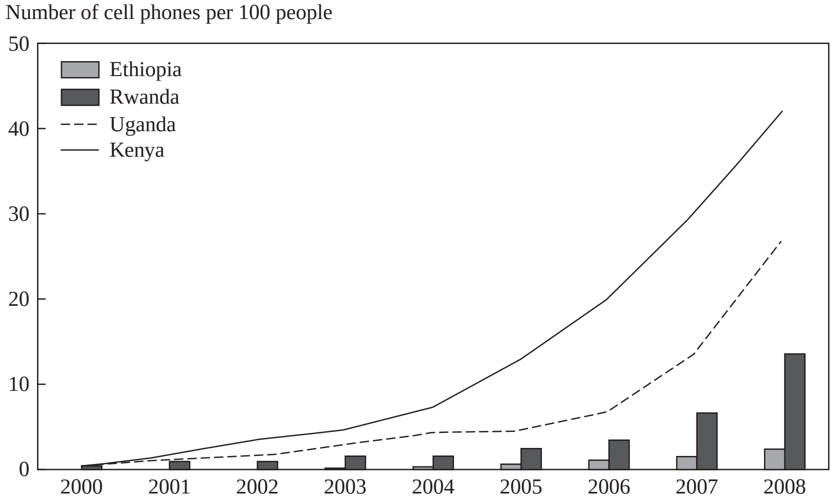
The public sector dominated the provision of transport services during the socialist regime. As the private sector was limited, so was the private ownership of trucks. Since the reforms of the early 1990s, the total number of trucks has steadily increased. The number of small trucks, with a capacity of up to 7 tons, has increased more than eight-fold, from about 5,600 in 1993 to 48,200 in 2008. The number of larger trucks, with a capacity of 7.1 to 18.0 tons, has increased by 10.6 percent, from about 10,600 to 11,800. Overall, the total number of trucks has shown a large increase since 1999.

The increase in the number of trucks does not imply perfect competition in the Ethiopian trucking business. The ownership structure plays an important role as well. Currently, there are several types of firms operating in the transport sector, which include: (1) private limited-liability companies that own trucks and run their businesses independently, (2) share companies that facilitate the process of finding clients (truck users) for their members, (3) share companies that own trucks and rent to others,[16] (4) large endowment transport companies (such as Black Lion, Dinsho, and Trans), and (5) public transport enterprises (such as Bekelcha). In addition, a very small percentage of smaller trucks (2 percent) are owned by private individuals.

The size and distribution of licensed commercial trucks for different operator groups is given in Table 5.2. The numbers show that, with associations (including share and endowment companies) owning 72 percent of all trucks,

16. These companies are owned by former government employees who owned the government's fleets under the scheme of public enterprise privatization.

FIGURE 5.2 Cellular phone ownership per 100 people in Ethiopia and its neighbors, 2000–08



SOURCE: World Bank (2010).

TABLE 5.2 Size and distribution of licensed commercial trucks, by operator groups, 2006

	Types of trucks (thousands)					Share, by ownership types (percent)
Ownership or operator groups	Trucks	Truck/ trailers	Semi-trailers	Others	Total	
Associations	4,729	1,231	310	1,323	7,593	72
Private individuals	123	80	30	20	253	2
Private companies	56	885	239	87	1,267	12
Enterprises	3	32	131	n.a.	166	2
Enterprise affiliates	740	25	8	73	846	8
Government organizations	197	198	46	1	442	4
Total, by type of vehicle	5,848	2,451	764	1,504	10,567	n.a.
Shares (percent), by vehicle type	55.3	23.2	7.2	14.2	100.0	n.a.

SOURCE: Ethiopia, EIA (2008).

NOTE: n.a. = not applicable.

the ownership distribution is highly skewed. Only 14 percent of trucks are owned by private individuals and companies. The transport sector is dominated by large companies that own modern fleets. Independent transporters are limited to old-fashioned trucks and operate in remote areas that the modern fleets cannot access. Most long-distance transport activities are related to food aid relief operations in which small private transporters with traditional fleets do not have a competitive advantage due to economies of scale. Small private transporters also do not have the capacity to move all the relief items in a short time, as is often required by relief organizations.

Marketing and Pricing Information

Traditionally, grain traders have relied on informal sources of market information, such as friends and neighbors who visited markets, traders in different markets, and personal visits to market centers. A few government organizations, such as the EGTE and CSA, collect agricultural prices around the country. However, the EGTE prices are collected only for that organization's own internal marketing and administrative decisionmaking, and the CSA typically takes several months to make its price data available. Therefore, price information from public sources is rarely analyzed and communicated to the market agents on time. As a consequence, regional wholesale grain traders rely mostly on brokers in central markets for price information. A system of collection and dissemination of price information through radio broadcasts and bulletins was started by the Grain Market Research Project in 1996. When the project ended in 1998, the data collection continued, but the analysis, radio broadcast, and reporting of the market information was either discontinued or continued on a very limited scale.

In addition to price information, actors in the grain market need information regarding food aid pledges and arrivals, planned and actual local grain purchases by donor agencies, planned and actual commercial imports and exports of grains, the expected production situation (surpluses and shortages), stock releases from the food security reserve or intended purchases for the food security reserve, and changes in the demand for grain. Currently, there are no well-coordinated channels through which this information is communicated to various participants. The Ethiopian Commodity Exchange (ECX) may at some point play this role, but as of mid-2011, the volume of trade in cereals was too small for the ECX prices to serve as reliable indicators of overall market conditions.

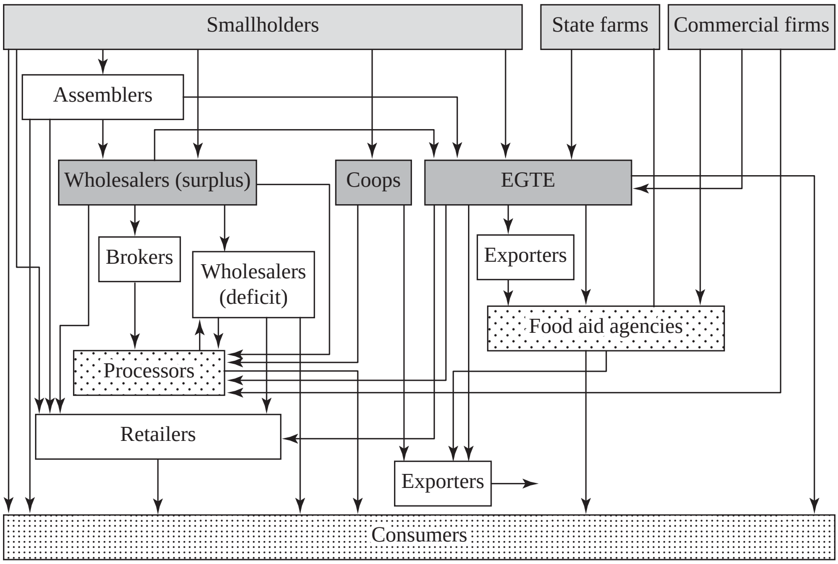
The Structure of Cereal Markets

Wide regional dispersion in cereal production and consumption in Ethiopia provides an opportunity for the interregional grain trade to flourish and reinforces the importance of efficient spatial and temporal arbitrage by the marketing agents. This section discusses the organization of cereal markets, with emphasis on the changing composition of market actors and broad changes in the overall market structure.

The Marketing Chain and the Key Actors

The cereal marketing chain in Ethiopia is long and complex, involving various types of market agents (Figure 5.3). This was not the case in the 1980s, when

FIGURE 5.3 Cereal value chain map involving traditional market channels in Ethiopia



SOURCE: Adapted from Dessalegn, Jayne, and Shaffer (1998) and Gabre-Madhin and Negassa (2006).
NOTE: EGTE = Ethiopian Grain Trade Enterprise.

most of the market actors operated on a limited scale. The cereal market structure in that period was dominated by the AMC, which served urban consumers with supplies from small producers. Official farmgate prices were set by the AMC and remained the same throughout the country. However, open market prices were often much higher and varied across regions. For example, after the major drought in 1984, wholesale grain prices for teff in 1985 were officially fixed at ETB 4.5 per kilogram, whereas open market prices were ETB 7.7 per kilogram in food-surplus Gojjam and ETB 15.7 per kilogram in food-deficit Wello (Webb and von Braun 1994). A major reason for this high interregional variability was government restriction of the movement of cereals.

Today several types of traders of various sizes and scales operate in cereal markets in Ethiopia, with small-scale traders dominating both ends of the marketing chain. These traders and processors can be grouped according to the four major market functions they perform: aggregation, wholesaling, processing, and retailing. The marketing chain starts with smallholder farmers and various buyers (petty traders, farmers-cum-traders, and, more recently, primary cooperatives) that aggregate the small volumes typically sold by individual farmers. The other key actors at this tier of the marketing chain are state and commercial farmers owning more than 100 hectares of land, who account for about 5 percent of maize and wheat production. Some of these farmers also have cereal trading businesses that supply flour millers, aid agencies, the EGTE, and the wholesalers.

On the second tier of the chain are the wholesalers, including the EGTE, who mainly perform the tasks of temporal and spatial arbitrage. Wholesalers are also the main suppliers of cereals to the flour millers and other processors. Brokers (traders who arrange cereal trades but do not buy or sell grain themselves) also play a key role in the coordination of grain buying, selling, and transporting by matching buyers and sellers, inspecting and witnessing transactions, and providing guarantees to enforce contracts. In general, brokers operate at both the production and the consumption end of the marketing chain. However, the major activities of brokers are concentrated in Addis Ababa, where the brokers receive grain from the regional wholesalers, inspect its quality, determine its price, and sell it on behalf of their clients. The final stage of the marketing chain is retailing to the consumers.

There have been two major changes in the cereal market structure in recent years: the establishment of the ECX and the emergence of aid agencies as important buyers. The launching of the ECX coincided with global price hikes and the balance-of-payments crisis in the country, which led to a rationing of foreign exchange and to further escalation of cereal prices in domestic markets (IFPRI and EDRI 2009; Rashid 2010). The cereal market was quite volatile, and, unlike in the case of coffee, the government did not pass any law mandating cereal traders to trade through the ECX floor. According to available data, from its inception in April 2008 to February 2009, ECX traded only 950 tons of maize and 90 tons of wheat (Rashid, Winter-Nelson, and Garcia 2010). Given the size of the cereal markets, this volume of trade is unlikely to have any significant impact. On the other hand, although it was prohibited from buying during the 2007–09 price hikes, the WFP procured an average of 394,000 tons of maize and wheat from Ethiopia from 2003–04 to 2006–07. One-fifth of this grain was procured through the EGTE. Some large cereal traders have also become regular suppliers to the WFP and other nongovernmental organizations.

Broad Changes in the Cereal Market Structure

Changes in the cereal market structure may mean changes in (1) the number of market actors at both the production and marketing levels, (2) the scale at which market actors operate, and (3) the functions that market actors perform in accord with existing rules and regulations. A systematic assessment of each of these aspects is beyond the scope of this chapter. However, broad changes can be traced based on available surveys and secondary data. That is what we attempt to do in this section.

Table 5.3 presents the general structural changes in Ethiopian cereal markets. Since the 1980s, there have been four major changes at the production level. First, available statistics suggest that the proportion of cultivated lands of less than 2 hectares owned by households has been declining steadily over the past three decades. In 1982–83, there were about 8 million peasant families and 6 million hectares of cultivated land under crop agriculture, and the proportion of land owned by these peasant families was about 95 percent (Ghose 1985). The land use reports of the CSA, which the agency began publishing in the 1990s, indicate that this share declined to 65 percent in the 1990s and 56 percent during 2000–2008.[17] Given population pressures, these changes are understandable. However, the CSA statistics on the proportion of farmers owning less than 2 hectares of land is puzzling. According to official statistics, the proportion of holdings smaller than 2 hectares declined from 87 percent in the 1990s to 80 percent in the 2000s. The third major change, which began in the past 10–15 years, has been the emergence of commercial farmers. Although they represent less than 1 percent of total holdings, this group accounts for 5 percent of total maize production and a much larger share of marketed surplus. Finally, although coverage is not yet extensive, cooperatives are playing an increasingly important role in cereal markets (Bernard and Spielman 2009; Bernard et al. 2010).

The biggest changes, however, have occurred in the marketing of cereals. These include (1) the diminished role of public food marketing, (2) growth in cereal processing, (3) the increasingly important role of the cooperatives in marketing, and (4) the inception of the commodity warehouse receipt system. Furthermore, although it has not had much impact on the cereal markets, a government proclamation now requires all exports of coffee and pulses to go through the ECX.

The Changing Role of Public Food Marketing

As discussed earlier, the cereal markets went through a dramatic change during the Derg regime. The AMC market share increased from a mere 10 percent during 1960–74 to about 57 percent by the 1980s (see Table 5.3). In the 1980s, public market shares declined to 40 percent, but this decline was due not to reduced public interventions but rather to a decline in production and marketed supplies in the mid-1980s. In the 1990s, the government's market share declined drastically to 4 percent; in 2008 it was less than 2 percent. In other words, the cereal market is now largely dominated by the private traders and processors.

Although the role of the government in cereal trade has declined, the volume of cereal trade and the number of traders have increased. During 1975–80, the average production of major cereals was 4.5 million tons, of which 11 percent was marketed surplus. Given that the government's share was 57 percent, this implies that the government controlled 285,000 tons of the half-million tons of marketed surplus, leaving the rest for the private sector. Smaller assemblers at the bottom of the marketing chain deal in about 100 quintals of cereals per

17. Only three land use reports (for 1995/96, 1997/98, and 1999/2000) are available from the 1990s.

TABLE 5.3 Broad structural changes in Ethiopian cereal markets since the 1960s

Indicators	1961–74 Imperial regime	1975–80 Transition period	1980–90 State control	1991–2000 Liberalization	2001–08 Rapid growth
Cereal production (thousands of metric tons)[a]	4,641	4,527	5,601	7,056	10,672
Marketed (percentage of production)	25[b]	11[c]	19[d]	25[e]	28.10[f]
Public market share (percent)	10[g]	57[h]	40[i]	4	1.87
Marketed (thousands of metric tons)	1,160	498	1,064	1,764	3,000
Public sector (thousands of metric tons)	116	286	426	71	56.0[j]
Population (millions)	28.3	35.6	42.9	57.6	77.4
Marketed (kilograms per capita)	41.0	14.2	24.8	30.6	38.8
Source of market supplies	Farms rents paid to landlords; tribute; private	Collapse of markets after land reform	Compulsory quota for all market actors	Liberalization; increasing trade	Liberalized market; private trade dominates
Percentage of farms holding less than 2 hectares of land[k]	n.a.		98.7	87.0	80.0
Percentage of lands owned by holders with less than 2 hectares[k]			94.7	65.0	56.0

Government intervention and price stabilization	Very limited	n.a.	Yes	Yes	Only during the food crisis
Key market actors	Private sector, limited Ethiopian Grain Board	Agricultural Marketing Corporation (AMC), declining private sector	AMC, limited private trade	Ethiopian Grain Trade Enterprise (EGTE), small traders; small farms, millers	EGTE, traders, coops, Ethiopian Commodity Exchange, processors

NOTE: n.a. = not available.

[a]Production statistics obtained from FAO (various years).

[b]Estimate for 1977–78 is from Ghose (1985), p. 136, assuming 40 percent of the cereal crop area under tenancy with rents equal to 50 percent plus an additional 5 percent to account for sales by other farmers.

[c]Estimate is from the Ministry of Agriculture as cited by Ghose (1985); excludes Tigray and Eritrea.

[d]In 1981–82, peasant farmers accounted for 84 percent of total marketed volume of cereals, of which 60 percent were traded by private traders (Ghose 1985). Thus, peasant sales to AMC were equal to 24 percent (84 – 60 = 24 percent) of the market or 29 percent (24/84 = 29 percent) of the total peasant cereal market. Given that AMC smallholder sales were on average 4.4 percent of total smallholder production in *meher* season (Taffesse 1997), total smallholder sales are 4.4/29 percent = 17 percent, and the total marketed surplus is 17/84 percent = 19 percent of production.

[e]1995–96 estimates are from Negassa, Myers, and Jayne (1997), p. 24.

[f]These estimates are based on the EDRI-IFPRI survey of 2008 (EDRI/IFPRI 2008). The official Government of Ethiopia estimate was 20.6 percent.

[g]1974–75 estimates are from Holmberg (1977), p. 9.

[h]1978–80 AMC estimates cited in Dadi, Negassa, and Franzel (1992), p. 213.

[i]1981–82 estimate from Ghose (1985), p. 137.

[j]Average cereal purchase by the EGTE from 2004–05 to 2007–08.

[k]1980–90 figure is from Ghose (1985), Table 1, p. 131; the other figures are from Ethiopia, CSA (various years).

trader. Assuming that all marketed surplus passes through these small traders, there were a few more than 21,000 traders of this sort in the 1980s. In the 2000s, cereal production averaged 10.7 million tons; of this, 28.1 percent, equivalent to 2.95 million tons, were marketed. Given that the EGTE's share was only 1.87 percent, this implies that the government dealt in only 56,000 tons of cereal and left the rest (about 3.0 million tons) for the private market. Given that a small trader deals in about 10 tons per year, one can conclude that there were about 300,000 traders of this type in the 2000s, which was 14 times more than the number of traders in the 1980s. These statistics suggest a large increase in competition and also indicate that cereal trading is a major livelihood of the rural population.

Cereal Processing

A significant proportion of grain continues to be consumed on-farm in Ethiopia. In very remote rural areas, cereals are still processed manually using mortars and pestles or grinding stones. In relatively accessible rural areas, small-scale water mills, diesel flour mills, and small-scale flour mills are used to process cereals. In these areas, rural households bring their grain to the mills to be processed and pay the processing fee based on the weight of the grain processed. Because manual flour processing is time-consuming, access to reasonably priced flour mills in rural areas represents a great labor-saving opportunity for farms, particularly during peak agricultural seasons. Given that cereals take up a large share of rural households' food budgets and that improved processing can provide cost savings for rural households, the development of processing not only will change the market structure but also has the potential for significant welfare gains for many rural households.

Fortunately, growth in cereal processing has already begun in the country. Until the early 1990s, all commercial flour mills were owned by the government. There were no private-sector-owned flour mills until the mid-1990s. This started changing rapidly in the early 2000s. In 2008, there were 65 large commercial flour mills in the country, with an annual processing capacity of 968,000 tons, which is equivalent to about 30 percent of the market surplus in the country (Table 5.4). Although the processing sector has shown significant growth in a short period of time, the growth in flour mills appears to be highly concentrated. For example, 76 percent of mills are located in Oromiya and Addis Ababa regions, and these two regions account for more than 80 percent of the total processing capacity. Further investigation is needed to determine the extent to which this regional concentration reflects preferences of households for favoring commercial flour meals over custom-made flour meals.

Cooperatives

Smallholder cereal growers face a variety of challenges in accessing markets for both inputs and outputs. Given the small scale and geographic dispersion of

TABLE 5.4 Processing capacity and regional distribution of flour mills in Ethiopia, 2007–08

Region	Number of mills	Average capacity (metric tons per year per mill)	Total annual capacity (metric tons)	Region's share of total capacity (percent)
Addis Ababa	20	31,072	528,228	54
Amhara	7	5,591	39,140	4
Dire Dawa	1	37,397	37,397	4
Oromiya	29	9,380	262,625	27
SNNPR	3	15,000	45,000	5
Tigray	5	11,245	56,224	6
Total	65	15,879	968,614	100

SOURCE: Based on data from Ethiopia, EIA (2008).

NOTE: SNNPR = Southern Nations, Nationalities, and People's Region.

cereal production in Ethiopia, cooperative marketing can, in principle, play a significant role in promoting smallholders' market participation through improving the economies of scale in collection, storage, transportation, and marketing of grains and farm inputs. Cooperatives can vertically integrate smallholder farmers, eliminating some of the middlemen and thereby reducing the length of the value chain and increasing margins for smallholders. This is the logic behind the government's heavy emphasis on promoting agricultural cooperatives in recent years. Given the dismal history of cooperatives during the Derg era, many have considered this policy move surprising.

However, the government appears to be committed to cooperative-led agricultural commercialization. Since the inception of the policy, cooperative membership has been rapidly rising in Ethiopia. The share of households participating in agricultural cooperatives has increased in all major regions of the country (Table 5.5). In 2005, only 9 percent of total smallholders in Ethiopia participated in a cooperative; this number jumped to 36 percent by 2008. More importantly, growth in cooperative membership is higher in regions that grow cereal—that is, Amhara, Oromiya, and the Southern Nations, Nationalities, and People's Region (SNNPR). In Amhara, smallholders' membership in cooperatives almost quadrupled, from 14 percent in 2005 to 54 percent in 2008. Although overall smallholder membership was 31 and 21 percent in 2008 in Oromiya and the SNNPR, respectively, growth in membership was also remarkable in these two regions. For all regions, in 2008, on average, 28 percent of cooperative members sold grains through their cooperative. In 2005, fewer than 40 percent of households had access to a cooperative in their peasant association, and only 17 percent of them participated in the cooperative if they had access to it.

TABLE 5.5 Cooperative membership and use of cooperatives for cereal sales, 2005 and 2008

Year	Participation, marketing indicators	Region (percent)				Total
		Tigray	Amhara	Oromiya	SNNPR	
2005	Smallholders participating in a coop	21	14	7	4	9
	Smallholders with access to a coop in their peasant association (PA)	88	46	42	18	39
	Smallholders participating when they have access to a coop in their PA	22	4	12	9	17
2008	Households that are members of cooperatives	33	54	31	21	36
	Cooperative members that sell grains through cooperatives	8	38	25	19	28
	Share of other households that sell grain through cooperatives	3	21	8	4	10

SOURCE: Bernard et al. (2010).

NOTE: SNNPR = Southern Nations, Nationalities, and People's Region.

The Performance of Cereal Markets

Assessment of market performance requires analyses of prices (over time and space) and the process that influences price formation. This follows from the simple fact that the price of a commodity is the outcome of an exchange process. In the absence of public interventions, three important determinants of an efficient exchange process (market fundamentals) are infrastructure, institutions, and information.[18] If there are inadequacies or incompleteness in these fundamentals, it will be reflected in the prices. For instance, if the markets are not connected with adequate infrastructure and efficient information flow, price shocks in one market location may not get transmitted to the other, which can be detected through spatial integration of market locations. Similarly, if farmers do not have access to credit or risk-mitigating institutions, they are compelled to sell immediately after harvest when prices are low. The presence of such institutional incompleteness can be detected though analysis of price seasonality.

18. Two examples can help make the point clear. First, the results of the "getting-prices-right" campaign of the 1980s, which involved dismantling marketing boards and allowing market forces to determine prices, varied widely across countries. Although liberalization led to higher price variability (Barrett 1997) and subsequent policy reversals in some African countries (Jayne et al. 2001), it was remarkably successful in Vietnam (Goletti and Minot 1998), arguably because that country had better infrastructure and institutions. Second, famines and acute food insecurity have historically been localized phenomena; in fact, many are named after a specific region of a country. The classic example is the Bengal Famine of 1943, which tragically demonstrated how a small decline in food production can trigger a massive food security crisis in the absence of infrastructure, information, and risk-mitigating institutions (Drèze and Sen 1989).

However, price analysis over time and space does not provide direct information about market fundamentals and hence misses some critical aspects of market performance. For example, prices between two locations can be integrated even when transaction costs are high due to high search costs (finding buyers and sellers) or high transport costs due to poor infrastructure. This can be detected by estimating the costs and margins of trade between two locations. Thus, in this section we present analyses of both prices and costs and margins.

Price Analyses

A REVIEW OF AVAILABLE MARKET INTEGRATION STUDIES. Under the assumption of competitive markets, spatial market equilibrium requires that the price differentials between two market locations be equal to transfer costs, including the opportunity costs of capital, labor, and risk. Empirical analyses of market integration can explain the extent and degree of market integration across various market locations. However, when the market is controlled by the government, as was the case in Ethiopia during the socialist regime, such analysis is essentially meaningless. This is the reason that policy analysts never embarked on such analyses in Ethiopia when grain markets were controlled by the AMC.

With the advent of structural adjustment programs and the dismantling of marketing boards, there was increased interest in market integration analyses; such analyses provided evidence as to how markets were evolving following liberalization. Growing interest in the topic led to substantial improvements in the methods of analyzing market integration as well, with more recent applications relying on variants of parity-bound models (PBMs) and threshold cointegration methods.[19] There have been a number of studies, using a variety of econometric methods, on Ethiopian grain markets. The key results, geographic coverage, and methods of a set of studies are presented in Table 5.6.

A central message from all these studies is that the integration of markets across various market locations has improved over time. Using price data from the 1970s and 1980s, the authors of one of the studies, Dadi, Negassa, and Franzel (1992) concluded that the spatial arbitrage was seriously flawed in those decades. Things started changing following liberalization. Using a more robust econometric method, Dercon (1995) concluded that liberalization in the 1990s has had important effects on both the short-run and the long-run integration of teff markets. In other words, compared to earlier decades, more teff markets became integrated following the liberalization. Except for the study of Negassa and Myers (2007), which examined the effects of the 1999 reforms and reported mixed effects, all other studies reported improved market integration across space in recent years.

19. For further details on the methods, please see Barrett (1996), McNew and Fackler (1997), Barrett and Li (2002), and Campenhout (2007).

TABLE 5.6 Summary of cereal market integration studies in Ethiopia, 1992–2007

Author(s)	Commodities	Geographic coverage and time period	Method of analysis	Key findings
Dadi, Negassa, and Franzel (1992)	Maize and teff	Bako area of Western Shoa and Eastern Wollega (1985–89)	Price correlation analysis	Private-sector marketing of maize and teff is characterized by high risk and variable gross margins; spatial arbitrage is seriously flawed, and correlations are very weak for most locations.
Dercon (1995)	Teff	Ethiopia (1987–93)	Modification of Ravallion's method	Liberalization in the early 1990s had important effects on the long-run and short-run integration of markets in that most teff trading market locations were integrated with the Addis Ababa market.
Getnet, Verbeke, and Viaene (2005)	Teff	Ethiopia (1996–2005)	Autoregressive distributed lag model	A long-run and short-run relationship was found between producer prices and the wholesale price in the major terminal market (Addis Ababa).
Negassa and Myers (2007)	Maize and wheat	Ethiopia (1996–2002)	Extended parity bounds model	Grain market reform in 1999 improved spatial market efficiency in a few markets, worsened it in a few others, but generally had little effect on spatial efficiency.
Rashid (2011)	Maize, wheat, and teff	Ethiopia (1996–2007)	Common trend and multivariate co-integration analyses	Most market locations, except Mekelle in the north and Dire Dawa in the eastern part of the country, are integrated. Analyses further suggest that shocks to maize markets have the most persistent effects on all major cereals.

SOURCE: Constructed by the authors.

SEASONALITY OF MAJOR CEREAL PRICES. Seasonality is a fact of life in any agrarian production system. Prices of agricultural crops typically fall immediately after farmers harvest their crops and rise gradually thereafter. In a competitive market (and in the absence of new shocks such as large-scale government interventions), the difference between the harvest-time price and lean-season price should reflect the costs of storage, which consist of opportunity costs of holding stocks (interest charges), storage losses, the costs of labor and capital, and a normal profit (see Timmer, Falcon, and Pearson 1983). Drawing conclusions about whether seasonality is consistent with competitive markets is difficult. However, any changes in the price seasonality are indicative of improvement (or deterioration) of market performance. An improvement in credit access can alleviate farmers' liquidity constraints and hence reduce distress sales and market supply, resulting in an overall increase in postharvest prices. Similarly, improved storage and credit access can lower the cost of storage and hence result in lower lean-season prices. We try to capture these intrayear price changes by estimating the seasonality indexes of four major cereals for three time periods.[20]

Using the seasonality indexes by decade, one can draw two sets of broad implications about whether there are (1) changes in the pattern of seasonality and (2) changes in the magnitudes of indexes. The pattern of seasonality can change, especially if a commodity is nontradable, only if there are changes in the cropping season.[21] Given that the farming season in Ethiopia has not changed over the past three decades, we cannot expect a significant change in the overall pattern of seasonality without large-scale public intervention. The estimates in Table 5.7 appear to be consistent with this idea—that is, prices go up after harvest and rise thereafter—in the cases of maize and teff. This is not the case for wheat, because the seasonal minimums have varied widely across decades. This may be an outcome of a combination of several factors, such as the thinness of wheat markets, the timing of food aid distribution, and the low level of wheat production in the country.

In addition to helping us determine seasonality patterns, these estimates can also be used to draw implications about the improvement in seasonality by checking whether there have been upward movements in the seasonal minimums over time. The estimates for wheat are not conclusive in this regard. However, both maize and teff have exhibited improvement over the past three decades. The seasonal minimums for these two cereals have moved up one month each decade, from December in the 1980s to February (maize) and March (teff) in the 2000s. On the other hand, the seasonal maximums have stabilized in the

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20. Given the existing evidence on the spatial integration of markets, seasonality patterns should be similar across various market locations. However, we also recognize that there is evidence that retail cereal prices between 2005 and 2006 rose sharply in some locations (see Sabates-Wheeler and Devereux 2010).

21. This was the case when a winter crop was introduced in Asia during the Green Revolution.

TABLE 5.7 Summary of wholesale price seasonality indexes of staple cereals over time, 1980–2010

	1980–90			1991–2000			2001–10		
Month	Teff	Maize	Wheat	Teff	Maize	Wheat	Teff	Maize	Wheat
January	0.978	0.931	0.964	0.930	0.888	0.947	0.913	0.923	0.910
February	0.951	0.953	0.972	0.933	0.920	0.948	0.894	0.916	0.950
March	0.969	0.949	0.953	0.936	0.978	0.947	0.889	0.919	0.937
April	0.967	0.950	0.980	0.957	0.973	0.969	0.933	0.925	0.979
May	0.963	1.033	1.014	1.009	1.041	0.998	0.992	0.977	0.996
June	1.004	1.027	1.007	1.047	1.101	1.021	1.040	1.100	1.032
July	1.018	1.077	1.031	1.041	1.083	0.907	1.044	1.097	1.046
August	1.058	1.106	1.022	1.049	1.135	1.039	1.090	1.146	1.070
September	1.078	1.119	1.053	1.040	1.063	1.064	1.073	1.093	1.037
October	1.099	1.140	1.109	1.040	0.963	1.067	1.047	0.983	1.014
November	1.119	1.110	0.845	1.027	0.911	1.006	1.031	0.978	0.971
December	0.883	0.919	0.866	0.981	0.913	0.964	0.996	0.912	0.940
Seasonal maximums									
Index	1.119	1.140	1.109	1.049	1.135	1.067	1.090	1.146	1.070
Month	November	October	October	August	August	October	August	August	August
Seasonal minimums									
Index	0.883	0.919	0.845	0.930	0.888	0.907	0.889	0.916	0.910
Month	December	December	November	January	January	July	March	February	January
Maximum/ minimum	1.267	1.241	1.313	1.128	1.277	1.177	1.226	1.305	1.175

SOURCE: Authors’ calculations based on data from Ethiopia, EGTE (various years).

NOTE: The results for all three major cereals—teff, maize, and wheat—are presented here.

month of August. However, the ratio of seasonal maximums and minimums indicates that the gap between maximum and minimum increased in the 2000s, reflecting unusual price hikes during 2007–09.

VARIABILITY IN GRAIN PRICES. Because of its inherent economic and political implications, managing food price instability has attracted the attention of almost all actors in the food policymaking world over the past few decades. Politicians want food price stability irrespective of their ideology, public administrators have struggled to make food price policies work, and researchers have debated the ways and means of ensuring food price stability. However, all actors agree on the fact that food price instability can have detrimental consequences for consumers, producers, and overall economic growth.[22] This is perhaps the reason that governments across developing countries have repeatedly reverted to some form of price stabilization. Despite officially withdrawing from market intervention, the Ethiopian government had to intervene twice in its grain markets in extraordinary situations in recent years: once in 2002–03, when cereal prices collapsed, and again in 2007–08, when prices skyrocketed.

There is no quantitative guideline as to what level of price stability is desirable for a given country. That level is essentially a political decision that generally depends on country-specific realities. In this section we examine how domestic grain price variability in Ethiopia changed over time by comparing various measures of price variability. The simplest measure of variability is the coefficient of variation (CV), which expresses standard deviation as a percentage of means. This measure is not appropriate when there is a trend in the price data or when the data contain high seasonal or irregular fluctuations. The trend component of the data can be eliminated from the CV by using the Cuddy La Valle index (CLVI).[23] Although it accounts for the trend, the CLVI still contains seasonal and irregular components. Therefore, a moving average is used to calculate the CV.

All three estimates are presented in Table 5.8. The results suggest that cereal prices were more stable in the 1990s than in any other period and that in the years following complete withdrawal of the EGTE from cereal price stabilization there has been higher price variability. These results give rise to two obvious questions: (1) Why was cereal price variability high in the 1980s despite tight government control? and (2) Why did price variability increase in the 2000s despite an overall improvement in market infrastructure? The answer to the first question lies in the famine and production shocks in the 1980s. Marketing restrictions that impeded cereal flows across administrative boundaries undoubtedly also played a role (Webb and von Braun 1994).

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22. For further details, see Newbery and Stiglitz (1981), Timmer (1989), William and Wright (1991), and Fafchamps (1992).

23. The CLVI is expressed as $CLVI = CV\sqrt{(1 - R^2)}$, where CV is the standard deviation as a percentage of the mean and R^2 is obtained by regressing the log of prices on a time trend.

TABLE 5.8 Cereal price variability over time, 1983–2008

Time period	Measures of variability	Cereals				
		Maize	Wheat	Sorghum	Barley	Teff
2000s	Coefficient of variation	71.33	53.45	59.82	60.95	51.27
	Cuddy La Valle index	36.37	24.40	29.35	23.05	28.48
	Coefficient of variation (based on a MA series)	50.17	40.96	43.68	46.59	37.45
1990s	Coefficient of variation	23.01	16.81	20.05	17.75	16.00
	Cuddy La Valle index	22.59	11.45	18.67	15.06	9.49
	Coefficient of variation (based on a MA series)	17.07	13.79	14.23	15.18	13.29
1980s	Coefficient of variation	41.91	31.95	31.54	28.45	24.67
	Cuddy La Valle index	41.79	31.18	30.07	28.37	24.39
	Coefficient of variation (based on a MA series)	34.72	24.54	26.66	21.14	18.92

SOURCE: Authors' calculations based on price data from Ethiopia, EGTE (various years).

NOTE: MA = moving average.

On the other hand, high price variability in the postreform period has been caused by production shocks in 2002–03 and by very unpredictable market behaviors during 2006–08, when domestic prices went above import parity for several months. A few in-depth studies have attempted to understand reasons behind sharp increases in cereal prices despite consecutive years of bumper harvests during 2006–08 (World Bank 2007; IFPRI and EDRI 2009; Rashid and Lemma 2011). These studies conclude that the sharp price increase in that period did not result from structural problems in the market; it was rather an outcome of a set of information failures and macroeconomic policy responses. In particular, these studies argue that the price increase resulted from a series of events, including an overestimated production forecast, a balance-of-payments problem that prompted the government's decision to ration foreign exchanges and restrict private imports (IFPRI and EDRI 2009; Rashid and Lemma 2011), and a disproportionate increase in the money supply relative to overall economic growth (World Bank 2007).

Marketing Costs and Margins

Analyses of marketing costs and margins can reveal important information about the functioning of a market. In many developing countries, marketing margins, the difference between farmgate price and consumer price, are large; this can be due either to high transaction costs or to some kind of market imperfection. When the large margin is due to high transaction costs, it can be reduced by appropriate government investment in infrastructure. On the other hand, if the margin is excessively high compared to carefully collected data on total transaction costs, it would imply the presence of monopolistic behavior in the market. In this section we compare costs and margins of the cereal trade from two different traders' surveys—one conducted in 2002 and the other in 2008, respectively. The first survey was conducted by IFPRI and the International Livestock Research Institute, and the second was conducted by IFPRI and the Ethiopian Development Research Institute. Four important points need to be highlighted about the comparability of the results: (1) both surveys included the same set of questions regarding costs and margins; (2) only the samples of markets that were included in both surveys are used; (3) due to wide dispersion, both mean and median values are reported; and finally, (4) the estimated nominal numbers are deflated by the general consumer price index (CPI).[24]

Table 5.9 presents the summary of components of transaction costs and trade margins from this analysis. The estimates suggest that, since 2002, there have been sizeable declines in most components of transaction costs and margins, especially if the mean values are considered. In 2006 prices, the mean transaction cost per ton of traded volume in 2002 was ETB 176, which declined to about ETB 66 in 2008; that is, the real price in 2008 was far less than half of 2002 prices. When median values are considered, the estimate drops from ETB 53 per ton in 2002 to ETB 22 per ton in 2008, which translates to a decline of about 59 percent. In other words, total transaction costs in 2008 were less than half of what they were in 2002. Looking at the components of these costs, we see very sharp declines in three large cost components: transport costs, handling costs, and brokerage costs. Compared to 2002, the average handling and transport costs per ton in 2008 were about 32 and 27 percent, respectively. The brokerage fees declined even more dramatically, with 2008 costs 8 percent of those in 2002.

Changes in trade margins tell a similar story. The average price differential —the difference between sales and purchase price—declined from ETB 141 per ton in 2002 to ETB 102 per ton in 2008. There were similar declines in both gross and net margins, although the magnitudes were smaller if the median values are considered. The gross margin, defined as the ratio of sales price to purchase price, declined from 7 percent in 2002 to only 4 percent in 2008, if the mean values are considered, and from 4 percent to 3 percent if median values are considered. The net margin, defined as sale price minus purchase price plus transaction costs, also declined from ETB 132 per ton to ETB 37 per ton.

The impacts of these changes on grain prices are substantial. To demonstrate, consider the share of transaction costs in maize prices. In 2002, the wholesale price of maize was ETB 553 per ton, and the transaction cost was ETB 100 per ton, or 18 percent of the price. In 2008, the wholesale price of maize was

24. In an earlier version of this chapter we also reported Gabre-Madhin's (2001) results based on her 1996 survey. Those estimates are now dropped because they are not strictly comparable. Regarding the use of deflators, one can argue that the transaction costs are nonfood in nature and hence should be deflated by the nonfood CPI. However, a large share of transaction costs are labor related and are thus influenced by food inflation rather than nonfood inflation.

TABLE 5.9 Changes in the real costs and margins of the grain trade since 1996

	2002		2008		Absolute change since 2002	
Costs and margins	Mean	Median	Mean	Median	Mean	Median
A. Transaction costs						
Total transaction costs (ETB/ton)	176.4	52.91	65.7	21.90	110.7	31.01
Handling	54.7	10.58	17.7	5.91	36.9	4.67
Sacking	56.4	24.29	21.0	6.94	35.4	17.34
Transport	37.0	6.88	9.9	3.28	27.2	3.59
Storage	1.8	0.05	0.7	0.22	1.1	0.17
Road stop	0.0	0.53	0.0	0.07	0.0	0.46
Brokers	15.9	4.76	1.3	1.09	14.6	3.67
Travel	1.4	0.53	0.7	0.22	0.8	0.31
Others	9.2	5.29	14.5	4.16	5.3	1.13
B. Trade margins						
Price difference (ETB/ton)	141.0	88.2	102.2	73.0	38.9	15.19
Gross margin rate (percent)	7	4	4	3	3	1
Net margin (ETB/ton)	132.3	52.9	37.0	43.8	95.3	9.11

SOURCE: The estimates for 2002 and 2008 are calculated by the authors from IFPRI-ILRI and IFPRI-EDRI surveys conducted in 2002 and 2008, respectively. Their calculations are based on the samples that match in both rounds.

NOTES: All nominal values are deflated by the April consumer price index (December 2006 = 100) because the surveys were conducted during March–May of the respective years. ETB/ton = Ethiopian birr per ton. *Gross margin* is defined as the percentage difference between sale and purchase price. *Net margin* is defined as the difference between sale price and the sum of purchase price and out-of-pocket transaction costs.

ETB 4,170 per ton, while the transaction cost was ETB 90 per ton, or about 2.2 percent of the price. If the transaction costs had remained at the 2002 level, prices would have been more than 15 percent higher. In other words, the wholesale price of maize would have been ETB 4,796 per ton, and market conditions would have been far worse than what was observed in 2008. Thus, although other factors might have played roles, these numbers are indicative of an overall improvement in Ethiopian cereal market efficiency.

Conclusions

Cereal production and marketing play vital roles in Ethiopia's economy. Major changes in the ideology of the Ethiopian government have contributed to several key shifts in Ethiopian cereal markets and policy structure. The imperial regime under Emperor Haile Selassie was characterized by limited government interventions and minimal rural infrastructure. The state-controlled markets under the Derg regime introduced a period of significant government involvement, setting prices through the AMC. The recent period has been characterized by a series of reforms and investments in improving market fundamentals, which have triggered increasing competition in the country's cereal market. Since the early 1990s, the government has gradually withdrawn from the market by limiting the roles and responsibilities of the EGTE, the national food logistics agency. These policy reforms have resulted in major changes in the structure of Ethiopian cereal markets, including an increase in the number of all types of market actors, the emergence of cooperatives in both production and marketing, and growth of the grain processing sector. However, the EGTE has continued ad hoc market interventions in recent years, including domestic procurement in 2003 and international procurement and domestic distribution in 2007–08. This chapter argues that, in order to avoid market actors' loss of policy credibility, it is important to make EGTE interventions rule-based, transparent, and predictable.

Great strides have been made in terms of improving market fundamentals such as roads, telecommunications, and market institutions (including commodity exchanges and warehouse receipts systems) in the past 10 years. These improvements have contributed to reducing transaction costs and improving market efficiency. However, this chapter argues that two issues need further policy attention. First, Ethiopia still lags far behind its neighbors in terms of cellular phone ownership. Only 2 percent of the people in Ethiopia owned a cell phone in 2008, compared to more than 40 percent in Kenya and more than 30 percent in Uganda. Yet, all three countries were at the same level of cell phone ownership only about 8 years ago. Second, although there was much hope and optimism during the inception and launch of the ECX, the exchange has not lived up to expectations in terms of promoting cereal market development. In fact, given the size of the country's cereal markets, the cereal trade volume at the ECX will have to increase many times to influence prices and to pass other anticipated benefits to the market actors.

The performance of the Ethiopian cereal market has greatly improved, particularly in terms of increased market integration and reduction in marketing costs and margins. However, price variability has worsened in the past decade. This is partly due to the unusual circumstance of 2003 and just before and after the cereal price spike in 2007 and 2008, when policy interventions were ad hoc and unpredictable. Almost all existing studies find that cereal markets are spatially integrated, suggesting that there are no abnormalities in price transmission. Furthermore, contrary to the common perception that the seasonality of grain markets is changing, this study finds that seasonal variations in prices tend to follow the country's production cycles. Price stability varied in both the 1980s and the 2000s, most likely stemming from famine conditions in the 1980s and the recent food price crisis. Thus, there is substantial evidence that cereal markets in Ethiopia have matured over the years. Continued progress is not automatic, however, and will depend much on government policy and investments in market infrastructure.

Appendix

TABLE 5A.1 Chronology of government grain market interventions in Ethiopia, 1950–2007

Proclamation, notice, or regulation number and year	Relevant institution directly affected	Stated objectives of policy intervention
Ethiopian Grain Board Proclamation 113/1950	Ethiopian Grain Board	To license grain export and control quality To oversee marketing intelligence To regulate domestic and export purchases and export sales prices
General Notice 267/1960	Ethiopian Grain Corporation	To purchase and sell grain in local and foreign markets To establish grain purchase and sales outlets throughout the country To hold stocks to stabilize prices
Agricultural Marketing Corporation Establishment Proclamation 105/1976	Agricultural Marketing Corporation (AMC)	To purchase agricultural products for export or sale in the domestic market To import agricultural products To purchase and sell inputs within Ethiopia or abroad To purchase, process, mill, transport, sell, or store agricultural products and inputs for profit or otherwise To construct, equip, and maintain buildings, silos, storage facilities, grain elevators, and other structures and machinery To maintain a national grain reserve
Legal Notice 103/1987	AMC	To buy grain from suppliers and sell to (a) mass organizations and other organizations engaged in retail trade, (b) public enterprises engaged in export trade, and (c) government offices To supply grain to government, mass organizations, and private factories that use it as a raw material

		To maintain a national emergency grain reserve To construct, equip, and maintain, for its own use, buildings, silos, storage facilities, grain elevators, and other structures and machinery To sell or otherwise dispose of any grain prone to deterioration or unfit for human consumption in accordance with directives from the minister
Council of Ministers Regulation 25/1992	Ethiopian Grain Trade Enterprise (EGTE)	To stabilize markets and prices in order to encourage producers to increase their output and protect consumers from unfair grain prices To export grains to earn foreign exchange To maintain a grain buffer stock for market stabilization To engage in any other related activity for the attainment of its objectives
Council of Ministers Regulation 58/1999	EGTE	To purchase grain from farmers and sell it in local and mainly in export markets To contribute to the stabilization of markets for farmers' produce to encourage them to increase their outputs To engage in other related activities conducive to the attainment of its purposes
Proclamation 67/2000	Emergency Food Security Reserve Administration	To provide adequate capacity to prevent disasters on the occurrence of slow- and fast-onset disasters through the provision of loans to the Disaster Prevention and Preparedness Commission and organizations engaged in relief activities until additional relief food can be mobilized through other mechanisms
Proclamation 212/2000	National Disaster Prevention and Preparedness Fund Establishment	To maintain a readily available cash reserve to combat disasters that are likely to threaten the lives of people and livestock until such time as other resources can be mobilized locally or from abroad To assist the implementation of employment generation schemes that would support the achievement of national food security

(*continued*)

TABLE 5A.1 Continued

Proclamation, notice, or regulation number and year	Relevant institution directly affected	Stated objectives of policy intervention
Warehouse Receipts System Proclamation 372/2003	Warehouse operators	To put in place a legal framework creating a warehouse system in order to help farmers cope with price fluctuations
Proclamation 380/2004	Ethiopian Grain Trade Enterprise (EGTE)	To change the accountability of the EGTE from the public enterprise authority to the Ministry of Agriculture and Rural Development
Ethiopian Commodity Exchange Proclamation 550/2007	Ethiopian Commodity Exchange (ECX)	To create an efficient, transparent, and orderly marketing system that serves the needs of buyers, sellers, and intermediaries and promotes the increased market participation of Ethiopian small-scale producers To provide an automated back-office operation to record, monitor, and publicly disseminate information on ECX transactions
Ethiopian Commodity Exchange Authority Proclamation 551/2007	ECX	To ensure the development of an efficient modern trading system and to regulate and control the secure, transparent, and stable functioning of a commodity exchange and to protect the rights and benefits of sellers, buyers, intermediaries, and the general public

SOURCES: Various issues of *Negarit Gazeta* (Imperial Ethiopian Government 1950, 1960); Provisional Military Administration Council of Ethiopia (1976, 1987); Transitional Government of Ethiopia (1992a, 1992b); FDRE (1999, 2006).

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6 Livestock Production and Marketing

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The livestock sector is an important subsector of Ethiopia's economy in terms of its contributions to both agricultural value-added and national gross domestic product (GDP). Between 1995/96 and 2005/06, the livestock subsector's share averaged 24 percent of agricultural GDP and 11 percent of national GDP (Ethiopia, NBE 2006). The contribution of livestock and livestock product exports to foreign exchange earnings is also significant. The annual average revenue from livestock and livestock product exports is estimated to have been 13 percent of the annual national export earnings during the period 2000/01 to 2007/08 (Ethiopia, NBE 2008). Given Ethiopia's long, porous border, a large number of cross-border exports also go unrecorded. According to a recent assessment (GebreMariam et al. 2010), the total unofficial exports of livestock were worth twice as much as the official record of $150 million.[1] If the unofficial export figures are right, this means that the livestock sector would have accounted for about 30 percent of the country's total exports of $1.5 billion in 2008/09.

At the household level, livestock plays a critical economic and social role in the lives of pastoralists, agropastoralists, and smallholder farm households in the central highlands. Livestock fulfills an important function in helping people cope with shocks and accumulate wealth, and it also serves as a store of value in the absence of formal financial institutions and other missing markets. In smallholder mixed farming systems, livestock provides nutritious food, additional emergency and cash income, farm outputs and inputs, and fuel for cooking food. Livestock is central to support and sustain the livelihoods of pastoralists. Furthermore, available research suggests that with economic growth, consumption patterns tend to change toward high-value, high-protein foods such as those derived from livestock (Delgado et al. 1999).[2] This implies that, given the economic growth in Ethiopia and the region, the market demand for livestock and livestock products will continue to grow.

1. The official export earnings are from Ethiopia, NBE (2010), 64, Table 5.3.

2. Econometric estimates of income elasticities of demand for livestock products are presented in Chapter 7.

There is no substantive disagreement about the future growth in livestock demand and Ethiopia's potential to take advantage of this new trend. The government also appears to be convinced that the livestock subsector can play an important role in its ongoing efforts toward poverty alleviation and agriculture-led growth. Government policy has been supportive of the livestock sector through a wide range of fiscal, regulatory, and institutional policies relating to livestock production and marketing. The key policies include improving veterinary services, developing a credible certification system to avert future export bans, promoting credit access, and improving the availability of feed. The livestock subsector has also been included as one of the focus areas of the newly established Ethiopian Agricultural Transformation Agency. Some of these policy initiatives are gradually being recognized. For instance, the National Animal Health Diagnostic and Investigation Center, which was instituted under a special project as part of the government's policy focus, has recently been designated as a reference lab for the Horn of Africa by the UN Food and Agriculture Organization and the African Union (SPS-LMM 2011).[3]

However, behind all these policies are some very hard realities. Both production and marketing systems in the country suffer from serious bottlenecks and constraints. The average productivity of livestock in the country is among the lowest in the world; the ratio of livestock to humans is on a perpetual downward trend, pasturelands are declining fast, and the livestock mortality rate remains one of the highest in the region. The main objective of this chapter is to identify the major constraints to the livestock production and marketing systems in Ethiopia. The chapter begins with an overview of Ethiopia's livestock subsectors and then goes into the analysis of the production and marketing systems. Each of these three sections provides brief discussions of the key issues, which are further explored in a separate section on opportunities and policy challenges. The chapter concludes with a summary.

An Overview of Ethiopia's Livestock Subsector

Trends in the National Livestock Population

The statistics on the livestock population are controversial. The official statistics often exclude the estimates from the pastoral areas on the basis that it is difficult to implement the sampling strategy of Ethiopia's Central Statistical Agency (CSA) in those areas. Some unofficial statistics from those areas are available but are often contested. However, all sources seem to agree that Ethiopia has the largest livestock population in Africa. In 2008/09, Ethiopian seden-

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3. We recognize that there is also disagreement about the government's livestock policies, especially about the motives of these policies and their impacts on Somali pastoralists (Devereux 2006, 2010). Further analysis and discussion of these issues are presented later.

tary private holdings were estimated at about 49 million head of cattle, 25 million head of sheep, 22 million head of goats, and 38 million head of poultry (Ethiopia, CSA 2008). These livestock estimates exclude pastoral areas because there are few to no official statistics for these regions.[4] Some rough expert estimates indicate that pastoral areas account for about 20 percent of cattle, 40 percent of sheep, and 40 percent of goats in the country (Jabbar, Negassa, and Gidyelew 2007). Thus, if these rough estimates are included, the national population estimates for 2008/09 will change to 59 million cattle, 35 million sheep, and 31 million goats.

The two main official sources of historical data, the Food and Agriculture Organization (FAO) and the CSA, are inconsistent as well (Table 6.1). According to FAO statistics, the total number of cattle declined slightly in the 1970s (–0.4 percent per year), followed by a small increase in the 1980s (1.1 percent per year). Since 1990, there has been a steady increase in the cattle population, with an average growth rate of about 3 percent. If the 2000–08 period is considered, the annual growth rate is calculated to be even higher, 4.2 percent.

In the cases of the sheep and goat populations, the trend was similar to that for cattle in the 1970s and 1980s. During 1990–99, the sheep and goat populations actually declined by an average of 7.3 percent. This trend reversed after 2000, and the number of sheep and goats grew by roughly 13 percent. However, the total sheep and goat populations have not yet reached their 1970–90 levels. The poultry population was more or less stable for the first half of the time period before declining rapidly in the 1990s. This decline stopped in the last decade, but the number of poultry has not completely recovered.

The next set of statistics in Table 6.1 covers 2001 to 2008/09 and is compiled from CSA *Statistical Bulletins* (Ethiopia, CSA 2001–09). Although the magnitudes are slightly different, the two datasets appear to give consistent estimates (in terms of trends) for all species except poultry, which are estimated to have declined according to the CSA statistics. Although both sources show an increase in all species except poultry, neither source provides an explanation as to what triggered that growth. In particular, even though there have been policy changes, it is unclear whether growth was a policy outcome or whether it was a result of improved feed availability due to favorable weather conditions for several years in a row.

Herd Characteristics: Spatial Distribution and Dynamics

An important part of characterizing the livestock subsector in any given country is an understanding of the herd characteristics there. Spatial aspects are particularly important in Ethiopia because of regional variations in predominant ethnic

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4. Official estimates are unavailable not just for livestock but for some of the vital statistics of the country, including access to safe drinking water, marital status of household head, and educational facilities (Devereux 2010).

TABLE 6.1 Trends in average number of animals, by livestock species, 1970–2008

Source	Years	Indicator[a]	Cattle	Sheep	Goats	Poultry
FAO (various years)	1970–79	Number (millions of head)	26.2	23.4	17.3	50.7
		Growth rate (percent)	–0.38	–0.39	–0.23	0.85
	1980–89	Number (millions of head)	27.2	23.4	17.6	54.4
		Growth rate (percent)	1.05	0.36	0.40	1.40
	1990–99	Number (millions of head)	31.4	15.2	11.5	37.7
		Growth rate (percent)	1.84	–7.14	–7.54	–7.65
	2000–08	Number (millions of head)	40.5	18.5	15	35.3
		Growth rate (percent)	4.21	12.45	13.38	0.11
Ethiopia, CSA (2008)	2001–08	Number (millions of head)	42.7	20.7	17.3	36.2
		Growth rate (percent)	3.88	10.44	9.48	–0.16

[a]Indicator: Number is the annual total averaged over the time period; growth rate is calculated using logarithmic regression.

groups and agroecological conditions. In particular, livestock's role in the rural economy and livestock herd dynamics (in-take and off-take patterns) are much different in pastoralist systems than in the settled agriculture systems of the central highlands. In addition, analysis of herd dynamics also offers valuable insights about livestock mortality and profitability, as well as future prospects.

We begin by analyzing the spatial characteristics of Ethiopian herds. Two points are clear from the spatial data. First, at the national level, a larger share (63 percent) of Ethiopian cattle is in the 3- to 10-year age group; of this, 36 percent are females (Table 6.2). The official sources use this categorization to reflect the fact that the cattle are more productive and valuable in this age group. However, further disaggregation by age would have helped us better understand marketing behavior and the purpose of keeping livestock. In particular, unless there were a distress sale, an optimizing household would perhaps sell a narrower age group. Also, there could be variation across ethnic groups and the use of livestock. For instance, although households in the central highlands use livestock for plowing and transporting, pastoralists do not have similar uses for livestock. The other key point we can draw from Table 6.2 is that the share of female cattle is much higher in the pastoral regions than in the highlands. The share of females is about 80 percent in Afar, 70 percent in Gambella, and 68 percent in Somali region, reflecting differences in marketing behavior and purposes of keeping cattle.

Further disaggregation of these data can offer important insights. For instance, a recent study reports that Ethiopian households in the highlands own a higher proportion of oxen because of their plowing and transportation needs (Negassa and Jabbar 2008). However, we could not compile such disaggregated data. At the aggregate level, various CSA reports suggest that the households keep older cattle for draft and breeding purposes. On the other hand, house-

TABLE 6.2 Regional distribution of cattle, by gender and age structure, 2008/09 (percent)

	Males					Females				
Region	<1 year	1–3 years	3–10 years	>10 years	Total	<1 year	1–3 years	3–10 years	>10 years	Total
National average	8.19	7.23	27.46	1.62	44.50	8.9	9.2	35.9	1.4	55.5
Afar	9.51	3.81	6.77	0.21	20.30	17.3	12.7	47.4	2.1	79.5
Amhara	6.80	7.21	34.55	2.65	51.21	7.4	7.9	31.9	1.6	48.8
Benishangul-Gumuz	8.50	7.77	25.24	2.18	43.69	10.7	9.5	34.2	1.7	56.1
Dire Dawa	10.20	12.24	12.24	n.a.	34.68	12.2	12.2	36.7	1.0	62.2
Gambella	10.76	6.92	10.00	0.77	28.45	14.6	11.5	41.5	2.3	70.0
Harar	11.37	11.36	13.64	n.a.	36.37	9.1	11.4	40.9	1.0	62.4
Oromiya	8.52	0.69	27.12	1.44	37.77	8.7	0.5	35.7	1.4	46.2
Somali region	11.94	5.32	14.68	0.11	32.05	13.4	9.2	44.4	0.7	67.6
SNNPR	8.84	6.53	20.32	0.44	36.13	10.4	10.4	42.0	1.2	63.9
Tigray	8.25	6.77	29.23	2.96	47.21	9.9	8.6	32.3	2.0	52.8

SOURCE: GebreMariam et al. (2010) using Central Statistical Agency and other sources.

NOTE: SNNPR = Southern Nations, Nationalities, and People's Region; n.a. = not available.

holds keep sheep and goats older than two years for breeding purposes only. In terms of the class composition of cattle, oxen and cows account for about 44 percent and 24 percent of cattle herds, respectively. By contrast, bulls and young animals like heifers and calves together account for only about 32 percent (Negassa and Jabbar 2008). The higher proportion of oxen confirms that the main reason for keeping cattle in the highland areas of Ethiopia is for draft purposes. This finding is consistent with the results of several other microlevel studies on the role of livestock in smallholder crop–livestock systems (Sansoucy et al. 1995).

For sheep and goats, we were unable to compile spatially disaggregated data in such detail. Some aggregate numbers are available from various CSA reports, which suggest that the age structure is very different for goats and sheep. There are three age groups for animals between birth and age two years (birth to six months, six months to one year, and between one and two years) and one for animals older than two years. According to recent statistics, 52 percent of sheep and 49 percent of goats are more than two years old. The next-largest share is under six months old, which accounts for 25 percent of goats and 27 percent of sheep. A review of the CSA reports for various years indicated that the age structure of Ethiopian livestock has rarely changed over the years. Furthermore, the breeds of sheep and goats kept by households are reported to be almost entirely indigenous. These statistics do not speak well for the government's policies about the modernization and commercialization of livestock. Given the availability of modern breeds and the government's concerted emphasis on the subsector, one would expect a significant increase in adoption of improved breeds, which apparently has not happened in Ethiopia.

Herd Dynamics

Detailed information on the in-takes and off-takes of major livestock species, known as herd dynamics in the livestock literature, is presented in Negassa and Jabbar (2008). These authors present detailed statistics on major sources of inflows and outflows of cattle, sheep, and goats for both pastoralists and the smallholders in the highlands. The majority of smallholders and pastoralists obtain cattle through births from their current herd, although highlanders also procure animals from the pastoralists. In other words, there is very little market participation, especially among the large pastoralists and large farmers. This finding is consistent with those of other studies. For example, Barrett et al. (2004) report that markets are not commonly used for restocking by larger pastoral households; poor households rely more heavily on purchases for restocking. More specifically, between 74 percent and 86 percent of the inflows of the sheep and goat populations for both production systems come from animal births. For smallholders in the highlands, purchases account for only 23 and 16 percent of the inflows of sheep and goats, respectively. The comparable estimate for the pastoralists is only about 8 percent.

There are five channels of off-takes—sales, deaths, home slaughters, gifts, and thefts—of which deaths account for the largest shares of livestock outflows in Ethiopia (Figure 6.1). Deaths represent the single largest source of livestock outflow in Ethiopia, accounting for 41 percent in the case of sheep and 47 percent each for cattle and goats. Sales are the second-largest source of outflows, accounting for 18 percent of off-takes for goats, 38 percent for sheep, and 45 percent for cattle. In the "other" category, which includes home slaughters, gifts, and thefts, goats and sheep represent a higher share because of a high share of home slaughters during Ethiopian festivals such as Fasika and the Ethiopian New Year. The reasons for and the underlying implications of such high rates of animal deaths are considered in a later section, but briefly these statistics are reflections of the weak provision of public veterinary services, the limited existence of private veterinary services, and increasing difficulties with feeds and grazing.

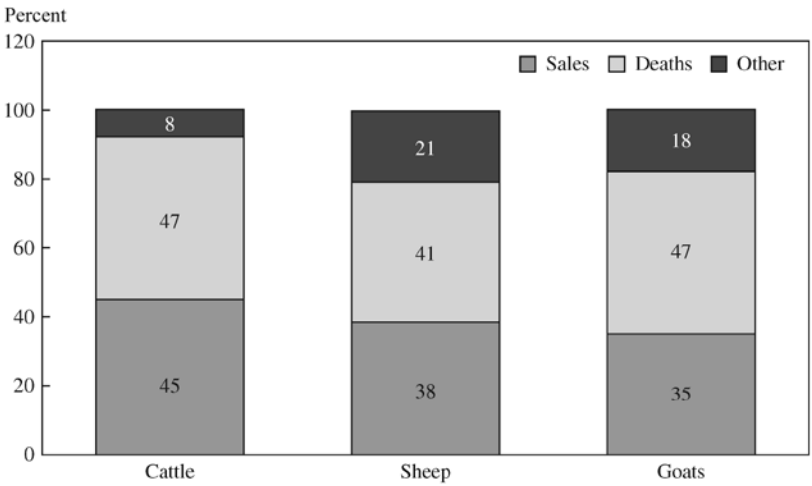
Livestock Production

Three sets of discussions are presented in this section, on (1) production organization, (2) productivity in a regional context, and (3) the underlying causes of Ethiopia's low productivity relative to other countries in the region, with a special focus on Kenya.

Production Organizations

Livestock production in Ethiopia is organized in two broad ways: in the sedentary mixed crop–livestock production system (highlands) and in the nomadic

FIGURE 6.1 Outflow of cattle, sheep, and goats, 2009



SOURCE: Constructed by the authors using data from GebreMariam et al. (2010).

pastoral production system (lowlands). However, we should note that there are variations, and in some locations a mixture of both systems is practiced. Although it does not yet appear in the national statistics, there is another less important production organization in the periurban and urban areas of major cities. Of the total cattle population, the highlands account for about 80 percent, or about 40 million head. Available statistics indicate that a highland household owns, on average, two to four cattle and four to five goats or sheep (Negassa and Jabbar 2008). Given that the rural population in the highlands is around 55 million, or about 10 million households, these statistics suggest that not all households in the highlands own livestock. Among the households that do own livestock, cattle are primarily used to provide draft power (about 45 percent) and dairy products (about 25 percent). Commercial sales and meat production are secondary reasons for herd keeping in the highlands.

Households largely rely on communal grazing and crop residues to feed their cattle, and this is becoming increasingly challenging for the highland herd keepers due to expanding crop areas and hence decreasing pasturelands. This is reflected in the recent trends in agricultural specialization in the highlands. For instance, according to CSA data, the numbers of households exclusively cultivating crops or exclusively keeping livestock are declining rapidly. In 2001–02, about 18 percent of farmers were growing crops only, but that number dropped to only 9 percent in 2008. Similarly, the percentage of households only keeping livestock dropped from 8 percent in 2001 to 5 percent in 2008. By contrast, the percentage of farmers with both crop and livestock holdings increased from 74 percent to 86 percent during the same period. Thus, farmers appear to be adapting to changes by adopting a diversification strategy that allows them to mitigate both risks of crop failure and losses of livestock.

The pastoral (lowland) livestock system is estimated to account for about 20 percent of Ethiopian cattle. With an estimated population of 10 million, pastoralists include largely nomadic communities and sedentary agropastoralists. In the lowlands, nearly all households own herds with an average of 10–15 cattle and 7–10 sheep or goats. Given that the majority of a herd is female, the main purposes of keeping a herd are considered to be the production of dairy products for household consumption and breeding. Ethiopian pastoralists are often at odds with their agropastoralist neighbors, public officials, and government policies. At the root of this conflict is a tension between protecting a unique way of life (at least for the people in power in pastoral areas) and accepting modernization. Pastoralists have limited access to the key provisions of public services. In fact, the lack of public services and infrastructure can create havoc in cases of large-scale shocks, such as the droughts in 1999–2000, which are considered to have been one of the most severe shocks in Ethiopia's history in terms of the total affected people (CRED 2011). However, it is also not clear whether modernization is compatible with this unique way of life of pastoralists, of which livestock is the central part.

This is an old debate but has drawn renewed attention in the context of recent drought-related food security problems in the Horn of Africa. A number of studies cast doubt on the viability of pastoralism as a primary livelihood system (Sandford and Habtu 2000; Sandford 2004). The basis of their arguments is the declining trend in the ratio of livestock to humans, which has reached such a critically low level that there is not enough livestock to meet the income and dietary needs of the pastoralists. Sandford (2004, 25) goes as far as to conclude that "pastoralism and agro-pastoralism, the core activities, at present no longer provide even minimal livelihoods." Devereux and Scoones (2006) differ with Sandford (2004) on the grounds that the ratio of livestock to humans may not be important for Ethiopian pastoralists (Somalis) because trade and remittances provide effective informal social protection for many families against drought and other shocks. Clearly this debate boils down to whether there should be policy interventions to expedite the process of modernization. Even if one takes the view of Devereux and Scoones (2006), a transformation of pastoralist society appears to be inevitable in the long run, but the difference perhaps would be that the process of transformation would be natural instead of policy imposed. If remittances from the diaspora are already significant, it is likely that the trend will continue, and once these people of the diaspora assimilate with the new culture—be it abroad or in an urban center within the country—it is unlikely that they will go back to pastoralism. If this process of migration continues, it will naturally change the pastoralists' livelihood as we know it today.

Leaving the previous debate aside for now, we focus on another key aspect of livestock production organization that is equally important for both highlanders and pastoralists. This has to do with ownership patterns and herd sizes at the household level, which in turn influence commercialization and modernization. Furthermore, herd size is critically important for households' ability to cope with shocks. Available studies suggest that herd recovery after a shock depends on the size of the herd before experiencing the shock (Santos and Barrett 2005). In other words, if the herd size is below some critical minimum, a climatic shock can push the household into destitution. Studying the pastoralist production system, Getachew and McPeak (2004) concluded that households with larger herds recover from shocks significantly faster than households with smaller herds; hence herd accumulation can be an effective way of reducing risks and vulnerability (Getachew and McPeak 2004).

From a policy standpoint, a fundamental challenge is to determine whether there are policy justifications that can alter the incentive structure to reach an equilibrium that represents a Pareto improvement. Table 6.3 presents some summary statistics on the livestock ownership and size of holdings of smallholders in the highlands and of pastoralists. The numbers suggest that there have been some changes in terms of livestock ownership and the sizes of livestock holdings between the rounds of surveys, one conducted in 1999–2000 and the other

TABLE 6.3 Distribution of livestock ownership, by region and species, 1999–2000 and 2004–05 (percent)

	Smallholder farmers						Borana pastoralists		
	1999–2000			2004–05			2004–05		
Number	Cattle	Sheep	Goats	Cattle	Sheep	Goats	Cattle	Sheep	Goats
0	17	69	79	20	62	67	22	80	58
1	13	3	2	11	6	4	2	2	2
2	14	4	4	15	8	6	4	2	2
3	12	4	2	14	6	4	3	2	4
≥4	44	20	14	40	18	19	69	14	34
Mean (SD)	3.7 (3.6)	2.1 (5.1)	1.5 (4.0)	3.7 (4.7)	1.9 (4.4)	2.2 (6.1)	13.1 (17.5)	2.2 (7.4)	4.7 (8.3)
Maximum	30	50	57	145	170	160	120	79	43

SOURCES: Smallholder figures based on ILRI and IFPRI (2000) and Ethiopia, CSA (2006). Borana pastoralist calculations based on GL-CLRSP (2006).

NOTE: SD = standard deviation.

in 2004–05, in the central highlands. The following changes are clear: (1) the percentage of households owning no cattle increased from 17 percent in 1999–2000 to 20 percent in 2004–05, but the households owning no sheep or goats declined by 7 and 12 percent, respectively, and (2) shares of households owning more than four animals declined from 44 to 40 percent in the case of cattle and from 20 to 18 percent in the case of sheep but showed a slight increase in the case of goats.

A more interesting comparison is between smallholders and pastoralists in the Borana area to the south near the Kenyan border. Similar to the case of smallholders, a significant proportion of pastoralists (in Borana) do not own sheep or goats. In fact, compared to households in the central highlands, a larger proportion of households in Borana do not own any cattle or sheep, although the numbers are different in the case of goats. According to these surveys, 22 percent of pastoralists do not own any cattle at all, 80 percent do not own sheep, and 58 percent do not own goats. However, the pastoralists appear to have larger herd sizes than smallholder sedentary farmers in the highlands. On average, Borana pastoralists own about 13 head of cattle and 5 head of goats, compared to 4 head of cattle and 2 head of goats for smallholder farmers. People in both systems own, on average, 2 head of sheep.

Going one step beyond primary production organization is the dairy sector, which lags far behind dairy organization in Kenya. The factors behind this weak performance will be discussed later; only some basic facts are presented in this section. The production and marketing of milk are primarily carried out by smallholder farmers in the highlands. There has been growth in milk production in recent years. CSA data indicate that total raw milk production grew from 0.90 million tons in 2000 to 1.3 million tons in 2008, with an average growth rate of 4.4 percent. Given a human population of about 80 million in Ethiopia in 2008/09, this level of production is indeed very low. Note that these are officially published data that did not include milk production in the pastoralist and agropastoralist areas, where milk is consumed by the households and is rarely marketed. However, there are some statistics on camel's milk, which amounted to about 0.168 million tons in 2008 and accounted for 13 percent of total milk production.

The production organization for milk processing is also dominated by smallholder farmers or smallholders' cooperatives. Depending on accessibility and distance from major towns, smallholder dairy producers typically supply raw milk to the market for immediate consumption or for further processing by dairy cooperatives or private dairy processing firms. However, there are many bottlenecks in the supply chain, which is evident from the fact that a very small share of production goes to industrial processing. A recent study reports that even in major urban markets like Addis Ababa, the dairy market is still dominated by traditional dairy processing (Francesconi 2009). According to this study, 75 percent of the marketed dairy products come from traditional processing, 17 percent from local industrial production, and the remaining 8 percent of local demand is met through imports. In Ethiopia *traditional processing* refers to cottage processing, whereby individual farmers or cooperatives produce traditional dairy products including fluid milk, fermented or sour milk (*ergo*), and traditional cheese (*ayib*). Besides, most of the cottage dairy products are consumed on-farm or in nearby towns. Fresh fluid milk is marketed within close proximity of its production areas. These patterns demonstrate that, except for cottage butter, the marketing of dairy products over significant distances is limited due to perishability.

Livestock Productivity

All available statistics suggest that the productivity of livestock is among the lowest in the world. Average productivity numbers from the FAO are presented in Table 6.4, which shows that Ethiopia lags behind almost all regional countries, regional averages, and world averages of productivity. The most strikingly low productivity is in milk production, where Ethiopia's production of 210 kilograms per year per cow is less than a tenth of the world's productivity of 2.3 tons and about a third of Kenya's 551 kilograms.

In addition to exhibiting the world's lowest livestock productivity, more disaggregated data for recent years indicate that Ethiopia has experienced no significant productivity gains in recent years, even though its total meat production has gone up by 4.6 percent, with mutton and goat meat registering growth rates of 12 and 13 percent, respectively (Table 6.5). The total quantity

TABLE 6.4 Livestock productivity in African countries versus the world, 1999–2008

Country	Meat (carcass weight, per head per year)				Milk (kilograms per head per year)
	Beef (kilograms)	Mutton (kilograms)	Goat meat (kilograms)	Chicken (grams)	
Ethiopia	108	10	8	800	210
Kenya	146	12	11	1,204	551
Malawi	205	14	12	800	451
Rwanda	104	12	11	900	494
Sudan	119	16	13	1,000	400
Tanzania	108	12	12	909	174
Uganda	150	14	12	1,300	350
Eastern Africa	127	11	11	966	321
Least developed countries	117	13	10	950	318
World	205	16	12	1,450	2,257

SOURCE: FAO (various years).

TABLE 6.5 Livestock production and productivity, 2000, 2004, and 2008

	Total production (thousands of metric tons)				Productivity[a]			
Category	2000	2004	2008	Growth rate[b] (percent)	2000	2004	2008	Growth rate[b] (percent)
Meat	393	488	572	4.57	n.a.			
Beef	294	336	380	2.90	108	108	109	0.02
Mutton	36	60	82	12.30	10	10	10	–0.02
Goat meat	26	44	65	13.31	9	8	9	0.06
Chicken	38	47	46	0.11	1	1	1	0.00
Milk	900	1,050	1,350	4.35	207	210	211	0.61

SOURCE: FAO (various years).

NOTE: n.a. = not available.

[a]Productivity measures: meat—carcass weight (kilograms per head); milk—kilograms per head per year.

[b]Growth rate calculated over 2000–08.

of meat produced in 2008 was estimated at 572,000 tons, of which beef accounted for 66 percent (380,000 tons). In terms of production, the production of both goat meat and mutton more than doubled. Goat meat production increased from 26,000 tons in 2000 to 65,000 tons in 2008, and mutton production grew from 36,000 tons to 82,000 tons during the same period. These production numbers are quite different from the productivity numbers presented in the same table. Note that there was hardly any change in the productivity numbers obtained from the FAO. All productivity growth numbers except those for milk are at the level of two decimal points, ranging from –0.02 percent to 0.61 percent. Therefore, it is quite obvious that the growth in meat production has resulted from the increase in the number of slaughtered animals, not from an increase in productivity. Comparing the estimates in Table 6.5 with those in Table 6.1, it can be concluded that the growth in herd populations in 2000–08 was actually depleted through increased meat production in the same period.

Reasons for Ethiopia's Low Livestock Productivity

A host of factors influence livestock productivity. The most important factors include the availability and adoption of high-yielding breeds, access to veterinary services, cultural and social practices of livestock rearing, grazing, and feed supply constraints. These factors will be further discussed later in the chapter, but we would like to highlight two important points here. First, many of the factors underlying low productivity can be termed some form of market failure and hence justify policy supports. Apparently such policy supports in Ethiopia have not fared as well as such supports in its neighbors. For instance, dairying in Kenya started at the beginning of the 20th century when European settlers introduced exotic high-milk-producing cattle breeds and other forms of exotic agriculture from Europe. There was a deliberate effort to promote the adoption of these exotic breeds under the Swynnerton Plan of 1954, which encouraged Kenyans to engage in commercial agriculture (Connelly 1998). At the time of Kenya's independence from British rule in 1963, its dairy herd had grown remarkably, to 400,000 head of exotic cattle (Muriuki 2009). Furthermore, the government subsequently introduced highly subsidized input services for animal healthcare, production, artificial insemination and bull schemes, dipping to control ticks and other ectoparasites, and training of livestock specialists. In Ethiopia there was a clear lack of such initiatives until very recently.

These realities are actually clear in recent Government of Ethiopia publications. A Ministry of Finance and Economic Development (MoFED) report highlights that there is a significant productivity difference among local dairy breeds. The milk yield for local dairy breeds is about 1.5 liters per day per cow, which is about one-eighth of the milk yield (9 liters per day per cow) for improved dairy breeds (Ethiopia, MoFED 2006). The report also shows that the difference in the length of lactation between the local and improved dairy breeds is significantly large. Similarly, there is a substantial productivity difference between local and improved poultry breeds. The local poultry breeds lay only 50 eggs per year, which is one-third the number laid by modern breeds, which lay up to 150 eggs per year. Because a majority of Ethiopian livestock consists of indigenous breeds, it is no surprise that the country's livestock productivity is so low compared to that of other countries in the region, as well as the least developed countries.

There are two major reasons why, despite the high productivity and availability of improved breeds, adoption rates are low: lack or limited availability of veterinary services and increasing problems with feeds and grazing. Summary statistics from the available CSA reports suggest that only about 26 percent of Ethiopian cattle were vaccinated during 2005–09. The percentage of sheep and goats vaccinated was much lower (12 percent). According to the same reports, fewer than half of sick cattle were even treated by a certified veterinarian. The numbers were far worse for goats and sheep: of the total diseased, only about one-fifth of the goats and one-fourth of the sheep were ever treated. Given this state of veterinary services, it is very unlikely that cash-strapped smallholders will ever make substantive investments to acquire expensive and high-maintenance improved breeds; the private sector has not filled the gap and is unlikely to evolve in the near future.

Poor availability of feed and grazing, which is often communal or communally administered and exhibits a strong seasonality due to weather conditions, constrains the adoption of improved breeds. A recent study suggests that grazing and green fodder are the predominant sources of livestock feed, exceeding 80 percent, in the pastoralist regions of Afar and Somali lands (GebreMariam et al. 2010). The same is true in the agriculturally backward regions of Gambella and Benishangul-Gumuz. Communal grazing as a source of livestock feed has begun to decline in recent years, especially in the highlands, where crop cultivation is becoming increasingly intensive. Another major source of feed is crop residues, which account for about 27 percent of the total national livestock feed consumption (GebreMariam et al. 2010). Industrial by-products and grain-based feed are small shares of the national total.

Recent survey data show that the increasing scarcity of pastureland and grazing has resulted in a sharp increase in livestock feed prices in recent years. Table 6.6 is constructed based on two rounds of surveys conducted by the Sanitary and Phytosanitary Standard and Livestock Meat Marketing Program implemented with technical support from Texas A&M University. The estimates suggest that the price of the second-largest source of livestock feed (bale hay) quadrupled in nominal terms between 2004 and 2008. The prices of grain-based feed and industrial by-products, used for commercial livestock, have also increased three- to four-fold. True, these numbers overstate the price growth, especially because of high inflation during 2007–09. However, the magnitudes remain high even after deflating them by the appropriate consumer price indexes. In real terms, prices have increased by 82 percent for bale hay, 113 percent for wheat chaff, and 25–37 percent for the other sources. Thus, without implying any attribution, one can argue that the unavailability of feed can be an important reason for both the low body weight and the high mortality of livestock.

TABLE 6.6 Increases in livestock feed prices, by feed type, 2004–08

	Nominal prices (ETB per ton)			Real price (2006 price)[a]		
Feed type	2004	2008	2008 price as a percentage of 2004 price	2004	2008	2008 price as a percentage of 2004 price
Cottonseed	800	2,200	275	1,065	1,334	125
Noug cake	800	2,300	288	1,065	1,395	131
Wheat (grade-2)	600	1,800	300	799	1,092	137
Wheat chaff (grade-2)	300	1,400	467	399	849	213
Bale hay (teff or grass)	300	1,200	400	399	728	182

SOURCE: Nominal numbers are from SPS-LMM (2004, 2008).

NOTE: ETB = Ethiopian birr.

[a]Deflated by the December consumer price index of the respective year, with December 2006 = 100.

Livestock Marketing

Domestic Marketing

Many smallholder farmers and pastoralists in Ethiopia do not participate in the livestock market, and for those who do, the size of transactions (sale or purchase of cattle, sheep, or goats) has been found to be very small (Table 6.7). The numbers further suggest that most household livestock production is ultimately consumed within the household. For example, the CSA data for 2004/05 indicate that about half of the households neither sold nor bought cattle, while 43 percent and 50 percent of the smallholder farmers neither sold nor bought sheep or goats, respectively. Borana pastoralists were even less likely to participate in markets, with nearly 47 percent not engaging in cattle sales or purchases and 72 percent choosing not to engage in sheep sales or purchases. However, numerous studies have shown that the domestic market for livestock, even at such a small scale, is substantial and is in fact growing, due in part to greater consumption of livestock products in urban markets such as Addis Ababa.

Barrett et al. (2004) indicate that when pastoral households in Ethiopia participate in livestock markets, they do so in relatively small volumes and at varying rates over time. In pastoral areas livestock is sold to meet family cash needs to purchase food and clothes and to meet educational and medical expenses (Hurissa and Jemberu 2002; Gebremedhin, Hoekstra, and Jemaneh 2007). Barrett et al. (2004) discussed several reasons for the limited nature of market off-take from the pastoral areas. First, with banking services largely lacking there are few investment opportunities in the pastoral areas, making live animal herd-building the primary means of storing wealth. Second, because most of

TABLE 6.7 Distribution of livestock producers, by market participation regime and species, 2003 or 2004–05 (percent)

	Live animal species		
Market participation regime	Cattle	Sheep	Goats
Smallholder farmers (2004–05)			
Sales only	22	26	27
Purchases only	16	23	18
Sales and purchases	12	8	5
No sales and no purchases	50	43	50
Borana pastoralists (2003–05)			
Sales only	47	18	25
Purchases only	2	6	7
Sales and purchases	4	4	2
No sales and no purchases	47	72	66

SOURCES: Negassa and Jabbar (2008). Smallholder figures based on CSA (2006). Pastoralist calculations based on GL-CLRSP (2006).

the resources required for livestock production are free, pastoralists have limited demand for cash income. In the event that pastoralists need cash income, the need is usually met by selling a few animals, and even then, animals that are less productive in terms of milk and breeding. Pastoralists' market participation is also limited by other factors, such as high transaction costs. Given their distance from markets, there are a number of intermediaries that require payment for their services, which erodes the profits from selling animals (Devereux 2006). For instance, Umar and Baulch (2007) detail how transaction charges are not limited to transport alone but also include local taxes and the costs of holding, fodder, and water while a buyer is found. For small-scale traders with little working capital, accessing markets is particularly difficult unless they are willing to operate on a credit-based system with local traders or cooperatives (Umar and Baulch 2007; GebreMariam et al. 2010; Hashi and Mohamed 2010). Therefore, pastoralists are more inclined to build larger herds and flocks for cultural prestige, to accumulate wealth or pay dowries (social functions), and as drought-coping mechanisms than to build a large herd for increased commercial off-take.

These findings are reinforced with data from three regions in the highland areas of Ethiopia (Tigray, Amhara, and Oromiya) indicating not only that the net commercial off-take rate of cattle was low but also that the bulk of this net commercial off-take was of low-quality cattle, such as culled draft oxen (Negassa and Jabbar 2008). Oxen accounted for 62 and 75 percent of the gross and net commercial off-take for cattle, respectively, while the off-take rates for calves and heifers were found to be negligible. Cattle sales, then, can be considered as an input to crop production in the mixed crop–livestock production systems of Ethiopia rather than as an output of a livestock production system. More than 70 percent of the net commercial off-take for sheep and goats was in the form of males for smallholder sedentary farmers. For Borana pastoral production systems, the net commercial off-take was totally in the form of male sheep and goats.

Both sedentary farmers and pastoralists appear to be unwilling to part with either young or productive animals, implying that the market is supplied with a surplus of aged male animals rather than younger animals that can be fattened and either processed or sold to export markets. In a survey of over 2,500 animal transactions in nine small ruminant markets in eastern Ethiopia, Ayele et al. (2006) found that about half of the sheep and goats were marketed at or under the age of 15 months. The same study also indicated that about 57 percent and 55 percent, respectively, of the sheep and goats marketed had bodies in good condition, while the remainder had bodies in poor condition at the time of sale.

In an analysis of the livestock value chain, GebreMariam et al. (2010) described how the irregular interaction of both pastoralists and highland smallholders with markets undermines the effectiveness of both traders and livestock cooperatives who supply export markets and large-scale domestic feedlots.

When supplies of animals are erratic and strongly dependent on seasonal events, traders are unable to rely on a stable volume of animals and are forced to trade in small volumes, lowering their market power. Additionally, because of their small scale, the lack of working capital limits the degree to which these small businesses can expand (GebreMariam et al. 2010).

The expansion of medium- and small-scale trading businesses is also constrained by an inadequate supply of feed, water, and land. Although the feedlot industry has grown in recent years and is increasingly playing a role in livestock fattening for markets, it remains a dichotomous system, with large-scale feedlots purchasing livestock in high volumes for domestic urban markets and export markets while smaller backyard operations supply local markets and butchers. For smallholder farmers, limited grazing land in the mixed farming system means that livestock production could be improved only through intensification and better integration of crop and livestock production practices. Thus, for larger feedlots securing land with access to water and credit to cope with increasing feed costs remains a priority.

Formal Export Markets

The rapid growth in demand for meat products in the world represents a potential opportunity for livestock-rich countries like Ethiopia. From 1970/71 to 2007/08, the share of livestock and livestock products in the total value of exports was about 13 percent, fluctuating between 12 percent and 16 percent for different periods (Table 6.8). However, it is important to note that hides and skins accounted for most of these export earnings (77 percent), signifying that Ethiopia has thus far failed to take advantage of increasing demand and its comparative advantage as a livestock producer. The annual export volume of live animals and meat and meat products averaged 6.6 million tons and 19.6 million tons, respectively, with coefficients of variation of 145 percent and 384 percent, respectively. These high coefficients of variation indicate that there is high interyear variability in the volume of meat exports, which is likely attributable to a series of stringent health and quality control regulations restricting exports (SOS Sahel Ethiopia 2008).

Ethiopia suffered the sad consequences of these strict quality and safety regulations when the Arab States of the Persian Gulf imposed a ban on all livestock imports from the Horn of Africa in 1998 and 2000. These bans resulted in a halving of total livestock exports in 1998 and in a near-collapse of the pastoral network of traders and businesses operating to move animals between the Horn of Africa and Saudi Arabia (Umar and Baulch 2007; Devereux 2010). Based on computable general equilibrium modeling results, Nin Pratt et al. (2004) estimate that there was a total loss of $136 million, which was equivalent to 36 percent of the Somali region's GDP and a reduction in producers' income of 50 percent relative to a typical trading year in the past. This loss of income, as well as the collapse of livestock prices relative to cereals, not only adversely

TABLE 6.8 Export volume and value of major livestock exports, 1970–2008

	1970–80		1981–90		1991–2000		2001–08		1970–2008	
Indicator	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Live animals										
Mean volume, value	6,734	139	6,721	53	1,131	10	14,616	98	6,706	73
Growth rate (percent)	–28.0	–8.1	11.5	3.3	10.2	17.0	193.2	140.0	–2.6	–4.1
Export share (percent)	n.a.	3.1	n.a.	2.0	n.a.	0.3	n.a.	1.4	n.a.	1.8
Meat and meat products										
Mean volume, value	67,180	78	1,476	16	905	19	4,049	80	19,566	46
Growth rate (percent)	–45.2	–27.0	–13.2	–17.6	75.6	91.0	54.2	55.2	–5.9	–1.5
Export share (percent)	n.a.	1.8	n.a.	0.6	n.a.	0.6	n.a.	1.2	n.a.	1.1
Hides and skins										
Mean volume, value	12,624	410	9,585	338	6,958	361	12,786	644	10,302	422
Growth rate (percent)	3.8	3.9	0.1	1.2	5.5	10.8	7.1	–1.2	–0.2	1.4
Export share (percent)		9.3		12.8		10.6		9.4		10.2
Share of livestock in total exports (percent)		14.2	n.a.	16.0	n.a.	12.0	n.a.	12.0	n.a.	13.0

SOURCE: Based on raw data from the National Bank of Ethiopia.

NOTES: Volume is expressed in metric tons, value in millions of Ethiopian birr. n.a. = not available.

affected households' consumption but also forced many of them to deplete their herds rather than slip into poverty and destitution.

Things have improved since then, and the total livestock exports have gradually increased, as has the livestock population. However, there are indications that Ethiopia has not yet been able to take full advantage of these improved conditions. Let us consider some recent export numbers obtained from the Ethiopian Custom Authority. Table 6.9 summarizes these numbers by livestock species, total export value, and country of destination from July 2007 to June 2008. The main live animal species considered include cattle, sheep, goats, and camels. During this one-year period, the total value of animals exported was $40.6 million, more than 80 percent of which came from cattle and camels, with cattle accounting for about half of the total export value. Looking at each destination country's share in total export value, Yemen turns out to have been the largest trade partner, accounting for 26 percent of the total live animal export value, followed by Djibouti (19.5 percent) and the Kingdom of Saudi Arabia (16.7 percent). However, one study suggests that exports to Djibouti and Yemen as well as Somalia and Sudan are typically rerouted to other Persian Gulf nations in order to circumvent import restrictions from the Horn (Hashi and Mohamed 2010). It also argues that Yemen and Djibouti import live animals at low prices from Ethiopia, fatten them, and then export them to the Persian Gulf states, enabling these countries to generate value addition. This is perhaps why export prices are often lower than Addis Ababa prices. For example, domestic cattle price data suggest that in August of 2010 grade-1 cattle were selling for ETB 14,450, roughly equivalent to $870, which was more than three times higher than the export price of cattle in 2008/09 calculated by the Ethiopian Custom Authority.[5]

Informal Export Marketing

Recent studies have also estimated that over 300,000 head of cattle and over 1 million head of sheep and goats were exported through informal trade in 2001 (Belachew and Eshetu 2002), primarily destined for Middle Eastern markets via Djibouti and Somalia. Little (2005) estimates that, of the animal trade coming out of the ports of Somalia, as much as 50–60 percent is sourced through informal trade from Ethiopia. Additionally, the strong demand for livestock in Nairobi, where prices can be as much as 25 percent higher than in neighboring countries, also attracts approximately 40,000 cattle annually sourced from Ethiopia through informal trade (Little 2005).

The informal trade of livestock and livestock products has a strong history founded on clan-based linkages and a strong regional trade relationship with the Middle East. With trade in the region largely unregulated and contractual

5. These data are published by a joint project of the US Agency for International Development and the Government of Ethiopia (available at http://www.lmiset.net).

TABLE 6.9 Value and share of exports of live animals from Ethiopia, by destination, 2007–08

	Cattle		Camels		Sheep		Goats		Others		Total	
Country	Value	Share	Value	Share	Value	Share	Value	Share	Value	Share	Value	Share
Djibouti	1.01	5.1	5.78	42.9	0.77	13.5	0.22	19.2	0.12	23.0	7.90	19.5
Somalia	2.87	14.4	0.03	0.2	n.a.	0.0	0.00	0.0	0.00		2.90	7.1
Sudan	3.19	16.0	0.71	5.3	n.a.	0.0	0.00	0.0	0.09	16.8	3.99	9.8
Yemen	10.48	52.5	0.03	0.2	0.06	1.0	0.09	7.7	0.00	0.6	10.7	26.2
Kingdom of Saudi Arabia	0.11	0.5	0.93	6.9	4.81	84.7	0.80	68.3	0.12	23.4	6.77	16.7
United Arab Emirates	2.30	11.5	2.35	17.4	0.02	0.4	0.06	4.9	0.18	35.5	4.73	11.6
Egypt	0.00	n.a.	3.63	27.0	n.a.	0.0	0.00		0.00	n.a.	3.63	8.9
Jordan	0.00	n.a.	0.00	n.a.	0.03	0.4	0.00		0.00	n.a.	0.03	0.1
Other	0.00	n.a.	0.00	n.a.	n.a.	n.a.	0.00		0.00	0.6	0.00	0.0
Total	19.95	100.0	13.47	100.0	5.68	100.0	1.17	100.0	0.51	100.0	40.6	100.0
Share (percent) each animal	n.a.	49.0	n.a.	33.0	n.a.	14.0	n.a.	3.0	n.a.	1.0	n.a.	100.0

SOURCE: Authors' calculations based on Ethiopian Custom Authority data.

NOTES: Value is expressed in millions of US$, share in percent. n.a. = not available.

arrangements missing, traditional clan-based trade offers both a sense of security to buyers and sellers of livestock and a means of settling differences. For traders and those who trek livestock to markets and across borders, clan-based relationships provide a means of safe passage to central markets through distant lands and help guarantee access to pasture and water (Umar and Baulch 2007). With little operating capital, limited insurance, and the high frequency of raids or conflict, many pastoralists are reluctant to leave these arrangements and enter into the formal sector. Additionally, the complexity and costs of obtaining permits to perform livestock transactions, as well as government regulation and seizure of Somali currency within Ethiopia, have caused many traders to avoid places where trade is heavily regulated (Devereux 2006) and to rely on informal trade to move livestock.

Meat Exports

It can be argued that Ethiopia would benefit more from exporting meat than from exporting live animals, because there are several problems in exporting live animals. First, there is a limited marketing infrastructure, including feeding and watering facilities en route to the live animal export markets, which results in high transaction costs and reduces the quality of live animals upon arrival in destination markets. Second, live animal exports have also been observed to enhance the chances of disease transmission, and as a result, the export of live animals has frequently faced bans by importing countries whenever there have been animal disease outbreaks within Ethiopia or bordering countries. Furthermore, the live animal export trade from Ethiopia is observed to be very seasonal, usually concentrated around the time of religious celebrations in Middle Eastern countries, while the meat export trade could be a year-long activity, providing year-round employment.

The export of meat also offers opportunities for value-addition in the country of origin, which increases the levels of employment and income and maximizes the number of people participating in and benefiting from value-adding activities. Meat exports also have the potential to generate increased tax revenue for the government from various services, processing, marketing, and other associated activities catering to the preparation of meat for export. Meat by-products such as hides and skins could also be key sources of revenue through further processing and manufacturing within the country or through direct exports of raw or semi-processed hides and skins. Other by-products, such as offal, left in the country could provide less expensive sources of protein for domestic consumers or could be export items by themselves.

Opportunities and Policy Options

There has been a growing consensus that, with increasing economic growth and urbanization, the demand for livestock will continue to grow and that animal products will rapidly become major sources of protein (Delgado et al. 1999; Hall, Ehui, and Delgado 2004; Seré et al. 2008). According to available projections, Africa is currently at a net deficit, with very low productivity, and the situation is likely to get worse in the coming decade (World Bank 2008). Of course these projections are based on several assumptions, including an assumption about the level of policy emphasis. This suggests that the evolving trend presents an opportunity in global markets for the livestock-rich and smallholder-dominated African countries in terms of both growth and poverty alleviation. Additionally, as pointed out earlier, there is a rising (and unmet) domestic demand for dairy products. Close to 70 percent of per capita daily calorie intake in a typical African country comes from cereals; livestock accounts for only around 5 percent. Animal products continue to provide less than 5 percent of the protein consumed in Ethiopia, mainly due to low income and religious considerations.[6] A recent survey shows that more than 90 percent of the surveyed households expressed a willingness to consume more livestock products if they could afford them (Negassa 2009), implying that the potential to expand domestic livestock consumption is high.

There are three other sources of growing domestic demand for livestock products. First, malnutrition is one of the most serious public health problems in Ethiopia. Estimates from the recent Demographic Health Survey indicate that 47 percent of children in the country are stunted, 38 percent are underweight, and 11 percent are wasted.[7] The government intends to take action by supporting local production and the use of complementary blended food similar to corn soy blend, which requires milk powder as an ingredient. How much additional demand this can generate is a subject for further research. However, given that the livestock market is plagued with various sources of market failure, introducing government-supported feeding programs as part of the social safety net would not only be a justified intervention but would also provide a much-needed initial boost to the dairy sector in the country. Second, urbanization has accelerated in the country in recent years, and supermarkets, albeit at a smaller scale, are sprouting up in cities and urban centers. If this trend continues, as it has in many other developing countries, a food service sector will grow with greater domestic demand. Again, the exact nature and magnitude of potential additional demand is unknown, but the trends are obvious, and identifying policy options to expedite this trend should be on the policymakers' radar. Given the historical neglect of the subsector in Ethiopia compared to Kenya and other developing countries, there are clear opportunities to bring about change by ramping up policy interventions. In this section we highlight some of those interventions, but we begin by assessing the costs of doing nothing.

6. The fasting practice of the Orthodox Christian Church, which is followed by the majority of the Christians in the country, prohibits consuming livestock products.

7. These statistics are cited by a local newspaper (*The Reporter*, December 26, 2009).

Some Arithmetic of Livestock Mortality

There are theoretically justifiable reasons for policy interventions in the Ethiopian livestock subsector. Weak institutions, inadequate provision of public goods, information asymmetry among market actors, and the unaffordability of veterinary services due to high transaction costs—all qualify as sources of market failure and can serve as an undisputed rationale for public policies. However, another more appealing dimension of policy justification is the cost of not doing anything. We have made a modest attempt to get at this issue, and a summary of the results is presented in Table 6.10, which is constructed using off-take data from the CSA, export data from the Ethiopian Custom Authority, and price data from the Ethiopian Livestock Market Information System. The first three panels (six rows) of the table show the off-takes of cattle, sheep, and goats by major channel. The bottom two panels (eight rows) present the valuation of off-takes at export and market prices, respectively. As indicated earlier, deaths account for the largest share of off-takes for all three species, with cattle and goats accounting for 47 percent and sheep accounting for 41 percent.

TABLE 6.10 Livestock off-takes and valuation, by species, 2007–08

		Off-take channel			
Species, value	Category	Sales	Deaths	Other off-takes	Total
Cattle	Head count (millions)	4.0	4.2	0.7	8.9
	Share in total off-takes (percent)	45	47	8	100
Sheep	Head count (millions)	5.24	5.66	2.90	13.8
	Share in total off-takes (percent)	38	41	21	100
Goats	Head count (millions)	3.29	4.42	1.69	9.4
	Share in total off-takes (percent)	35	47	18	100
Value at export price (millions of US$)	Cattle	957	1,005	168	2,130
	Sheep	199	210	109	517
	Goats	134	178	69	381
	Total for all three species	1,290	1,393	345	3,028
Total value at Addis Ababa price (millions of US$)	Cattle	3,503	3,678	613	7,794
	Sheep	339	358	185	882
	Goats	256	341	132	729
	Total for all three species	4,098	4,378	930	9,406

SOURCE: Authors' calculations based on Central Statistical Agency data.

NOTES: Export price per head is calculated from Custom Authority data by dividing export value by total number of animals exported. The Addis Ababa price is taken from http://www.lmiset.net, August 2011, for grade 1 of each species.

Using available data, we calculated the value of the deaths of these animals, and the numbers are striking. At export prices, the total costs of animal deaths for 2007–08 are estimated at about $1.4 billion, with cattle alone accounting for $1.0 billion. When these animals were valued at the August 2011 market price for grade-1 cattle, the value of dead animals for that year almost quadrupled, to $4.4 billion.

Just how large are these estimates? To put the magnitudes in perspective, let us consider a few examples. The Productive Safety Net Programme (PSNP) of Ethiopia, which is the largest program of its kind on the continent except in South Africa, costs about $300 million and serves almost 8 million poor beneficiaries. This means that, had Ethiopia prevented the deaths of the three species considered, the associated savings would be great enough to fund about 5 programs equivalent to the size of the PSNP if the dead animals are valued at the export price and about 16 programs if they are valued at the Addis Ababa grade-1 price. Similarly, the country receives about 500,000 tons of food aid a year, which, if valued at the 2009 US Gulf price, is worth about $100 million, which is miniscule compared to the savings that the country could generate by preventing animal deaths. True, these valuations are approximate, and we do not have as a counterfactual the costs of saving those animals. However, this much is obvious from the official statistics: very little is done to decrease mortality. During 2005–09, only 26 percent of the Ethiopian cattle and 12 percent of the goats and sheep were vaccinated; fewer than half of the sick cattle, one-fifth of the sick goats, and one-fourth of the sick sheep received veterinary services. According to the government's livestock master plan (2008), total spending (salary plus drugs, equipment, and overheads) per animal is about ETB 1, compared to the recommended spending of ETB 31 per animal. Thus, one can argue that investments in preventing mortality would likely yield high dividends.

Other Key Policy Issues

The Ethiopian livestock subsector is far below its production potential. Thus, a lot needs to be done to make the system efficient and equitable along the value chain. Improvements in production, marketing, and processing can add large value gains not only in terms of income but also with respect to improving food security and reducing poverty and vulnerability. Many of the issues came up in the preceding sections, but some of them warrant attention with respect to prioritizing policy. In particular, we would like to highlight the needs for (1) introducing a cohesive and coordinated policy and institutional environment, (2) improving the livestock information systems, (3) addressing the feeding and grazing issues, and (4) improving dairy and other processing.

Ethiopia has lagged far behind Kenya with respect to policy attention to the livestock subsector. Over the past three decades, the majority of livestock development projects in Ethiopia have been donor driven. Although many of these projects added some localized value, almost all of them lacked sustainability and local ownership. On the part of the government, a lack of coordinated effort toward livestock sector development becomes clear when one looks at the livestock mandates within the ministries. There is no single agency or institution within the Government of Ethiopia to exclusively oversee livestock development (GebreMariam et al. 2010). Things are very different in Kenya, where livestock development policies predate the country's independence. Not only does Kenya have a dedicated ministry, called the Ministry of Livestock Development, but also there are a host of other agencies and departments supporting the livestock sector.[8] Among others, they include the Kenya Dairy Board, Kenya National Artificial Insemination Services, the Kenya Veterinary Vaccines Production Institute, Kenya Cooperative Creameries, and the Kenya Veterinary Board. True, one can argue about the efficiency of these public and semipublic agencies, but there is no denying that this wide range of agencies and departments reflects a clear commitment to livestock development that has historically been missing in Ethiopia.

Limited information has also long been a serious constraint on the Ethiopian livestock subsector. To address this deficiency, there have been some initiatives in the past; the most recent has been a government project with technical support from Texas A&M University and financial support from the US Agency for International Development. The underlying idea is to technologically link various actors in the value chain with regional and national institutions. This is a good step forward, but more should and can be done. To mitigate information asymmetry across market actors, the government should set up secured market locations where trade takes place on a daily basis (or on preset dates). These locations could then be linked with other central locations by displaying information from the central markets through price tickers. The Ethiopian Commodity Exchange has already set up such price tickers for coffee in various markets in coffee-growing regions. Therefore, future efforts will involve extending the current infrastructure to livestock market locations.

Feeding livestock is increasingly becoming a challenge for Ethiopia due to rapid population growth, expansion of croplands, and the high frequency of climatic shocks. Therefore, the country will have to find ways to develop alternative feeding arrangements. Such alternatives will likely play important roles not only in improving the supply of feed but also in generating demand. Commercial feedlots, in particular, have the potential to increase the livestock supply through improving animal nutrition and hence increasing the value of animals. Commercial feedlots can also help improve consistent supply with predictable quality. It is also envisaged that commercial feedlots can generate other beneficial effects; they can (1) serve as aggregators for smallholder farmers in their vicinities, (2) help local businesses such as private animal health service providers and forage seed distributors, (3) serve as consistent sources

8. For a brief but useful discussion, see van der Valk (2008).

of demand for animal fattening, and (4) demonstrate high-productivity feed crop cultivation and provision of stable demand for feed crops and crop residues grown by smallholders.[9]

For the livestock subsector to be efficient and competitive, both dairy and meat processing have to improve. Increasing the production and export of live animals or meat is directly correlated with improvement of dairy productivity. However, although there has been some emphasis on dairy cooperatives, the government has done little to improve the dairy sector in comparison to the dairy sectors of Ethiopia's neighbors. As shown in Table 6.4, milk production per cow per year in Ethiopia is 210 kilograms, which is lower than the East African average of 321 kilograms per cow per year and the least developed countries average of 318 kilograms per cow per year. Another example from Kenya can provide further insight. Smallholders in Kenya own about 62 percent of the dairy animals, almost all of which are some form of improved breeds (21 percent exotic crosses, 41 percent Zebu and other crosses).[10] By comparison, most of the Ethiopian dairy animals, except those of periurban cooperatives, are local breeds. Can similar rates be achieved for Ethiopian smallholders? Answering this question is beyond the scope of this chapter, but we have not come across any project or public documents showing that there have been deliberate policy actions to achieve this objective. Given that livestock development has become an important focus of the Ethiopian Agricultural Transformation Agency, one can only hope that a well-planned initiative will be undertaken in the near future.

Conclusions

The livestock subsector plays a significant role in the Ethiopian economy at both the national and the household level. Its contributions to both agricultural value-added and national GDP are substantial. At the household level, livestock plays a critical economic and social role in the lives of pastoralists, agropastoralists, and smallholder farm households. Livestock fulfills an important function in coping with shocks, accumulating wealth, and serving as a store of value in the absence of savings (financial) institutions and factor and output markets. In the case of smallholder mixed farming systems, livestock provides nutritious food, additional emergency and cash income, means of transportation, farm outputs and inputs, and fuels for cooking food. In the case of pastoralists, livestock represents the primary means to support and sustain their livelihoods. Improving livestock production and marketing is therefore critical to enhancing livelihoods and to alleviating poverty in Ethiopia.

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9. These issues are further elaborated in GebreMariam et al. (2010).
10. These numbers are from page 12 of the van der Valk report (2008).

The total number of livestock in Ethiopia is the largest in Africa. However, the number of livestock at the level of the individual smallholder farmers and pastoralists remains very low. Besides the small herd size, the livestock subsector is characterized by multispecies and multipurpose activities, very low levels of productivity (the current level of livestock productivity in Ethiopia is one of the lowest in the world), less commercially oriented production systems, low commercial market off-takes, inadequate production and marketing infrastructure, and inadequate services, institutions, and support systems.

Though still in their infancy, some developments have been observed in recent years with respect to the emergence of new commercially oriented livestock production systems. Private-sector entries and capital investment into meat, dairy, and poultry farms have increased substantially over the past several years. However, the emerging commercially oriented livestock sector is constrained by lack of feed, improved breeds, and adequate support services (veterinary, extension, credit, information, and so on). Overall, the transformation of the livestock sector has been limited, suggesting the high potential for expanding the role of livestock in smallholder livelihoods and income.

To seize this opportunity the Government of Ethiopia must take action. First, a coordinated agriculture policy is needed that specifically deals with livestock, including a single agency or institution that manages livestock development. Moreover, institutional capacity is needed to push the livestock agenda forward. Second, the private sector's capacity to reliably deliver the required quantities of live animals and meat of a quality agreed upon by importers must be strengthened. In this regard, some of the major challenges are related to animal mortality, disease outbreaks, food safety, and sanitary standards. These challenges clearly signal the need for policy and investment to introduce veterinary services and the need for the government to work closely with export partners to develop a set of standards for food safety quality and implement them at the national level. Additionally, the provision of adequate high-quality feed through commercial feedlots must be explored in order to ensure improved animal health and to capture the value-added, which thus far has been done in neighboring countries such as Djibouti and Yemen. Ethiopia lags far behind developing countries in both meat and dairy processing. Investments in these sectors are critical for the country to be competitive in the global market. Finally, information asymmetries must be overcome to link the various actors in the value chain. Through the provision of technological infrastructure, market locations should be developed to increase fairer commodity exchange and improve information flows.

In general, the exploitation of Ethiopia's huge national livestock resources for national growth and poverty reduction requires the reorientation of the livestock production and marketing systems, investment in research and development to improve livestock productivity and increase marketable surpluses (in terms of quality and quantity), effective value chain coordination and development, reliable input and service provision, and improvement in policies.

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7 Patterns in Foodgrain Consumption and Calorie Intake

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The quality, quantity, and composition of food consumption are major determinants of the nutritional well-being of individuals, which has, in turn, important implications for individual and household-level health, productivity, and income. An analysis of food consumption patterns is essential to understanding and projecting domestic demand for agricultural products, as well as for the development of national policies to promote food security.

Food consumption patterns in Ethiopia are diverse, and, unlike in many other countries, no single crop dominates the national food basket (as, for example, rice does in most of East Asia, maize in Latin America, or cassava in Central Africa). The Ethiopian food basket consists of a wide variety of grains and other staples. However, the quantity, composition, and security of the average consumption basket varies by place of residence, agroecology, socioeconomic level, and livelihood strategy. Moreover, these consumption patterns have shifted over time.

This chapter presents analysis of spatial and temporal food consumption trends in Ethiopia with a focus on the six principal staples in the country: teff, wheat, maize, sorghum, barley, and *enset* (a root crop also known as “false banana”). A quick look at the nationally representative data used in this analysis shows that together these six staples make up much of the national food basket, supplying around 70 percent of total caloric intake (Table 7.1).

Given the high diversity in consumption patterns—see, for example, the differences in consumption of teff, maize, sorghum, and processed cereals by rural and urban households in Table 7.1—as well as the growth trends in production (see Chapter 3) and calorie consumption (discussed later), food security in Ethiopia has risen from the mid-1990s through 2004/05. However, significant vulnerabilities remain throughout the country, especially among poor households in the sparsely populated rural regions.

The data used in the analyses that follow come from the Household Income, Consumption, and Expenditure Surveys (HICES), conducted by the Ethiopian Central Statistical Agency (CSA), and the Livelihoods Integration Unit (LIU), provided by the Government of Ethiopia Disaster Prevention and

TABLE 7.1 Per capita calorie contributions of food items, by rural–urban place of residence, 2004/05

Food item	Calories per capita per day			Percent of total
	Urban	Rural	National	
Cereals				
Teff	601.70	196.69	254.13	11
Wheat	200.59	309.79	294.30	13
Maize	107.53	435.99	389.40	17
Sorghum	94.72	366.21	327.70	14
Barley	38.16	144.58	129.48	6
Other cereals	25.21	53.29	49.31	2
Processed cereals	195.15	17.10	42.35	2
Enset, kocho, and *bulla*	27.18	215.15	188.49	8
Total cereals and *enset*	1,290.24	1,738.79	1,675.17	72
Noncereals				
Pulses	123.94	167.06	160.95	7
Oilseeds	2.49	5.43	5.01	0
Animal products	65.43	58.07	59.12	3
Oils and fats	145.18	31.91	47.98	2
Vegetables and fruits	60.78	59.43	59.62	3
Pepper	6.89	3.57	4.04	0
Coffee, tea, and *chat*	30.62	42.72	41.01	2
Root crops	72.36	124.52	117.12	5
Sugar and salt	93.54	51.67	57.61	3
Other foods	96.47	103.28	102.31	4
Total noncereals	697.70	647.66	654.77	28
Total	1,987.96	2,386.46	2,329.94	100

SOURCE: Authors' calculations based on HICES (2004/05).

Preparedness Agency. The HICES, conducted roughly every five years since 1995/96, provide a large, nationally representative dataset with detailed information on consumption quantities and expenditures.[1] The LIU data were collected between 2006 and 2009 via the Household Economy Approach, an analytical framework that assesses livelihoods and how they might respond to environmental and economic shocks.[2] The LIU data were scaled up with population figures from the 2008 Ethiopia Census to provide national estimates. Unlike the HICES, which offer nationally representative data based on inter-

1. The data are representative of all urban and rural areas of Ethiopia with the following exceptions: all zones of the Gambella region, three nonsedentary zones of the Afar region, and six nonsedentary zones of the Somali region.

2. For more information, see *The Practitioners Guide to HEA* at www.feg-consulting.com/resource/practitioners-guide-to-hea.

views conducted with approximately 22,600 households, the LIU offers little more than stylized facts regarding household livelihood and consumption patterns. However, these stylized facts provide valuable insights into the consumption patterns of otherwise difficult-to-survey populations—the pastoral and agropastoral households that comprise 10 percent of the rural population—so we rely on them here to provide a more complete and disaggregated look at consumption in Ethiopia.

After a brief overview of general consumption trends and income and price demand elasticities, this chapter will take a closer look at spatial consumption patterns, disaggregating household consumption by place of residence, agroecology, income, and livelihood. The chapter then observes how these trends have changed over time and concludes with a discussion about how these trends relate not only to current and future food security but also to national agricultural growth and development policies.

General Trends in Food Consumption in Ethiopia

Food consumption in Ethiopia has been on the rise since the mid-1990s; meanwhile, the share of food consumption expenditures in the average household budget has fallen. The HICES datasets show that food consumption expenditures declined from 60 percent in 1995/96 to 56 percent in 2004/05 (Ethiopia, MoFED 2008), while per capita income (expenditure) rose by 16 percent over the same period.[3] These findings are consistent with Engel's Law, which dictates that as household incomes rise, the share of household income spent on food falls. However, the decline in food expenditure varies slightly across rural–urban locations. Figure 7.1 presents the density of per capita food expenditure by rural–urban location. Although the national food expenditure pattern clearly follows the rural expenditure distribution, urban expenditure is significantly higher than rural.

The pattern in Figure 7.1 conceals considerable heterogeneity across income levels in both rural and urban areas. Figure 7.2 presents a nonparametric Engel curve that captures this heterogeneity, depicting per capita total expenditure against per capita food expenditure. As expected, the share spent on food falls as household per capita total expenditure rises. However, Figure 7.2 shows that among those at the lower end of the income distribution, rural households spend more on food, and the decrease in food share as income rises is smaller for rural than for urban households. Because the Engel effect is more pronounced in urban than in rural households at all income levels, we can expect the gap between food expenditures in rural versus urban areas to decline as incomes rise.

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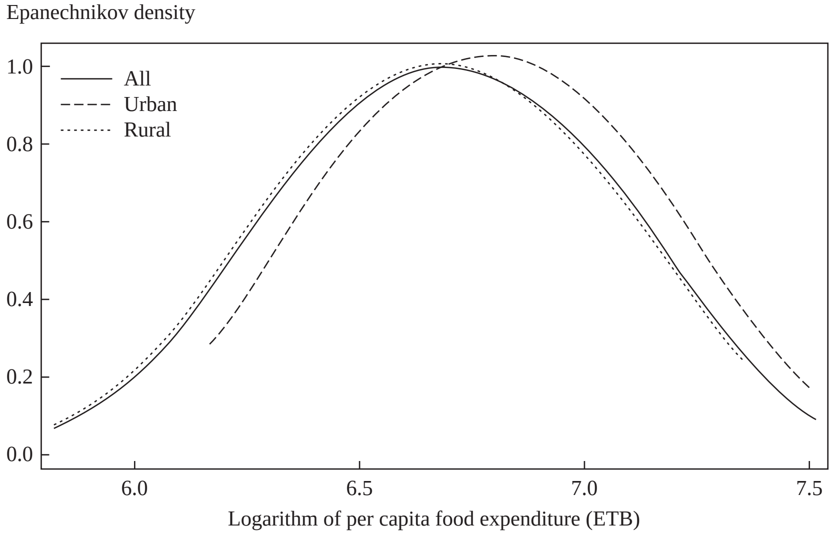
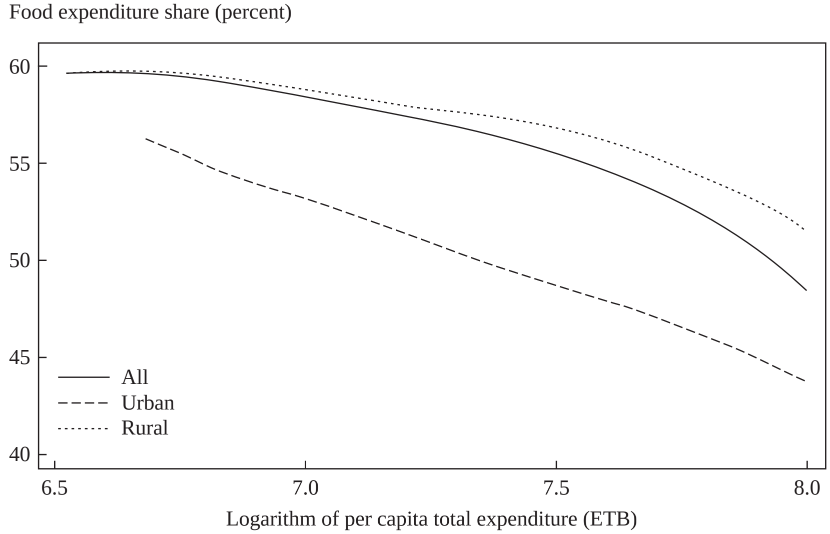
3. Throughout this chapter, income estimates have been calculated by aggregating household expenditure data from the HICES. In describing household welfare status, *income* and *expenditure* are used interchangeably.

FIGURE 7.1 Nonparametric regression estimates of per capita food expenditure, 2004/05



SOURCE: Authors' calculations based on HICES (2004/05).
NOTES: Bandwidth = 0.3. The Epanechnikov density indicates the distribution of population according to per capita consumption. ETB = Ethiopian birr. The natural log of 6 corresponds to a value of ETB 403; the natural log of 7 corresponds to a value of ETB 1,097; the natural log of 8 corresponds to a value of ETB 2,981; the natural log of 9 corresponds to a value of ETB 8,103.

FIGURE 7.2 Nonparametric Engel curve, 2004/05



SOURCE: Authors' calculations based on HICES (2004/05).
NOTES: Nonparametric regressions estimates; bandwidth = 0.25. ETB = Ethiopian birr.

As might be expected from these figures, consumption patterns throughout the country are responsive to changes in income and price (Table 7.2). Estimated income and price elasticities of demand for the 2004/05 HICES dataset are presented in Table 7.2 (Tafere et al. 2009).[4] These elasticity estimates reflect rural–urban preference and expenditure differences among major food items. All major foodgrains, with the exception of sorghum in urban areas, are normal goods and sensitive to income changes in rural and urban areas. Teff boasts the greatest income elasticity among cereals in both rural and urban areas: a 1 percent increase in income increases teff demand by more than 1 percent. In fact, in rural areas, teff is a luxury foodgrain, consumed at festivities or offered to special guests and, in some instances, available only to older family members. Wheat and maize appear to be important foodgrains in both urban and rural areas; a greater price elasticity of both grains is observed among urban residents compared to rural ones. As reflected by the differing budget shares and income elasticities of demand, sorghum plays an important role in rural diets but is an inferior good among urban residents. However, cross-price elasticity estimates suggest that sorghum is complementary to teff in urban areas (Tafere et al. 2009); this finding is likely due to the common practice among poorer urban residents of mixing sorghum with teff to make *injera*, Ethiopia's main national dish. In general, all major foodgrains have close to unitary own-price elasticities in both locations.

The remainder of this chapter is devoted to analysis of the variations in consumption patterns of the six major staples (teff, wheat, maize, sorghum, barley, and the root crop *enset*) across spatial and temporal parameters.

Spatial Trends in Consumption

Due to extensive geographical and productive heterogeneity and poor market linkages, household consumption patterns of the major staple crops are spatially heterogeneous. For example, teff is largely consumed in urban and semiurban Ethiopia; maize and sorghum are major lowland staples but are also consumed minimally in urban areas. Wheat has become an important staple throughout the country in recent decades, in part due to large-scale wheat food aid shipments over time that have encouraged wheat consumption. Barley is consumed mostly in the colder highlands and *belg* growing areas, but only to a limited extent.[5] *Enset* is consumed primarily in the highland areas of the Southern Nations, Nationali-

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4. Using the same dataset, Tafere et al. (2009) estimate a demand system of 10 equations (9 equations in their linear model) and apply an iterative feasible generalized nonlinear least squares estimation procedure to both the linear almost ideal demand system and the quadratic almost ideal demand system models.

5. The Ethiopian production season is divided into two periods of productivity: the more productive *meher* season and the less productive *belg* season.

TABLE 7.2 Budget shares and own price and income (expenditure) elasticities of demand for selected food items, by rural–urban place of residence, 2004/05

	Urban			Rural		
Food item	Percent of total budget spent	Own price elasticity of demand	Income elasticity of demand	Percent of total budget spent	Own price elasticity of demand	Income elasticity of demand
Teff	16.7	–0.92	1.10	7.5	–0.92	1.20
Wheat	4.9	–1.00	0.78	9.6	–0.94	1.19
Maize	1.9	–0.93	0.37	9.9	–0.70	0.82
Sorghum	1.8	–0.93	–0.36	9.3	–0.71	0.51
Pulses and other cereals	19.2	–0.88	0.90	11.4	–1.03	0.74
Animal products	12.7	–0.91	1.72	8.0	–0.94	1.98
Fruits, vegetables, and root crops	11.7	–0.99	1.22	15.3	–1.01	1.18
Other foods	30.0	–0.92	0.66	24.0	–0.92	0.92

SOURCES: The elasticities are based on Tafere et al. (2009); the budget shares are from the authors' calculations based on HICES (2004/05).

ties, and People's Region (SNNPR), where it accounts for the majority of food and calorie intake.

Consumption Patterns across Rural–Urban Locations

Part of the diversity of the consumption patterns throughout Ethiopia can be explained by the rural–urban livelihood dichotomy highlighted earlier. Urban consumption patterns are more dynamic than those in rural areas because urban consumption is highly monetized and sensitive to relative price and supply changes. Thus, comparison of the per capita budget shares, consumption quantities, costs, and calorie shares of major staples across rural and urban places of residence can provide insights into the differences in consumption patterns between these two environments. Moreover, given recent trends toward the increased urbanization of rural areas, such analysis may also offer insight into future consumption trends.

Table 7.3 shows the share of per capita consumption expenditures, quantities, and calories of the major foodgrains and *enset,* disaggregated by rural and urban places of residence. Overall, cereals make up a greater share of rural food expenditures (43 percent) than urban (27 percent). Teff alone constitutes 17 percent of urban food expenditures, while wheat, maize, and sorghum together constitute 29 percent of rural food expenditures. The urban food budget is dominated by expenditures on "other food items" (72 percent), including animal products, fruits, vegetables, and pulses. Although the share of the urban budget

TABLE 7.3 Per capita budget shares, consumption quantities, costs, and calorie shares of major staples, by rural–urban place of residence, 2004/05

Shares	Teff	Wheat	Barley	Maize	Sorghum	Other (including processed) cereals	Total cereals	*Enset*	Other food items	Total foods
Food expenditure shares (percent of total food expenditures)										
Rural	8	10	5	10	9	2	43	5	52	100
Urban	17	5	1	2	2	1	27	1	72	100
National	9	9	4	9	8	2	41	4	55	100
Food quantity (kilograms)										
Rural	20.1	31.2	14.3	42.2	35.9	8.1	151.7	47.2	133.9	332.9
Urban	61.4	20.2	3.8	10.4	9.3	32.2	137.2	6.0	126.0	269.3
National	25.9	29.6	12.8	37.7	32.2	11.4	149.6	41.4	132.9	323.8
Food quantity shares (percent of total kilograms of cereal and total kilograms of food)										
Rural	13	21	9	28	24	5	46	14	40	100
Urban	45	15	3	8	7	23	51	2	47	100
National	17	20	9	25	22	8	46	13	41	100

Food unit price (average expenditure per kilogram in ETB)[a]										
Rural	3.05	2.50	2.87	1.90	2.11	1.75	n.a.	0.89	n.a.	n.a.
Urban	2.43	2.16	2.47	1.62	1.74	0.25	n.a.	0.79	n.a.	n.a.
National	2.85	2.47	2.85	1.89	2.09	1.17	n.a.	0.89	n.a.	n.a.
Food calories shares (percent of total calorie consumption)										
Rural	8	13	6	18	15	3	64	9	27	100
Urban	30	10	2	5	5	11	64	1	35	100
National	11	13	6	17	14	4	64	8	28	100
Food calories (kilocalories per day)										
Rural	196.69	309.79	144.58	435.99	366.21	70.39	1,523.65	215.15	647.66	2,386.46
Urban	601.7	200.59	38.16	107.53	94.72	220.36	1,263.06	27.18	697.7	1,987.96
National	254.13	294.3	129.48	389.4	327.7	91.66	1,486.67	188.49	654.77	2,329.94

SOURCES: Authors' calculations based on HICES (2004/05). Calorie data are from HICES (2004/05) but calculated by Ethiopia, MoFED (2008).

NOTE: ETB = Ethiopian birr; n.a. = not available.

[a]Aggregate food unit prices not reported.

that is allocated to cereals is relatively low, the quantity share of cereal in the urban diet is 51 percent—5 percentage points higher than the rural and national shares. The source of this discrepancy between expenditure and quantity in the urban diet may be the relatively cheaper average unit prices of these cereals in urban areas than in rural ones. In every case, the urban average unit price is lower than the rural and national price for these staple goods (see Table 7.3).[6]

Consumption patterns differ not only across rural–urban locations but also across income groups in each area of residence. Figure 7.3 presents expenditure shares of major cereals in total food expenditures, disaggregated by the top 60 and bottom 40 percent of total food expenditures. This figure shows that the bottom 40 percent of rural income earners are among the largest consumers—in terms of budget share—of cereals in general and of maize, wheat, and sorghum in particular. Meanwhile, urban residents in the top 60 percent of total food expenditures are the smallest consumers of cereals. Note that the consumption share of cereals among urban residents in both income categories is much lower if processed cereals, which comprise a significant share of total food expenditures, are not included in the aggregation. It is also interesting to note that the top-earning 60 percent of rural residents consume, on average, relatively less total cereal than the bottom-earning 40 percent of urban residents. Overall, the lowest 40 percent of income earners—rural and urban combined—spend a greater share of their income on cereal than do the highest 60 percent of income earners; this pattern further indicates that expenditure shares of cereals decline as income increases.

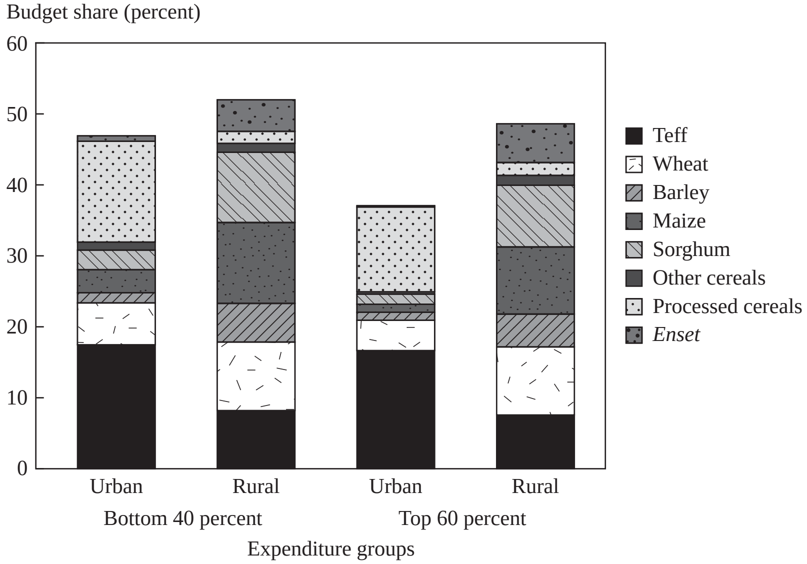
Closer examination of individual cereals within income groups across rural and urban places of residence (Table 7.4) shows that teff is an urban staple regardless of income level. Meanwhile, expenditure shares of wheat, maize, sorghum, and *enset* remain relatively consistent in rural areas across both income groups. These data indicate clear differences in consumption trends between rural and urban diets that we might expect to continue with the continued urbanization of Ethiopia.

Consumption Patterns across Agroecological Zones

Based on moisture levels and livelihood patterns, Ethiopia’s landscape can be classified into the following categories: humid agricultural highlands (further classified as cereal- and *enset*-growing areas), humid lowlands, arid and drought-prone areas, pastoralist lowlands, and densely populated urban areas (see Chapter 2 for more information). The 2004/05 HICES dataset shows considerable varia-

6. The extent of the discrepancy between the average urban and rural unit prices is surprising. As is discussed later, several food-deficit regions throughout Ethiopia import these key cereals from food-surplus regions. The significant difference in prices in the rural and urban areas implies that the cost of importing these cereals from food-surplus areas to food-deficit rural areas is, on average, greater than the cost of importing them to urban areas.

FIGURE 7.3 Share of major cereals in total food expenditures in Ethiopia, by income group and rural–urban place of residence, 2004/05



SOURCE: Authors' calculations based on HICES (2004/05).

TABLE 7.4 Share of major cereals in total food expenditures, by income group and rural–urban place of residence, 2004/05 (percent)

	Bottom 40		Top 60	
Cereal	Urban	Rural	Urban	Rural
Teff	17.3	7.9	16.4	7.3
Wheat	6.0	9.8	4.3	9.5
Barley	1.3	5.5	0.9	4.7
Maize	3.2	11.1	1.2	9.1
Sorghum	2.7	9.9	1.3	8.9
Other cereals	1.2	1.7	0.7	1.7
Processed cereals	14.3	1.3	11.6	1.6
Total cereals	46.0	47.3	36.4	43
Enset	0.9	4.4	0.3	5.5

SOURCE: Authors' calculations based on HICES (2004/05).

tion in consumption patterns across these agroecological zones. A snapshot of this variation is offered in Table 7.5, which presents per capita consumption shares of the total quantity of staple foods consumed by agroecology.

Generally, except in *enset*-growing areas, the five major cereals and their processed products account for more than 50 percent of the total quantity of food consumed in Ethiopia. The greatest consumption of cereal grains in the country is found in the pastoralist areas, where, followed by wheat and maize, the greatest quantities of sorghum are consumed, comprising 23 percent of total food expenditures. Traditionally, the lowland areas are known for growing maize and sorghum, while wheat is grown in the areas of the country that lie between 1,500 and 2,500 meters above sea level (EEA 2004). The high levels of wheat consumption in the lowland pastoralist areas may thus be due in part to food aid distribution in recent years.

The cereal-growing humid (rural) highlands and large cities are the second-greatest consumers of cereal grains, followed by the drought-prone areas. The three main cereal grains, teff, wheat, and maize, account for 36 percent of total food consumption in the humid cereal-growing highlands. Teff is the most important staple in urban Ethiopia, where *injera* is eaten at almost every meal. Sorghum and maize dominate food consumption in the humid lowlands (accounting for 16 percent each of total food consumption) and drought-prone areas (accounting for 17 percent and 13 percent of total food consumption, respectively). *Enset,* a root crop that grows predominantly in the humid high-

TABLE 7.5 Per capita share of the total quantity of cereals and *enset* consumed, by agroecological zone and rural–urban place of residence, 2004/05 (percent)

	Rural					Urban	
Cereal	Humid lowlands	Humid cereal-growing highlands	Humid *enset*-growing highlands	Drought-prone areas	Pastoralist areas	Small cities	Large cities
Teff	1.0	11.0	1.0	4.0	2.0	19.0	29.0
Wheat	1.0	12.0	4.0	11.0	20.0	9.0	6.0
Barley	1.0	6.0	1.0	5.0	0.0	2.0	1.0
Maize	16.0	13.0	12.0	13.0	15.0	5.0	1.0
Sorghum	16.0	9.0	6.0	17.0	23.0	5.0	1.0
Other (including processed) cereals	1.0	4.0	1.0	2.0	3.0	10.0	15.0
Total cereals	36.0	55.0	25.0	52.0	63.0	50.0	53.0
Enset	21.0	6.0	29.0	12.0	0.0	4.0	0.0

SOURCE: Authors' calculations based on HICES (2004/05).

NOTE: Large cities are Addis Ababa, Dire Dawa, and Harare; all other cities are categorized as small.

lands of the SNNPR and associated humid lowlands, is a major staple in those areas. Consequently, the humid *enset*-growing highlands have the lowest cereal consumption in per capita terms.

Consumption Patterns across Administrative Regions

Substantial variation in consumption patterns is also observed across administrative regions throughout Ethiopia. This variation hints at differences in ethnocultural preferences across the country as well as substantial interregional trade and price differentials. It also allows us to classify regions in terms of food sufficiency and calorie consumption.

Boundaries of the major regions in Ethiopia have been drawn largely on the basis of ethnicity; therefore, observation of consumption shares across those regions offers insight into ethnocultural preferences. Table 7.6 presents the shares of the five major cereals plus *enset* in households' total food expenditures, disaggregated by administrative region. The 2004/05 HICES data show substantial interregional variation. In general, Tigray allocates more than half of its food budget to cereal. Amhara, Dire Dawa, and Oromiya follow Tigray in allocating, respectively, 49.3, 45.3, and 45.0 percent of total food expenditures to the five major cereals. Teff accounts for the largest share of regional food expenditure in Amhara and Tigray regions; Addis Ababa is the highest consumer of this grain nationally. Wheat accounts for approximately 10 percent of the food budget in many regions, including Tigray, Amhara, Oromiya, Somali, and Afar; these regions are also among the largest food aid recipients of wheat in the country. In line with earlier findings, the expenditure share of processed cereals (and other cereals) is highest in the urban regions of Dire Dawa, Addis Ababa, and Harari. Overall, in addition to the urban regions, the lowland regions of Afar, Somali, Harari, and especially the SNNPR have the lowest consumption of cereals in Ethiopia. The SNNPR consumes more *enset* than any other region, while the food budgets in Afar, Somali, and Harari are concentrated on other food items, such as animal products and pulses.

Regional consumption patterns generally follow regional specialization in production. However, this is not the case for all grains. For example, in 2003/04, Oromiya was reported as the highest teff producer, in terms of both total and per capita production, after Amhara region (EEA 2004, 56). However, Oromiya's share of consumption expenditure on teff was 8 percent, a little less than the share of its expenditure on maize and wheat. In direct contrast, Afar, a region known in Ethiopia for its limited teff production potential, allocated higher budget shares to teff (10 percent) than did Oromiya. This indicates that there is substantial interregional trade in these grains as well as price differentials among regions. Meanwhile, consistent with its production potential, Benishangul-Gumuz is the highest consumer of sorghum in the country, followed by Tigray, which also has a great deal of sorghum production potential in its western lowlands.

TABLE 7.6 Annual per capita total expenditure, shares of major cereals and *enset* in total food expenditures, by region and rural–urban place of residence, 2004/05 (percent)

	Annual per capita food and nonfood expenditures (ETB)			Share in total food expenditures (percent)								
Region[a]	Rural	Urban[b]	Total	Teff	Wheat	Barley	Maize	Sorghum	Other (including processed) cereals	Total cereals	*Enset*	Other foods
Tigray	1,481	3,123	1,771	10.2	13.1	7.0	2.7	13.7	3.7	50.4	0.0	49.6
Afar	1,586	2,396	1,923	9.6	10.0	0.2	6.3	1.4	8.3	35.8	0.0	64.2
Amhara	1,469	2,307	1,548	12.8	10.4	6.7	5.3	9.6	4.5	49.3	0.0	50.7
Oromiya	1,641	2,583	1,737	8.2	9.6	4.7	10.8	7.9	3.8	45.0	4.9	59.9
Somali	1,462	2,041	1,651	1.0	9.7	0.8	7.0	8.1	10.8	37.4	0.0	62.6
B.-Gumuz	1,682	2,891	1,822	5.2	0.9	0.2	8.4	21.9	7.5	44.1	0.0	55.9
SNNPR	1,525	2,340	1,594	4.0	5.5	1.5	11.9	5.7	4.5	33.1	12.1	79.0
Harari	2,252	2,774	2,532	6.0	7.0	0.4	1.9	9.4	12.9	37.6	0.0	62.4
Addis Ababa	2,042	2,584	2,577	19.6	3.4	0.5	0.5	0.1	17.1	41.2	0.1	58.9
Dire Dawa	1,421	2,473	2,128	5.8	7.4	0.7	0.7	9.2	21.5	45.3	0.0	54.7

SOURCE: Authors' calculations based on HICES (2004/05).

NOTE: ETB = Ethiopian birr; SNNPR = Southern Nations, Nationalities, and People's Region.

[a]Data were not collected for Gambella region during the 2004/05 Household Income, Consumption, and Expenditure Survey.

[b]The "urban" category includes large urban centers and regional capitals as well as other urban centers and small towns.

The geography of food availability in Ethiopia can be classified into food-deficit areas, food-balanced areas, and food-surplus areas (Diao and Pratt 2007). Food-deficit *woredas* are those with cereal-equivalent output per rural household at levels 20 percent below the national average, food-balanced *woredas* are those with cereal-equivalent output at levels 80–120 percent of the national average, and food-surplus *woredas* are those with cereal-equivalent output at levels 20 percent greater than the national average. Based on the 2001/02 Agricultural Census Survey of Ethiopia, about 26 million Ethiopians (50 percent of the rural poor or 37 percent of the total rural population) live in food-deficit areas, where the average annual food availability, 530 kilograms per household, is only half the national average. In contrast, food availability in the food-surplus areas averages 1,800 kilograms per household, about 70 percent over the national average. Such disparities in food availability lead to differences in calorie consumption across regions and agroecologies (Diao and Pratt 2007).

A disaggregated analysis of the extent of calorie consumption by place of residence, agroecology, region, and income presents a better picture of the national food consumption pattern. Table 7.7 presents the daily per adult equivalent calorie intake in 2004/05 by region, while Table 7.8 disaggregates caloric intake and expenditures by income quintile, agroecology, and place of residence.

Compared with other regions, SNNPR has the highest total per adult equivalent calorie intake as well as the lowest expenditure per calorie consumed. The high-calorie-low-cost consumption pattern in SNNPR is largely due to the regional reliance on *enset*. Oromiya closely follows SNNPR with high per adult calorie consumption and relatively low cost per calorie. It should also be noted

TABLE 7.7 Calories consumed and the cost of calories, by region 2004/05

Region	Population (millions)	Annual per capita expenditure on cereals and *enset* (ETB)	Total calories per adult equivalent, per day	Cost per 1,000 calories (ETB)
Tigray	4.2	387.9	2,619	1.00
Afar	0.2	317.5	2,548	1.16
Amhara	16.7	385.3	2,638	1.00
Oromiya	25.7	445.1	3,103	1.00
Somale	0.7	328.6	2,706	1.11
B.-Gumuz	0.8	403.4	2,684	1.15
SNNPR	13.5	344.7	3,155	0.83
Harari	0.2	404.6	2,768	1.31
Addis Ababa	2.4	336.7	2,157	1.17
Dire Dawa	0.3	427.4	2,437	1.26

SOURCE: Authors' calculations based on HICES (2004/05).

NOTE: ETB = Ethiopian birr; SNNPR = Southern Nations, Nationalities, and People's Region.

TABLE 7.8 Calories consumed and the cost of calories, by income quintile, agroecological zone, and rural-urban residence, 2004/05

	Population (millions)	Annual per capita expenditure on cereals and *enset* (ETB)	Total calories per adult equivalent, per day	Cost per 1000 calories (ETB)
National	64.5	398.6	2,907	1.00
Income quintile				
Quintile 1	16.8	318.4	1,948	1.10
Quintile 2	14.8	372.5	2,707	0.97
Quintile 3	13.0	422.7	3,273	0.89
Quintile 4	11.3	432.6	3,480	0.87
Quintile 5	8.5	449.7	3,716	0.88
Agro-ecological zones				
Humid lowland	0.9	368.9	2,857	0.90
Humid highland (cereals)	29.6	414.8	2,813	1.02
Humid highland (enset)	12.0	344.3	3,198	0.84
Drought prone	21.0	409.2	2,890	0.99
Pastoralist areas	1.0	374.1	2,632	1.17
Urban–rural				
Urban	9.1	360.713	2,340	1.23
Rural	55.3	404.817	3,007	0.94

SOURCE: Authors' calculations based on HICES (2004/05, n. 12).

NOTES: The calorie conversion units are obtained from the Ethiopian Health and Nutrition Research Institute (EHNRI). Schmidt and Dorosh (2009) compared these conversion units against Food and Agriculture Organization conversion factors and found little variation between them. Note, however, that because the Household Income, Consumption, and Expenditure Survey (HICES) dataset contains household-level data, the calories reported here are computed by aggregating food items into 18 categories and taking the average calorie conversion units for each category of foods consumed by each household. Our estimates, although crude, are close to the estimates of Ethiopia, CSA (2007). ETB = Ethiopian birr.

that the SNNPR and Oromiya are home to 61 percent of Ethiopia's total population. In contrast, the regions dominated by urban cities, such as Addis Ababa, Dire Dawa, and Harari, have the lowest per capita calorie intake. In fact, overall, rural areas have higher calorie intake than do urban areas. This may be due to the fact that rural dwellers' consumption of maize and sorghum is much higher than that of urban residents, whose food consumption patterns are more concentrated on teff, a more expensive crop that offers fewer calories per gram than sorghum or maize. The cost per calorie of food consumed in urban areas is also greater than that in other regions.

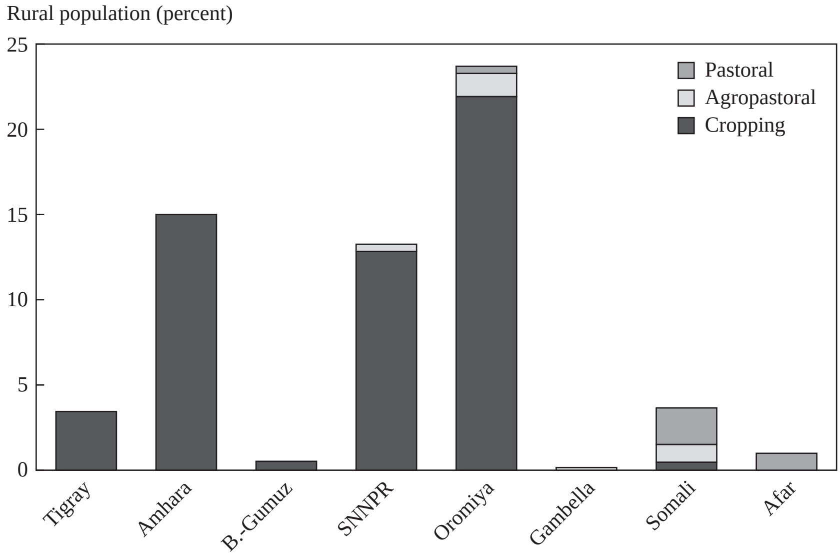
Similar to the way that calorie intake varies regionally, it also varies by agroecology, with the humid *enset*-producing highlands recording the highest level of calorie intake per day. In 2004/05, per adult equivalent calorie intake is second highest in the drought-prone areas of the country, though it should be noted that 2004/05 was a year of good rainfall and cereal harvests. Among agroecological zones, the pastoralist areas have the lowest levels of calorie intake per day; however, the average urban household consumes even fewer calories than the average rural household, regardless of agroecological zone. The level of calorie intake improves significantly, though at a decreasing rate, with the economic status of the households. For instance, households in the second income quintile have per adult equivalent calorie intake levels that were greater by 39 percent than those of the households in the lowest quintile, while households in the fourth quintile have caloric intake levels only 6 percent greater than those in the third quintile.

Rural Consumption by Livelihood

A closer look at consumption patterns among the rural populations of Ethiopia can be attained by disaggregation of households by livelihood: agropastoral, pastoral, and cropping households. The majority of agropastoral households are found in Oromiya (which has 44 percent of the total agropastoral population), Somali (34 percent), and the SNNPR (13 percent), while pastoral households are found predominantly in Somali (which has 59 percent of the total pastoral population), Afar (28 percent), and Oromiya (13 percent). The remaining rural population is dominated by cropping households, which make up 90 percent of the total rural population and are concentrated in Oromiya, Amhara, the SNNPR, and Tigray. See Figures 7.4, 7.5, and 7.6 for breakdowns of livelihood groups by region.

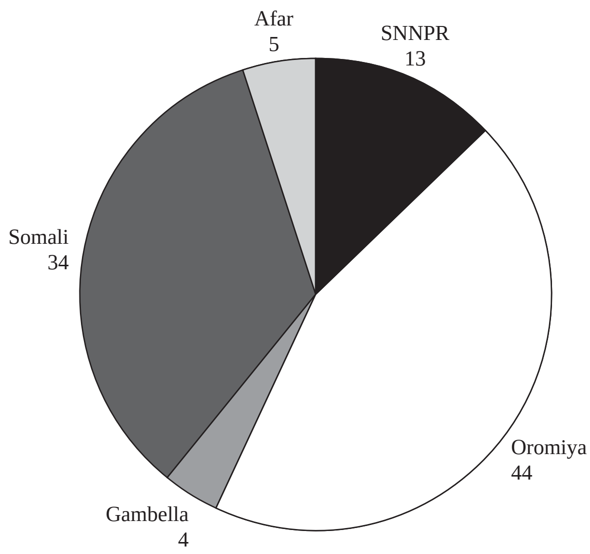
Among the cropping, agropastoral, and pastoral households we see significant differences in reliance on own production, the market, and aid for food consumption (Table 7.9). Overall, cropping households consume over 75 percent of their calories from their own crops, meat, and dairy production and have the lowest reliance on food aid and gifts among rural households. However, relative reliance on own production, the market, and aid differs by region. Cropping households in the less populous regions of Tigray, Somali, Gambella, and Benishangul-Gumuz have greater reliance on aid and gifts than do those in the more populous regions. Meanwhile, agropastoral households consume over 66 percent of their calories from their own crop (50.3 percent), meat, and dairy (16.2 percent) production; however, households in Somali region consume substantially more from their own meat and milk production (22 percent) than do those in Oromiya (10.5 percent) and Afar (15.4 percent). The agropastoral households in the less populated Afar region are more reliant on food aid for food consumption, while those in Somali

FIGURE 7.4 Distribution of rural population, by region and livelihood, 2008



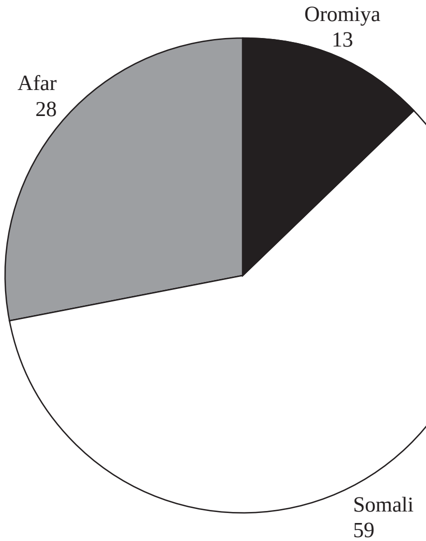
SOURCE: Authors' calculations based on LIU (2008).
NOTE: SNNPR = Southern Nations, Nationalities, and People's Region.

FIGURE 7.5 Ethiopia's rural agropastoral population, by region, 2008



SOURCE: Authors' calculations based on LIU (2008).
NOTES: The estimated total rural agropastoral population is 2.93 million. SNNPR = Southern Nations, Nationalities, and People's Region.

FIGURE 7.6 Ethiopia's rural pastoral population, by region, 2008



SOURCE: Authors' calculations based on LIU (2008).
NOTE: The estimated total rural pastoral population is 3.71 million.

region draw more on gifts than do the other regions. Pastoral households, lacking crop production, are heavily reliant on their own milk and meat production (38.4 percent overall) and purchases (55.3 percent). In addition, pastoralists in Afar region derive a relatively large proportion (18.6 percent) of their total calorie consumption from food aid.

Restriction of the data to rural households classified as poor and very poor (Table 7.10) shows that these groups have an even greater reliance on the market (as high as 72.5 percent among pastoralists in Oromiya), food aid, and gifts. Poor and very poor agropastoralists consume fewer calories from either source of own production (crops or milk and meat) than do nonpoor households in the same livelihood category, and an even greater reduction in consumption of own production is observed among the poor and very poor pastoralists relative to nonpoor households in the same livelihood category.

Overall, the values in Tables 7.9 and 7.10 paint a picture of vulnerability as well as resilience. Reliance on markets can be a source of vulnerability in the case of price rises or market failures. Reliance on households' own production can be a source of vulnerability in the cases of crop failures, droughts, pests, livestock diseases, and so on. And reliance on food aid and gifts is evidence of such failures in the past. However, the diversity of sources of food observed

TABLE 7.9 Source of rural food consumption, by livelihood zone and region, 2008

		Percent of minimum calories per person per year						
Livelihood zone, region	Population (millions)	Own crops	Own milk and meat	Payment in kind	Purchased	Food aid	Gifts, other	Total
Cropping	54.63	72.70	3.50	1.10	24.00	2.50	0.10	103.90
Tigray	3.47	59.70	2.80	1.10	29.30	7.80	0.00	100.60
Amhara	15.00	73.90	2.40	0.80	23.20	2.60	0.00	103.00
B.-Gumuz	0.57	75.10	5.40	0.10	21.50	0.00	2.50	104.60
SNNPR	12.87	72.50	3.60	2.40	21.00	2.70	0.00	102.30
Oromiya	22.01	74.60	4.10	0.60	25.20	1.40	0.10	105.90
Gambella	0.11	72.80	1.60	0.00	21.00	0.00	7.40	102.80
Somali	0.58	52.10	6.50	0.00	35.30	5.90	2.00	101.70
Agropastoral	2.93	50.30	16.20	0.10	32.90	4.10	1.80	105.40
SNNPR	0.37	32.60	19.60	0.10	40.60	5.10	2.00	99.90
Oromiya	1.29	56.40	10.50	0.00	35.10	3.70	0.70	106.30
Gambella	0.12	59.40	19.10	0.00	20.50	0.00	7.10	106.10
Somali	1.00	47.40	22.10	0.00	30.10	3.40	2.70	105.80
Afar	0.15	53.60	15.40	1.00	23.50	13.50	0.50	107.40
Pastoral	3.71	0.00	38.40	0.10	55.30	8.10	2.70	104.50
Oromiya	0.48	0.00	21.90	0.00	69.70	6.80	3.60	102.00
Somali	2.18	0.00	41.50	0.10	57.20	3.20	2.70	104.80
Afar	1.05	0.00	39.50	0.00	44.90	18.60	2.10	105.10
Total	61.3	67.30	6.20	1.00	26.30	2.90	0.30	104.00

SOURCE: Author's calculations based on LIU (2008).

NOTE: SNNPR = Southern Nations, Nationalities, and People's Region.

TABLE 7.10 Source of rural food consumption by the very poor and poor, 2008

		Percent of minimum calories per person per year						
Livelihood zone, region	Population (millions)	Own crops	Own milk and meat	Payment in kind	Purchased	Food aid	Gifts, other	Total
Cropping	54.63	56.5	1.1	2.6	33.8	5.2	0.2	99.4
Tigray	3.47	44.8	0.7	1.6	38.0	11.2	0.0	96.3
Amhara	15.00	56.1	0.4	1.6	34.7	6.0	0.0	98.8
B.-Gumuz	0.57	58.1	0.9	0.4	36.9	0.0	4.9	101.2
SNNPR	12.87	60.2	1.3	6.3	25.4	5.6	0.0	98.8
Oromiya	22.01	57.1	1.5	1.6	36.9	3.5	0.1	100.7
Gambella	0.11	62.3	0.6	0.0	28.3	0.0	8.8	100.0
Somali	0.58	43.5	3.2	0.0	35.8	9.4	6.4	98.2
Agropastoral	2.93	44.3	5.5	0.2	38.3	8.0	4.6	100.8
SNNPR	0.37	33.2	10.1	0.5	36.7	9.7	4.4	94.6
Oromiya	1.29	44.7	3.5	0.0	42.8	8.7	1.4	101.1
Gambella	0.12	50.5	8.0	0.0	31.4	0.0	12.7	102.6
Somali	1.00	45.0	7.7	0.0	32.3	5.6	10.5	101.0
Afar	0.15	46.8	7.7	2.8	28.7	16.0	1.3	103.3
Pastoral	3.71	0.0	15.1	0.2	62.5	13.0	8.5	99.2
Oromiya	0.48	0.0	3.2	0.0	72.5	14.6	7.8	98.1
Somali	2.18	0.0	19.3	0.4	65.6	5.8	9.0	100.0
Afar	1.05	0.0	14.5	0.0	47.4	28.5	7.8	98.3
Total	61.3	53.2	1.9	2.4	35.4	5.7	0.7	99.4

SOURCE: Authors' calculations based on LIU (2008).

NOTE: SNNPR = Southern Nations, Nationalities, and People's Region.

here points to rural households' resilience and ability to adapt in the case of failure of any one source.

Temporal Trends in Consumption

Spatial analysis of food consumption in Ethiopia has offered insight into demand, consumption, and food security patterns by place of residence, region, agroecology, income, and livelihood. Analysis of changes in consumption patterns over time offers insight into recent trends in demand, consumption, and food security across the country.

Drawing on data from the last three HICES (1994/95, 1999/2000, and 2004/05), Figure 7.7 presents the shares in household expenditures of the five major cereal grains for which disaggregated data are available (in addition to the category "other cereals") across the three available data points. The figure shows that the share of cereal grains in total consumption expenditures fell, then rose, over the data points considered. However, the trends for individual cereal grains varied substantially. Specifically, the share of teff declined between 1999/2000 and 2004/05, while shares of maize, sorghum, barley, and wheat rose over the same period. Overall, these trends (1999/2000–2004/05) show a shift toward greater allocation of household food budgets to the lower-cost, higher-calorie grains (maize, sorghum, barley, and wheat) and away from the lower-calorie, higher-cost grain (teff).

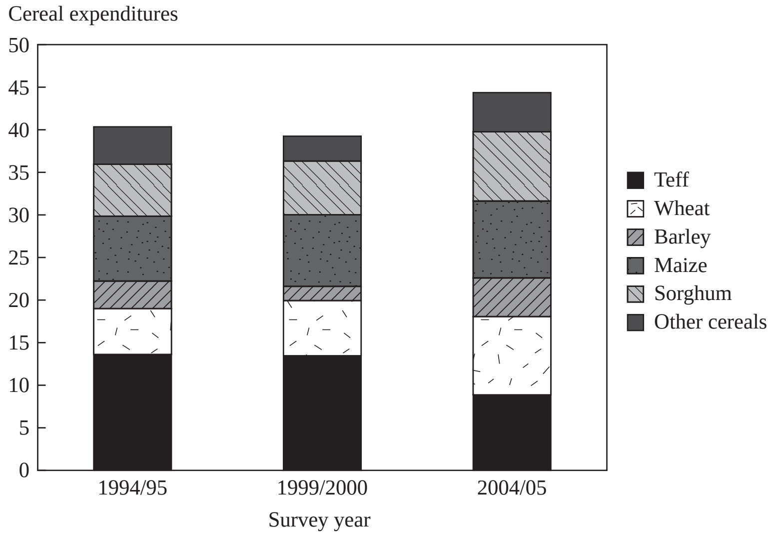
Note that Figure 7.7 is based on national average consumption shares over time and therefore masks differences across income groups. Figure 7.8 therefore disaggregates these trends by income quintiles; these data confirm the finding reported earlier—that households, even among the wealthiest quintile, have shifted away from teff expenditures toward expenditures on other grains.

Also, as seen earlier and consistent with the Engel curve, cereal consumption declined from the first to the fifth quintile, while the role of teff as an income-elastic luxury good among wealthy households was evident in the 1999/2000 and 1994/95 survey years. Barley took the lowest share of the household budget across all years and income quintiles.

The available data on calorie consumption across time confirm that rising incomes, as well as the shift toward expenditures on higher-calorie staples, have resulted in greater caloric intake. At the national level, there was a remarkable increase (about 40 percent) in calorie consumption across the period 1994/95–2004/05 (Table 7.11). However, the increase varied by place of residence and region. The percentage of change from 1994/95 to 2004/05 shows that there was an increase in calorie intake in every region except urban Afar. The greatest increases were observed in the SNNPR (with a 61 percent increase in per capita calorie consumption) and Benishangul-Gumuz (45 percent). Overall, calorie consumption rose by 44 percent in rural and 16 percent in urban areas.

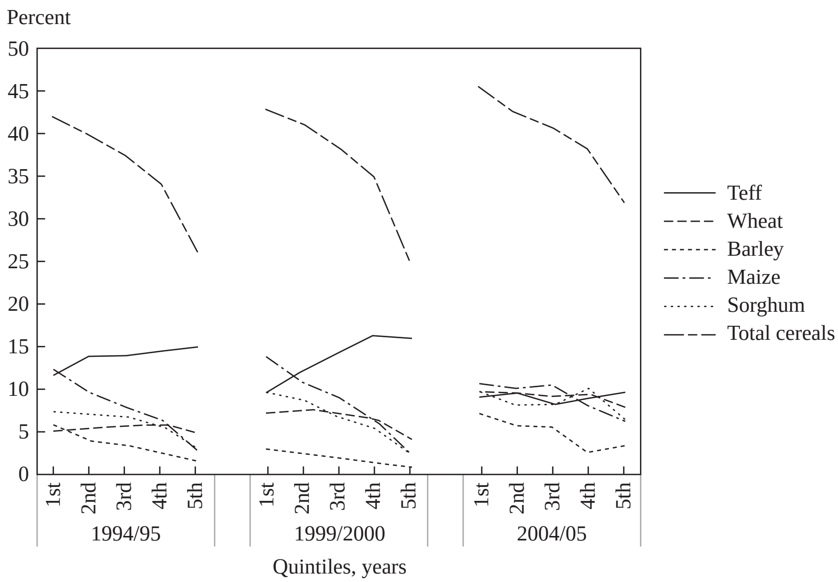
These trends imply that there is increasing consumption and food security throughout the country over time. Indeed, other analyses confirm these implica-

FIGURE 7.7 Share of major cereals in total food expenditures, 1994/95, 1999/2000, and 2004/05



SOURCE: Authors' calculations based on HICES (2004/05).

FIGURE 7.8 Share of major cereals in total food expenditures across income quintiles, 1994/95, 1999/2000, and 2004/05



SOURCE: Authors' calculations based on HICES (2004/05).

TABLE 7.11 Consumption of calories per adult equivalent per day, by region and rural–urban place of residence, 1994/95, 1999/2000, and 2004/05

	Calories per day consumed									Change between 1994/95 and 2004/05 (percent)		
	1994/95			1999/2000			2004/05					
Region	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total
Tigray	1,902	1,734	1,876	2,529	1,811	2,422	2,613	2,368	2,570	37	36	36
Afar	2,055	2,569	2,240	1,852	1,990	1,892	2,594	2,347	2,492	26	–8	11
Amhara	1,957	2,107	1,975	2,613	1,929	2,550	2,530	2,298	2,508	29	9	26
Oromiya	2,004	2,126	2,016	2,798	1,736	2,688	2,936	2,516	2,893	46	18	43
Somali	2,109	2,417	2,144	2,272	1,991	2,175	2,711	2,718	2,713	28	12	26
B.-Gumuz	1,767	2,341	1,801	2,665	2,110	2,627	2,649	2,438	2,625	49	44	45
SNNPR	1,800	2,039	1,817	2,815	1,915	2,753	2,964	2,524	2,926	64	23	61
Gambella	1,917	1,650	1,801	2,563	1,981	2,417	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Harari	2,488	2,085	2,268	2,759	1,882	2,286	3,229	2,274	2,715	29	9	19
Addis Ababa	2,014	1,993	1,993	2,409	1,906	1,917	2,756	2,233	2,239	36	12	12
Dire Dawa	1,814	1,831	1,824	2,528	1,929	2,104	2,923	2,172	2,418	61	18	32
Total	1,938	2,050	1,953	2,722	1,860	2,606	2,805	2,386	2,746	44	16	40

SOURCE: Ethiopia, MoFED (2008), based on HICES (2004/05).

NOTE: SNNPR = Southern Nations, Nationalities, and People's Region.

TABLE 7.12 Ethiopia Regional Hunger Index and underlying components, by region and rural–urban place of residence, 2000 and 2005

Place of residence, region	Prevalence of calorie undernourishment (percent)		Prevalence of underweight among children under 5 years (percent)		Under-5 mortality rate (percent)		Regional Hunger Index	
	2000	2005	2000	2005	2000	2005	2000	2005
Rural–urban place of residence								
Large urban	73.5	53.1	16.0	12.8	12.1	7.8	33.5	24.6
Small urban	85.4	51.9	41.4	27.1	16.1	10.6	47.6	29.9
Rural	63.4	45.0	48.5	39.5	19.0	13.3	43.6	32.6
Region								
Addis Ababa	72.9	53.3	14.1	11.0	11.4	7.2	32.8	23.8
Harari	65.2	47.6	27.1	26.7	19.1	10.3	37.1	28.2
Oromiya	61.1	42.3	42.4	34.4	19.4	12.2	41.0	29.6
SNNPR	77.6	45.5	53.7	34.7	19.2	14.2	50.1	31.5
Dire Dawa	68.5	51.3	30.8	29.6	17.6	13.6	39.0	31.5
Amhara	60.3	47.1	51.8	48.9	18.3	15.4	43.5	37.1
Tigray	72.6	59.3	47.9	41.9	16.9	10.6	45.8	37.3
B.-Gumuz	60.1	53.6	42.3	44.6	19.8	15.7	40.7	38.0
Ethiopia	65.9	46.0	47.2	38.4	18.8	13.2	43.9	32.5

SOURCE: Replicated from Schmidt and Dorosh (2009); the authors used data from HICES (1999/2000, 2004/05) and EDHS (1999/2000, 2004/05).

NOTE: SNNPR = Southern Nations, Nationalities, and People's Region.

tions (Table 7.12). In particular, the Ethiopia Regional Hunger Index (ERHI) (Schmidt and Dorosh 2009), which draws on the HICES as well as the Ethiopia Demographic and Health Surveys for 1999–2000 and 2004–05, shows that hunger, as measured by the proportion of undernourished adults, the proportion of underweight children, and the child mortality rate, declined across the country between 1999 and 2005 by 26 percent (from 43.9 to 32.5). The effect was greater in urban than in rural areas: in small urban areas the index fell from 47.6 to 29.9, and in large urban areas it fell from 33.5 to 24.6, while in rural areas it fell from 43.6 to 32.6.[7]

Regionally, the greatest reductions in hunger were observed in the SNNPR, which showed a 37 percent reduction, from 50.1 to 31.5, and Oromiya, with a 28 percent reduction, from 41.0 to 29.6. However, it is important to note that, despite these dramatic reductions in hunger, all regions in Ethiopia—both rural

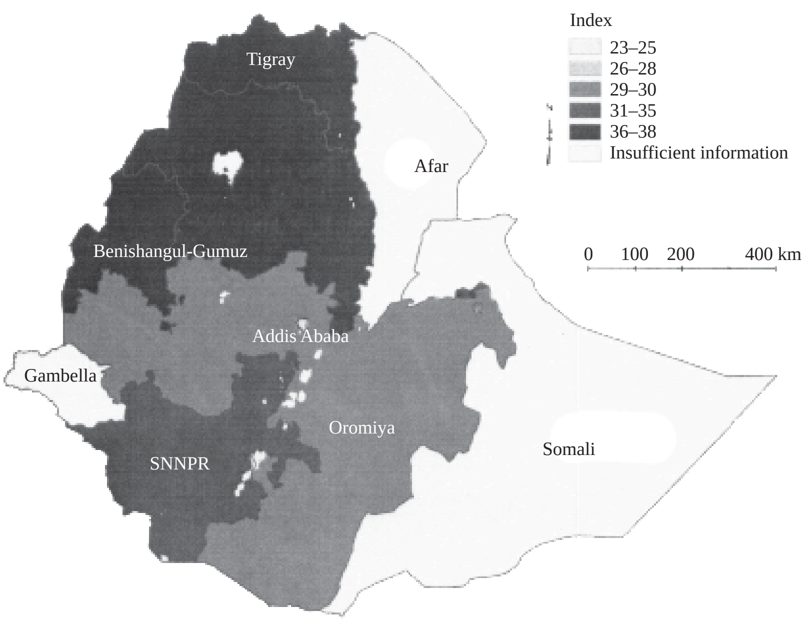
7. The ERHI data cover six of the nine administration regions of Ethiopia. The data do not include Gambella or the nonsedentary populations of Afar and Somali.

and urban—have very high values for the hunger index. Using the cutoffs from the Global Hunger Index (von Grebmer et al. 2010), all of Ethiopia falls into the "alarming" (20.0–29.9) or the "extremely alarming" (greater than 30.0) category (Figure 7.9). In fact, the smallest reductions in hunger were observed in the regions with hunger indexes categorized as "most alarming" according to the Global Hunger Index cutoffs: Benishangul-Gumuz (ERHI of 38.0), Tigray (37.3), and Amhara (37.1).

Conclusions

The wide diversity in consumption patterns across regions and the tendency of nearly all household groups to consume a variety of cereals (as well as *enset*, especially in the SNNPR), reduces reliance on a single staple and thereby reduces the risks associated with the failure of a single crop. For pastoralists and agropastoralists in dry lowland parts of Ethiopia, livestock products (including dairy) are a major source of calories and incomes, but both poor and non-poor households purchase a large share of their food.

FIGURE 7.9 Ethiopia Regional Hunger Index, 2005



SOURCE: Schmidt and Dorosh (2009).
NOTE: SNNPR = Southern Nations, Nationalities, and People's Region.

Overall, calorie consumption and food security across Ethiopia have increased. Per capita intake of calories is higher in rural than in urban areas, because urban consumption is concentrated on teff, which has a lower calorie content. Additionally, among agroecological zones in rural areas, the pastoralist areas have the lowest calorie intake levels. The share of food expenditures in total expenditures remains fairly high but has declined over time and declines more dramatically in urban than in rural households with rising incomes. Although additional data are needed to ascertain the extent to which the trends observed here have continued since 2005, it is reasonable to expect that, as household incomes continue to grow, food security will continue to increase while the portion of money spent on food, and on cereals in particular, will continue to decline, consistent with the trends we have observed.

These consumption patterns have important implications for agricultural growth and development policies in Ethiopia. Specifically, without growth in the industrial sector, continued agricultural growth will not be sustained by domestic agricultural demand alone—especially with continued urbanization of the country.

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PART II

Major Agricultural and Food Policy Interventions in Ethiopia

8 Implications of Accelerated Agricultural Growth for Household Incomes and Poverty in Ethiopia: A General Equilibrium Analysis

PAUL DOROSH AND JAMES THURLOW

Ethiopia's economy has experienced rapid growth in recent years. Although growth in agricultural gross domestic product (GDP) from 1998 to 2007 was less rapid than in other parts of the economy, agriculture also performed well, growing faster than the rural population. However, poverty is still severe in Ethiopia and is concentrated in rural areas. To accelerate growth and poverty reduction, Ethiopia's national strategy affords an important role to agriculture as a source of both growth and development for the broader economy. This is essential given that agriculture is an income source for most of the population. The sector accounts for more than two-fifths of GDP and three-fourths of merchandise export earnings, and it provides key inputs into the manufacturing sectors, whose agricultural processing sectors contribute further to national GDP. In parallel to Ethiopia's agricultural strategy, the New Economic Partnership for Africa's Development (NEPAD) is in the process of implementing the Comprehensive Africa Agriculture Development Programme (CAADP) together with African governments. The CAADP initiative supports the identification of an integrated framework of development priorities aimed at restoring agricultural growth, rural development, and food security in the African region. The main target of CAADP is achieving 6 percent agricultural growth per year in low-income African countries like Ethiopia.

Because choices are involved within the agricultural sector, both for the sector as a whole and across subsectors, many investment and policy interventions will be designed at the subsector level. However, strong interlinkages occur across subsectors and between agriculture and the rest of the economy. To understand these linkages and how sectoral growth could contribute to the country's broad development goals, an integrated framework is needed in order to synergize the growth projections among different agricultural commodities or subsectors and evaluate their combined effects on economic growth and poverty reduction.

Moreover, agricultural production growth is often constrained by demand in both domestic and export markets, and demand, in turn, depends on income growth both in agriculture and in the broader economy. Although agriculture is a dominant economic activity in Ethiopia and a majority of the population lives in rural areas, both rural and urban sectors need to be included in this framework in order to understand the economywide impact of agricultural growth.

This chapter analyzes agricultural growth projections that can support the design of a more comprehensive rural development component under Ethiopia's agricultural strategy that is also in alignment with the principles and objectives collectively defined by African countries as part of the broader NEPAD agenda. In particular, this chapter seeks to position Ethiopia's agricultural sector and rural economy within the country's national strategy. For these purposes, and to assist policymakers and other stakeholders to make informed long-term decisions, a new economywide model for Ethiopia has been developed and used to analyze the linkages and trade-offs between economic growth and poverty reduction at both macro- and microeconomic levels. The results from the model simulations are intended to guide debate in prioritizing the potential contributions of different subsectors to Ethiopia's achievement of its broader development objectives.

Modeling Sources of Agricultural Growth and Poverty Reduction

The Dynamic Regional Economywide Model of Ethiopia

A new Ethiopian computable general equilibrium (CGE) model was developed to capture (1) trade-offs and synergies from accelerating growth in alternative agricultural subsectors, (2) the economic interlinkages between agriculture and the rest of the economy, and (3) the effects of alternative sources of growth on household incomes and poverty. This model is called the Dynamic Regional Economywide Model of Ethiopia (DREME).[1] Although this chapter focuses on the agricultural sector, DREME also contains information on the nonagricultural sectors. In total, DREME identifies 69 subsectors, 24 of which are in agriculture (Table 8.1). Agricultural crops fall into five broad groups: (1) cereals, which is separated into teff, barley, wheat, maize, sorghum, and millet; (2) pulses and oilseeds, which is separated into pulses, such as beans, and oilseed crops, such as groundnuts; (3) horticulture, which is separated into fruits, vegetables, and *enset;* (4) higher-value export-oriented crops, which is separated into cotton, sugarcane, tobacco, coffee, tea, and cut flowers; and (5) other crops, which includes *chat* and other staples such as root crops. DREME also identifies four livestock subsectors, including cattle, milk, poultry, and other animal products.

1. The core model is described in detail in Diao and Thurlow (2012). See Table 8A.1 in the appendix for the model sets, parameters, and variables and Table 8A.2 for the model equations. Earlier CGE models for Ethiopia, however, have not included detailed disaggregation of the agriculture sector or of households by region (for example, Gelan 2002; Lofgren and Diaz-Bonilla 2005). See Diao and Nin Pratt (2007), where a fixed-price multiplier analysis using a 1999/2000 social accounting matrix of Ethiopia is combined with a detailed regionally disaggregated multimarket model to analyze the growth and poverty implications of alternative production scenarios.

TABLE 8.1 Sectors in the Dynamic Regional Economywide Model of Ethiopia

Groups (number of sectors in group)	Sectors
Cereals (5)	Teff, barley, wheat, maize, sorghum
Pulses and oilseeds (2)	Pulses, oilseeds
Horticulture (3)	Vegetables, fruits, *enset*
Export crops (6)	Cotton, sugarcane, tea, tobacco, coffee, cut flowers
Other crops (2)	*Chat*, other crops
Livestock (4)	Cattle, milk, poultry, animal products
Other agriculture (2)	Fisheries, forestry
Agroprocessing (10)	Meat, dairy, vegetable products, grain milling, milling services, sugar refining, tea processing, other food processing, beverages, tobacco processing
Other manufacturing (18)	Textiles, yarn, fibers, lint, clothing, leather products, wood products, paper and publishing, petroleum, fertilizer, chemicals, non–metallic minerals, metals, metal products, machinery, vehicles and transport equipment, electronic equipment, other manufacturing
Other industry (6)	Coal, natural gas, other mining, electricity, water, construction
Services (11)	Wholesale and retail trade, hotels and catering, transport, communications, financial services, business services, real estate, other private services, public administration, education, health

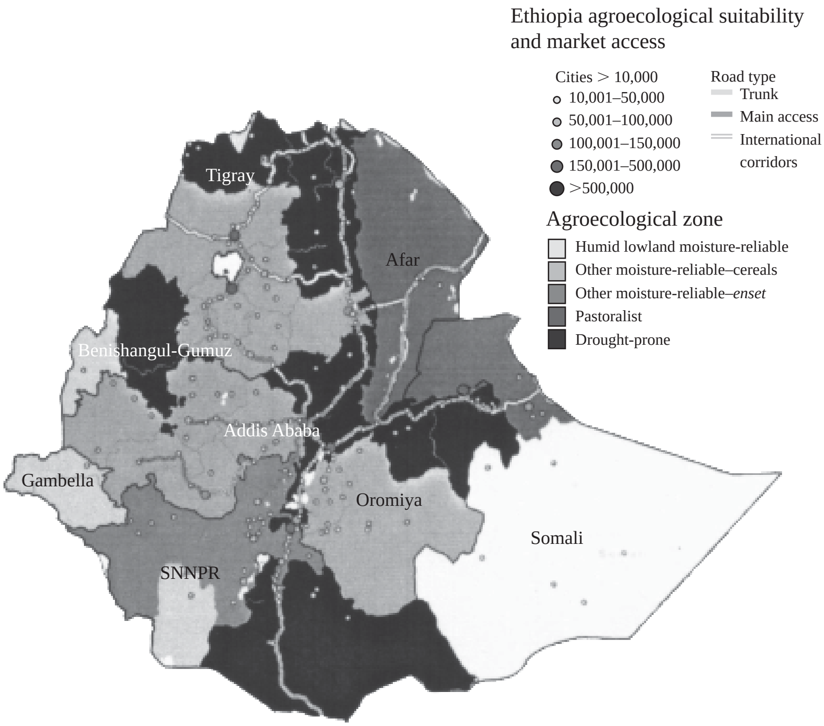
SOURCE: Dynamic Regional Economywide Model of Ethiopia (DREME).

To complete the agricultural sector, DREME has two further subsectors capturing forestry and fisheries. Most of the agricultural commodities listed are not only exported or consumed by households but are also used as inputs into various processing activities in the manufacturing sector. The agricultural processing sectors identified in the model range from meat, fish, and dairy to grain milling and sugar refining. The agricultural subsectors also use inputs from nonagricultural sectors, such as fertilizer from the fertilizer subsector and marketing services from the trade and transport subsectors.

DREME captures regional heterogeneity within Ethiopia. Farm production is disaggregated across four rural zones, as shown in Figure 8.1.These are Zone 1a ("humid lowland moisture-reliable" and "other moisture-reliable–cereals"), Zone 1b ("other moisture-reliable–*enset*"), Zone 2 ("drought-prone"), and Zone 3 ("pastoralist"). These zones reflect different agroecological and climatic conditions across the country.

DREME is calibrated to observed cropping patterns in each of the four zones. Representative farmers in each zone respond to changes in production technology and to commodity demand and prices by reallocating their land

FIGURE 8.1 Zones in the Dynamic Regional Economywide Model of Ethiopia (DREME), with city sizes, road types, and agroecological zones indicated, 2009



SOURCE: Ahmed et al. (2009).
NOTE: Zone 1a includes "humid lowland moisture-reliable" and "other moisture-reliable–cereals"; Zone 1b is "other moisture-reliable–*enset*"; Zone 2 is "drought-prone"; and Zone 3 is "pastoralist."

across different crops in order to maximize incomes. These farmers also reallocate their labor and capital between farm and nonfarm activities, including livestock and fishing, wage employment, and diversification into nonagricultural sectors, such as transport, trade, and construction. Thus, by capturing production information across subnational regions, DREME combines the national or macroeconomic consistency of an economywide model with zonal-level production models. DREME is thus an ideal tool for capturing the growth linkages and income and price effects resulting from accelerating growth in different agricultural sectors.

Finally, DREME endogenously estimates the impact of growth on household incomes and poverty. There are 12 representative household groups in the model, disaggregated by rural zones, small or large urban centers, and poor or nonpoor status. *Poor* is defined here as including all households falling into the bottom two expenditure quintiles (that is, the poorest 40 percent of the population).[2] Household income elasticities are based on estimates from the 2004/05 Household Income, Consumption, and Expenditure Survey (HICES) (Ethiopia, CSA 2007; Table 8.2).[3]

Each household questioned in the 2004/05 HICES is directly linked to the corresponding representative household in the model. This is the microsimulation component of DREME. In this formulation of the model, changes in representative households' consumption and prices in the CGE model component are passed down to their corresponding households in the survey, where total consumption expenditures are recalculated. This new level of per capita expenditure for each survey household is compared to the separate poverty lines for rural and urban areas, and standard poverty measures are recalculated. Thus, poverty is measured in exactly the same way as in standard poverty estimates, and changes in poverty draw on the consumption patterns, income distribution, and poverty rates captured in the latest household income and expenditure survey.

Data Sources for the Model

The core dataset capturing the economic structure of the Ethiopian economy is the 2005/06 social accounting matrix (SAM) developed by the Ethiopian Development Research Institute (EDRI) (Ahmed et al. 2009). This SAM includes four agroecological zones and a detailed regional disaggregation of household groups. Zonal-level agricultural production and area data taken from the 2005/06 agricultural sample survey were used to identify the four zones and to disaggregate production in the SAM. DREME is therefore consistent with recent agricultural production levels and yields at the zonal level.

Poverty Reduction on Ethiopia's Current Growth Path

We use DREME to examine the impact of Ethiopia's current growth path on poverty reduction. This "business-as-usual" scenario draws on production trends for various agricultural and nonagricultural subsectors. Ethiopia experienced rapid growth from 1998 to 2007, with national GDP growing at almost 8 percent

2. Given this definition of poverty, we then use the cutoff level of per capita expenditures that defines poor and nonpoor households (separately for rural and urban areas) as the poverty line in the subsequent simulations.

3. The income elasticities in Chapter 7 are based on an estimated almost ideal demand system. We follow King and Byerlee (1978) instead because their approach is more consistent with the linear expenditure demand system in the DREME model. Moreover, as is evident from Table 8.2, we use stylized elasticities because the econometrically estimated results cannot always be used in our demand system (for example, negative "inferior good" elasticities cannot be used in the model). That said, the two sets of elasticities are broadly consistent and, over the short time frame of our analysis (10 years), are unlikely to greatly influence our conclusions. Finally, we choose to use these elasticities for consistency with the original analysis done as part of the CAADP review process.

TABLE 8.2 Selected income elasticities of goods and services in the Dynamic Regional Economywide Model of Ethiopia, by rural–urban place of residence, 2004/05

Good or service	Rural	Urban	Product or service	Rural	Urban
Maize	0.70	0.50	Cattle meat	0.80	0.80
Wheat	1.00	0.66	Poultry	0.75	1.15
Teff	1.10	0.70	Milk	0.75	0.75
Other cereals	0.70	0.50	Other meats	0.50	0.50
Root crops	0.50	0.70	Fish	0.70	0.70
Pulses	0.75	0.60	Processed foods	0.80	0.90
Oilseeds	0.80	0.50	Beverages	0.50	0.80
Enset	0.70	0.50	Textiles	1.20	1.00
Vegetables	0.50	0.75	Other manufactures	1.20	1.00
Fruits	0.50	0.75	Construction	0.90	0.50
Sugarcane	0.75	0.60	Utilities	1.00	0.80
Chat	0.70	0.50	Trade and transport	1.00	0.80
Coffee	0.60	0.60	Restaurants	0.80	0.50
Tobacco	0.70	0.50	Other private services	1.10	1.10
			Public services	1.20	0.90

SOURCE: Authors' estimates based on data from Ethiopia, CSA (2007).

per year. During this period the agricultural sector did not grow as rapidly, with an average growth rate of 6 percent per year. However, much of this rapid economic growth has occurred in the last few years, and it is uncertain whether such rapid growth can be achieved (and sustained) over the near term, especially in light of the global economic recession starting in 2009. Accordingly, the baseline scenario takes a more cautionary position and assumes average annual agricultural growth of 3.8 percent per year during 2009–15 (Table 8.3).[4] Although this is below the recent spike in agricultural GDP growth rates, it still assumes a fairly strong performance by the agricultural sector over the coming decade.[5]

More than half of agriculture's strong growth performance during 1998–2007 was driven by land expansion, with the rest resulting from changes in cropping patterns and improvements in yields. For example, the land area under

4. Simulations are run beginning with the base year, 2005/06. Productivity shocks are modeled only from 2008/09 onward, however (that is, all scenarios are the same until 2008/09), so simulation results are shown only from this year onward.

5. As discussed in more detail later, five different scenarios were designed for this analysis. Scenarios 1–3 target specific groups of crops or agricultural subsectors, including cereals (Simulation 1), export-oriented crops (Simulation 2), and livestock (Simulation 3). The all agriculture scenario (Simulation 4) includes additional growth from the fisheries and forestry subsectors. Simulation 5 includes accelerated productivity growth in the nonagriculture sector as well.

TABLE 8.3 Sector growth results from the model scenarios, 2009–15 (percent)

		Average annual GDP growth rate, 2009–15					
Sector	GDP share, 2009	Baseline (1)	Cereals (2)	Export crops (3)	Livestock (4)	All agriculture (5)	Nonagriculture (6)
Total GDP	100.00	5.95	6.26	6.39	6.81	6.88	6.88
Agriculture	44.90	3.81	4.57	4.87	5.81	5.98	4.14
Cereals	13.49	5.18	7.25	7.30	7.51	7.53	5.31
Pulses and oilseeds	3.83	3.34	3.54	3.60	3.75	3.77	4.06
Horticulture	2.45	3.84	3.96	4.01	4.08	4.26	3.88
Export crops	4.50	4.54	4.54	7.20	7.20	7.20	4.54
Other crops	3.66	3.79	4.07	3.94	3.96	3.97	5.15
Livestock	12.94	2.88	2.91	2.93	6.02	6.02	3.28
Other agriculture	4.04	1.51	1.52	1.52	1.52	3.52	1.52
Industry	12.47	7.27	7.27	7.28	7.36	7.36	8.73
Manufacturing	5.24	8.15	8.18	8.17	8.42	8.40	9.41
Agroprocessing	2.41	6.08	6.51	6.69	6.83	6.82	6.31
Other industry	1.89	6.93	6.99	7.05	7.18	7.16	7.75
Services	33.47	8.19	8.20	8.20	8.23	8.25	9.78
Private	11.76	6.80	6.91	7.03	7.16	7.20	8.10
Public	4.88	5.69	5.69	5.69	5.69	5.69	5.70

SOURCE: Results from the Dynamic Regional Economywide Model of Ethiopia (DREME).

NOTES: The simulations are cumulative, such that the export crop scenario (3) includes the productivity gains from the cereals scenario (2) plus additional productivity gains for export crops. Similarly, the livestock scenario (4) includes the productivity gains for both cereals and export crops (that is, from the previous two scenarios). GDP = gross domestic product.

maize cultivation expanded by 2.2 percent per year during this period, while yields improved each year by 1.5 percent. Similar patterns were observed for other cereals; the only exception was wheat, for which the land area expanded extremely fast, at 5.5 percent per year, compared to yield growth, at 2.7 percent. Long-term agricultural growth has thus been driven more by the expansion of cultivated land than by improvements in cropping technologies. The baseline scenario is calibrated to production trends from 1998 to 2007, so it assumes that land expansion will continue along its long-term path, with about two-thirds of production increases driven by area expansion. This is equivalent to an increase in total harvested land by 2.6 percent per year during 2009–15, which is slightly below the rural population growth rate of 3.0 percent. It is often argued that future land expansion possibilities in Ethiopia are fairly modest, yet recent production data do not suggest that this is the case (that is, that land is the dominant source of growth). In our analysis we assume that future land expansion will be slower than historical expansion. However, land's contribution to overall agricultural growth remains fairly constant because we assume equally modest yield growth.

According to production trends, land area expansion varies across zones. Cultivated land growth is 2.2 percent per year in Zones 1a and 1b (the humid regions), 3.2 percent in Zone 2 (the drought-prone region), and 3.7 percent in Zone 3 (the pastoralist region). As shown in Table 8.3, the nonagricultural sectors are expected to maintain their strong performance over the coming decade, with manufacturing and services growing more rapidly than agriculture, at 8.2 percent per year.

The 3.8 percent agricultural growth rate in the baseline scenario is based on more detailed production trends for different agricultural subsectors. Table 8.4 shows the assumptions made about each subsector's yield growth. We initially adopt the teff yield of 0.76 tons per hectare that was observed in 2005/06 and then assume that teff yields will grow at 2.86 percent per year, such that Ethiopia will achieve a sustained national average teff yield of 1.01 tons per hectare by 2015. The land area under teff cultivation will also grow at 2.33 percent each year in the baseline scenario, such that overall production will expand by 5.26 percent. This is consistent with observed production patterns for 1998–2007. Moreover, yield and area expansions vary at the zonal level based on actual production trends. The baseline thus reflects expected improvements in the performance of the teff sector over the next decade, with the rate of growth of investments continuing as before. Similarly, for wheat we assume that initial yields will continue to grow rapidly, at 3.40 per year, and that yields will rise to 1.67 tons per hectare by 2015. National and regional production of each of the five cereal crops in DREME is thus calibrated to closely reproduce long-term production trends.

National production trends were used to calibrate the baseline growth rates for noncereal crops. Particularly rapid production growth was observed for the

TABLE 8.4 Production targets for various crops in the baseline and agricultural growth scenarios, 2005–15

	Crop yields					Crop production					Crop land area	
	Levels (metric tons per hectare)			Growth rates (percent)		Levels (thousands of metric tons)			Growth rates (percent)		Growth rates (percent)	
Crop	Initial 2005	Baseline 2015	Target 2015	Baseline 2005–15	Target 2005–15	Initial 2005	Baseline 2015	Target 2015	Baseline 2005–15	Target 2005–15	Baseline 2005–15	Target 2005–15
Cereals												
Teff	0.76	1.01	1.11	2.86	3.81	2,191	3,660	4,011	5.26	6.23	2.33	2.34
Barley	1.00	1.30	1.50	2.63	4.13	1,271	2,009	2,260	4.68	5.93	2.00	1.72
Wheat	1.20	1.67	2.18	3.40	6.17	2,230	4,105	5,558	6.29	9.56	2.80	3.20
Maize	1.72	1.99	2.32	1.46	3.02	3,647	5,424	6,086	4.05	5.26	2.55	2.17
Sorghum	1.12	1.44	1.55	2.48	3.30	2,608	4,226	4,560	4.94	5.75	2.40	2.37
Pulses and oils												
Pulses	0.92	1.03	1.04	1.08	1.19	1,110	1,632	1,695	3.93	4.33	2.82	3.10
Oilseeds	0.77	0.76	0.78	–0.10	0.08	778	1,035	1,054	2.90	3.08	3.00	3.00

(*continued*)

TABLE 8.4 Continued

Crop	Crop yields					Crop production					Crop land area	
	Levels (metric tons per hectare)			Growth rates (percent)		Levels (thousands of metric tons)			Growth rates (percent)		Growth rates (percent)	
	Initial 2005	Baseline 2015	Target 2015	Baseline 2005–15	Target 2005–15	Initial 2005	Baseline 2015	Target 2015	Baseline 2005–15	Target 2005–15	Baseline 2005–15	Target 2005–15
Horticulture												
Enset	7.52	8.74	8.80	1.51	1.57	211	321	333	4.25	4.63	2.70	3.01
Vegetables	4.17	4.54	4.54	0.86	0.86	954	1,321	1,321	3.31	3.31	2.42	2.42
Fruits	13.73	15.78	15.78	1.40	1.40	436	630	630	3.74	3.74	2.31	2.31
Export crops												
Sugarcane	33.69	36.79	38.67	0.88	1.39	1,617	2,614	2,747	4.92	5.44	4.00	4.00
Tea	0.96	1.04	1.08	0.76	1.16	5	9	10	6.81	7.23	6.00	6.00
Cotton	1.01	1.07	1.25	0.58	2.13	86	135	157	4.61	6.21	4.00	4.00
Tobacco	0.67	0.64	0.74	–0.34	1.02	3	3	3	–1.33	0.01	–1.00	–1.00
Coffee	0.66	0.66	0.81	0.04	2.12	157	244	300	4.54	6.72	4.50	4.50
Flowers	1.00	1.10	1.21	1.00	1.91	10	13	15	3.02	3.95	2.00	2.00
Other crops												
Chat	0.77	0.79	0.79	0.19	0.19	120	165	165	3.24	3.24	3.05	3.05
Other staples	4.89	5.26	5.29	0.73	0.79	1,576	2,537	2,584	4.87	5.07	4.12	4.24
All crops											2.62	2.62

SOURCES: Crop targets are drawn from consultations with a Comprehensive Africa Agriculture Development Programme stocktaking team and representatives from the Ministry of Agriculture; final sector targets are based on results from the Dynamic Regional Economywide Model of Ethiopia (DREME).

NOTES: The growth rates shown are national averages. Baseline 2015 denotes levels in the baseline scenario for 2015. Baseline 2005–15 denotes the growth rate in the baseline scenario from 2005 to 2015.

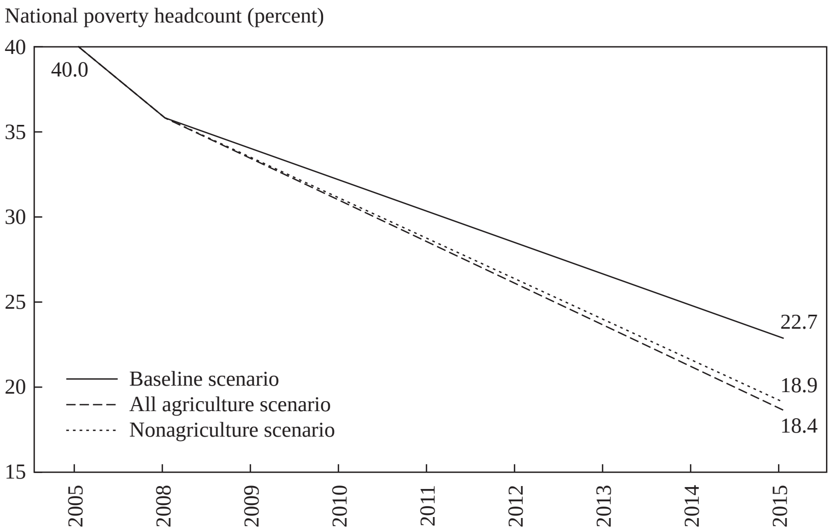
horticultural crops, including fruits, vegetables, and *enset*. However, unlike in the case of cereals, these high growth rates were driven more by land expansion than by improvements in crop yields. For example, during 1998–2007 *enset* yields remained largely unchanged, but cultivated land area grew extremely fast. This is reflected in the baseline scenario, where the production growth rate is driven mainly by a faster expansion of the *enset* land area. Similar biases toward land expansion over yield improvements were observed for pulses, oilseeds, and other staples such as root crops.

Industrial and export crops performed quite well during 1998–2007, with the exception of tobacco, whose production levels declined slightly. This is reflected in the baseline scenario. For example, coffee and cotton production will rise by 4.54 and 4.61 percent per year, respectively, during 2005–15, driven by a fairly rapid expansion of land area under export crop cultivation. The baseline scenario therefore assumes that the export-oriented crops will continue to grow rapidly, albeit more slowly than the major staple crops. Only tobacco production is expected to decline based on long-term trends.

Livestock is a key agricultural subsector generating a significant share of agricultural GDP, and it has strong upstream linkages to meat processing in the manufacturing sector (see Table 8.3). The baseline scenario assumes that livestock GDP will expand at a rate of 2.9 percent per year. This is below the rapid growth rate of the crop sectors but is entirely consistent with the livestock GDP growth rates reported in national accounts for 1998–2007. The baseline scenario reflects more rapid growth in the milk and poultry subsectors. Fisheries and forestry are also agricultural subsectors in DREME, with the latter generating 4.04 percent of total agricultural GDP in 2005/06. Based on national accounting for the period 1998–2007, the baseline scenario assumes that fisheries GDP will remain virtually unchanged during 2009–15. For the forestry subsector, the baseline scenario assumes that the value-added in this subsector will grow at 4.02 percent per year.

Drawing on the trends just described, DREME simulation results indicate that, with 4 percent growth in the agricultural sector and more rapid growth in the nonagricultural sectors, overall national GDP will grow at an average rate of 5.95 percent during 2009–15. This is equal to the average GDP growth rate of 6 percent observed for 1998–2007, thus assuming that Ethiopia’s economy will maintain its long-term growth rate over the coming decade. With population growth at 3 percent per year, this means that per capita GDP will also grow rapidly, at about 3 percent. With rising per capita incomes and growth across all sectors, DREME estimates that poverty will decline from 40 percent to 23 percent during 2005–15 (see Figure 8.2). The faster expansion of the nonagricultural sectors means that national income growth favors urban households and areas more than rural ones. For example, poverty will fall in small urban centers from 34 to 9 percent by 2015, while rural poverty will decline from 41 to 25 percent. Given the overall rapid poverty reduction and despite an

FIGURE 8.2 National poverty headcount results from the model scenarios, 2005–15



SOURCE: Results from the Dynamic Regional Economywide Model of Ethiopia (DREME).
NOTES: The poverty headcount is the percentage of the population living below the poverty line. We assign the poverty line so that 40 percent of the population is classified as "poor" (that is, in the bottom two expenditure quintiles). As noted in footnote 4, all simulations are the same for 2005–08. Additional productivity shocks are modeled from 2009 onward.

expanding population, the absolute number of poor people in Ethiopia is expected to decline from 25.8 million people in 2005 to 19.6 million by 2015. Although this will be a significant reduction in the number of poor people living in Ethiopia, it reveals the persistent burden of poverty in the country and emphasizes the need to reinforce pro-poor sources of economic growth.

Accelerating Agricultural Growth and Poverty Reduction

In the previous section we described the results of the baseline scenario, which estimated the impact of Ethiopia's current growth path on poverty reduction. We found that while economic growth over the coming decade is expected to remain robust and will halve the national poverty rate by 2015, it will reduce the number of poor people by less than one-third. Therefore, in this section we examine whether a medium-term 6 percent agricultural growth target identified by the CAADP is attainable based on reasonable subsector growth potentials. We also estimate the potential contribution of individual agricultural subsectors in helping Ethiopia substantially reduce poverty throughout the country.

Examining Whether a Sustained 6 Percent Agricultural Growth Rate Is Attainable

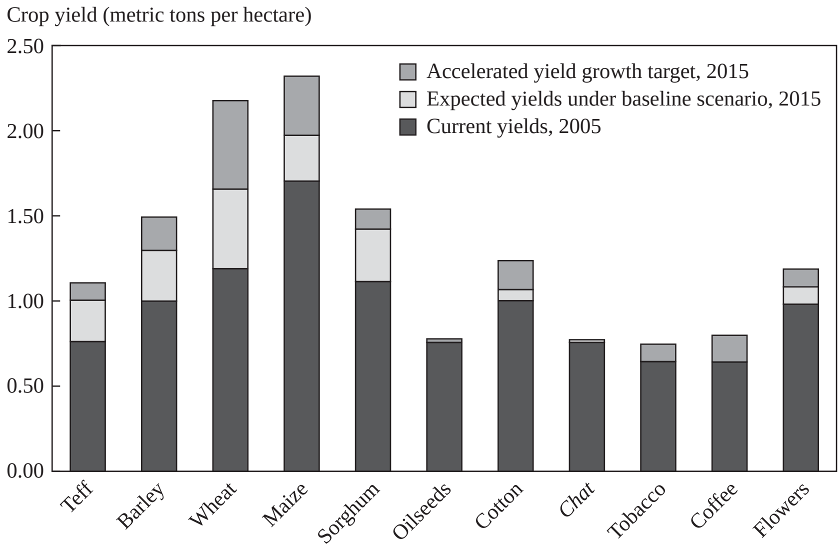
Accelerated crop production is modeled by increasing yields in order to achieve the ambitious yield targets identified for 2015. We do not attempt to identify the specific investments needed to achieve these yield targets; this is a topic addressed in other chapters. Our analysis merely translates yield projections into agricultural and national economic growth and into reductions in poverty. Our goal is to identify which potential sources of agricultural growth would be most effective in assisting Ethiopia achieve its broader development objectives.

Taking teff as an example, in the baseline scenario we assumed that average yields would rise from 0.76 to 1.01 tons per hectare during 2006–15 (see Table 8.4). In this section we model more ambitious teff yield improvements, with the annual yield growth rate for teff rising from its current 2.86 percent per year to 3.82 percent per year. This implies that national average teff yields will rise consistently over the next decade to reach 1.11 tons per hectare by 2015. This national target yield was identified together with the CAADP stocktaking team and in consultation with the Ministry of Agriculture and Rural Development. The yields of other crops were also increased in a similar manner but to differing degrees based on long-term trends and potential yields (Figure 8.3). Production growth targets were also identified for the livestock and fisheries subsectors.

Five different scenarios were designed for this analysis (see Table 8.3). In Scenarios 1–3 we target specific groups of crops or agricultural subsectors, including cereals (Simulation 1), export-oriented crops (Simulation 2), and livestock (Simulation 3). For instance, in the "cereal-led growth" scenario we increase total factor productivity (TFP) for all cereal crops so as to achieve the crop-specific yield target shown in Table 8.4. In the noncrop scenarios, such as "livestock-led growth," we also increase TFP of the particular noncrop sector to achieve targeted GDP growth rates. The results of each simulation are cumulative, so that Simulation 2 includes the effects of Simulation 1, Simulation 3 includes the effects of Simulation 2, and so on. In the "all agriculture" scenario (Simulation 4) we include additional growth from the fisheries and forestry subsectors. This is equivalent to a "CAADP scenario," because it captures all possible sources of additional agricultural growth.

In the all agriculture scenario, agricultural growth accelerates to 6 percent per year for 2009–15 (see Table 8.3). This is driven by a strong expansion in cereal production. For example, wheat production increases from about 4 million tons in the baseline scenario to over 6 million tons in the all agriculture scenario (see Table 8.4). A similarly large expansion of coffee production is also achieved in this accelerated scenario. Thus, even though the additional growth required for other crops is less pronounced, the achievement of the

FIGURE 8.3 Current, expected, and targeted crop yields, 2005 and 2015



SOURCES: Crop targets are drawn from consultations with a stocktaking team from the Comprehensive Africa Agriculture Development Programme and representatives from the Ministry of Agriculture; final sector targets are based on results from the Dynamic Regional Economywide Model of Ethiopia (DREME).

6 percent agricultural growth target remains ambitious. Livestock growth will also have to double, from an annual average growth rate of 2.88 percent per year in the baseline scenario to 6.02 percent in the all agriculture scenario. However, despite these challenges, the results from DREME indicate that if the crop yield and livestock productivity targets can be achieved by 2015, Ethiopia will be able to achieve and sustain the 6 percent agricultural growth target set forth by the CAADP.

Because agriculture represents more than a third of the Ethiopian economy, the acceleration of agricultural growth will increase the national GDP growth rate from its current 5.95 percent per year to 6.88 percent per year. Faster agricultural growth will also stimulate additional growth in the nonagricultural sectors by raising the final demand for nonagricultural goods and by lowering input prices and fostering upstream processing. For instance, in the all agriculture scenario the GDP growth rate of agriculture processing in the manufacturing sector increases from 6.08 percent in the baseline scenario to 6.82 percent per year. Achieving the 6 percent agricultural growth target therefore has economywide growth linkage effects for nonagriculture.

Looking at Whether Agricultural Growth Reduces Poverty

The acceleration of agricultural growth to around 6 percent per year in the all agriculture scenario and its spillover effects into nonagriculture will cause poverty to decline by a further 4.3 percentage points. This is shown in Figure 8.2, where the share of Ethiopia's population under the poverty line falls to 18.36 percent by 2015 in the all agriculture scenario compared to 22.67 percent in the baseline scenario. Thus, taking population growth into account, achieving the 6 percent growth target will lift an additional 3.7 million people above the poverty line by 2015. This is sufficient to almost halve the number of poor people in Ethiopia today (that is, reducing their numbers from 25.8 million to 15.9 million).

Faster agricultural growth will benefit a majority of households. However, not all households in all agroecological zones will benefit equally from achieving the higher crop yields and faster subsector growth rates targeted in the all agriculture growth scenario. Table 8.5 shows how poverty rates change under the various scenarios. Poverty declines among both rural and urban households, although the declines are more than twice as large in rural areas. Moreover, there are large declines in rural poverty rates in the two zones in which poverty is initially highest: the humid *enset* region (Zone 1b) and the drought-prone region (Zone 2). In urban areas, households in both small and large urban centers benefit from faster agricultural growth. This is because urban households usually spend a significant share of their incomes on food and agricultural products. They thus benefit from faster agricultural growth and lower food prices.

The impact of agricultural growth on households' incomes and poverty depends on a number of factors. One key factor is the geographic distribution of agricultural production. As indicated in Table 8.6, higher-value export-oriented crops are grown more intensively in certain zones.[6] Coffee, for example, is concentrated in the humid cereal region (Zone 1a). However, it forms a large share of agricultural GDP in the humid *enset* region (Zone 1b). Similarly, although cereals form a large share of agricultural GDP in the humid cereal region (Zone 1a), they also contribute a large share to the poorer drought-prone region's agricultural GDP (that is, they have a 41.8 percent share in Zone 1a and a 34.1 percent share in Zone 2). Finally, livestock is a key sector in all regions, contributing between one-fourth and one-third to agricultural GDP in Zones 1a, 1b, and 2. However, it is especially important in the pastoralist region, where it accounts for most of agricultural GDP, with the remaining agricultural incomes dominated by cereals. These concentrations of particular crops and

6. Note that in Table 8.5 agricultural GDP excludes fisheries and forestry (that is, it includes only crops and livestock).

TABLE 8.5 Household poverty results for rural and urban regions from the model scenarios, 2005, 2008, and 2015 (percent)

	Initial poverty headcount		Final year poverty headcount, 2015					
Region (zone number)	2005	2008	Baseline (1)	Cereals (2)	Export crops (3)	Livestock (4)	All agriculture (5)	Nonagriculture (6)
National	40.00	35.88	22.67	20.28	19.36	18.38	18.36	18.88
Rural regions	41.33	37.28	25.49	22.80	21.80	20.82	20.77	20.96
Humid cereals (1a)	38.19	33.91	20.71	18.48	17.65	17.35	17.35	17.11
Humid *enset* (1b)	44.98	41.05	30.15	27.66	26.26	24.83	24.41	23.91
Drought–prone (2)	47.97	44.14	33.13	29.43	28.31	26.92	27.08	27.74
Pastoralist (3)	27.70	24.11	16.10	13.45	12.91	10.19	10.19	13.69
Small urban centers	33.95	28.94	8.57	7.55	7.10	6.20	6.41	7.67
Large urban centers	32.95	29.16	9.30	8.48	7.84	6.75	6.77	10.48

SOURCE: Results from the Dynamic Regional Economywide Model of Ethiopia (DREME).

NOTES: The poverty headcount is the percentage of the population living below the poverty line. We assign the poverty line so that 40 percent of the population is classified as poor (that is, in the bottom two expenditure quintiles).

TABLE 8.6 Regional growth results for various crops under the model scenarios, 2009–15 (percent)

Zone (zone number), crop	Initial agricultural GDP share	Average annual GDP growth rate, 2009–15					
		Baseline (1)	Cereals (2)	Export crops (3)	Livestock (4)	All agriculture (5)	Nonagriculture (6)
Humid cereals (1a)							
Agriculture	100.00	4.05	5.15	5.50	6.31	6.33	4.33
Cereals	41.77	5.19	7.54	7.58	7.79	7.81	5.32
Pulses and oils	12.17	2.90	2.96	3.03	3.17	3.19	3.62
Horticulture	4.18	2.94	2.85	2.86	2.89	3.08	2.98
Export crops	9.88	4.55	4.55	7.55	7.55	7.55	4.55
Other staples	3.60	2.97	3.07	3.11	3.17	3.18	3.95
Livestock	28.39	2.88	2.92	2.93	5.63	5.64	3.29
Humid *enset* (1b)							
Agriculture	100.00	3.70	4.16	4.85	5.45	5.48	4.18
Cereals	17.57	2.75	4.77	4.88	5.08	5.10	2.88
Pulses and oils	4.81	4.49	4.95	4.96	5.18	5.21	5.41
Horticulture	13.46	4.15	4.35	4.43	4.54	4.71	4.19
Export crops	22.43	4.52	4.52	7.37	7.37	7.37	4.52
Other staples	21.12	3.89	4.13	3.93	3.97	3.97	5.36
Livestock	20.61	2.87	2.91	2.92	5.64	5.65	3.28

(*continued*)

TABLE 8.6 Continued

Zone (zone number), crop	Initial agricultural GDP share	Average annual GDP growth rate, 2009–15					
		Baseline (1)	Cereals (2)	Export crops (3)	Livestock (4)	All agriculture (5)	Nonagriculture (6)
Drought-prone (2)							
Agriculture	100.00	4.42	5.13	5.33	6.09	6.11	4.83
Cereals	34.07	5.79	7.36	7.41	7.63	7.64	5.91
Pulses and oils	9.41	3.95	4.35	4.43	4.57	4.59	4.63
Horticulture	6.51	4.41	4.68	4.73	4.80	4.98	4.48
Export crops	9.69	4.53	4.53	6.40	6.40	6.40	4.53
Other staples	13.50	4.07	4.45	4.31	4.30	4.31	5.49
Livestock	26.81	2.87	2.91	2.92	5.61	5.62	3.28
Pastoralist (3)							
Agriculture	100.00	2.91	2.93	2.95	7.17	7.18	3.32
Cereals	2.37	3.31	2.54	2.61	2.77	2.78	3.44
Pulses and oils	0.06	5.77	7.12	7.07	7.23	7.24	6.82
Horticulture	0.56	4.25	4.25	4.25	4.25	4.46	4.25
Export crops	0.14	4.67	4.67	4.67	4.67	4.67	5.76
Other staples	1.38	3.86	3.86	3.86	3.86	3.86	4.95
Livestock	95.49	2.88	2.91	2.93	7.33	7.33	3.28

SOURCE: Results from the Dynamic Regional Economywide Model of Ethiopia (DREME).

NOTE: GDP = gross domestic product. In this table agricultural GDP excludes fisheries and forestry because these two sectors are not regionalized in DREME.

subsectors will influence how agricultural growth driven by certain sectors affects household incomes in different parts of the country.

The sources of additional income also vary across representative households within zones. Not surprisingly, households that already depend on cereals tend to benefit more from cereal-led growth. However, two forces drive changes in production following subsector-specific yield improvements. First, increasing cereal yields directly affect farm incomes because they increase the quantity of output that a farm produces using the same quantity of factor inputs. But because supply of the agricultural product increases faster than demand (unless incomes are rising rapidly from other sources), prices typically fall following yield increases. In response to these price changes, farmers may reallocate some of their land to other crops. Thus, it is important to note that, although we model cereal-led growth by increasing cereal yields, some of the gains in this scenario are derived from diversification into other higher-value crops facing better demand conditions. DREME captures both direct and indirect effects in its assessment of the effects of improved yields in different subsectors.

Real income and poverty impacts are also determined by household consumption demand. For example, households that spend a significant share of their incomes on cereals will benefit from lower prices when cereal production rises. Household consumption patterns are based on the 2004/05 HICES, as captured in EDRI's 2005/06 SAM. The average budget shares for different household groups are shown in Table 8.7. Even though relatively little agricultural GDP in the pastoralist region (Zone 3) is derived from cereal production, households in this region spend 16 percent of their disposable income on cereals. Thus, although a national expansion of cereal production may not directly benefit households in the pastoralist region, it will indirectly benefit them through lower food prices. This is also the case for urban households, which derive relatively little income from agriculture directly but spend at least a third of their incomes on agricultural goods and processed foods. Together with regional production patterns, these average budget shares and the income elasticities in Table 8.2 will determine the impact of agricultural growth on poverty.

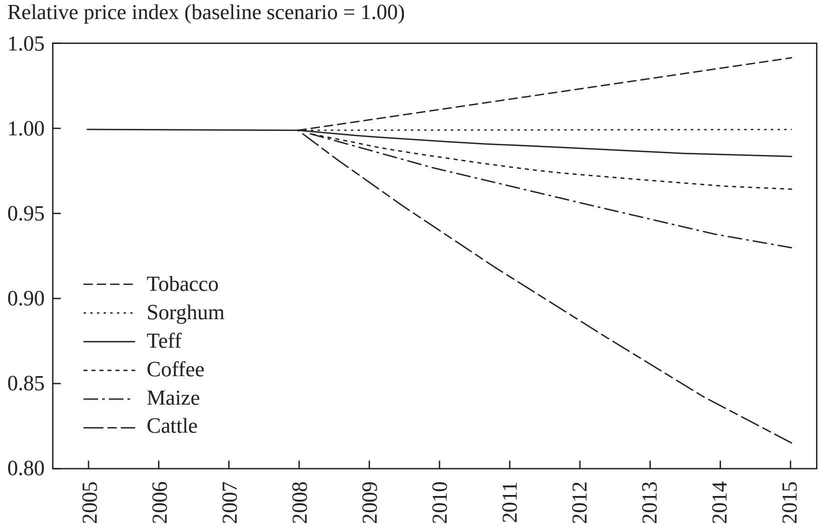
Figure 8.4 shows the importance of taking demand constraints and relative price changes into account. Wheat, for example, faces domestic demand constraints and has weaker linkages to upstream food processing and foreign markets. Therefore, when wheat production increases substantially in the all agriculture scenario, its prices decline by 7 percent in real terms (or relative to the overall consumer price index). Milk and cattle product prices decline more sharply (by more than 15 percent), highlighting the crucial importance of improved marketing in these subsectors. By contrast, some agricultural subsectors, such as pulses and horticulture, do not experience yield improvements in the all agriculture scenario, so increased household incomes cause real prices for these crops to rise. Finally, some crops, such as coffee, may also have stronger

TABLE 8.7 Household average consumption shares of various goods and services, by rural–urban place of residence and poverty status, 2009 (percent)

	Rural households							Urban households				
Good or service	All	Zone 1a	Zone 1b	Zone 2	Zone 3	Poor	Nonpoor	All	Small centers	Large centers	Poor	Nonpoor
All goods and services	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Agriculture	53.7	53.4	47.1	57.1	56.8	59.3	51.1	26.9	31.1	21.8	42.4	22.6
Cereals	20.5	23.1	13.1	21.8	15.8	24.6	18.6	8.6	10.1	6.9	16.3	6.5
Pulses and oilseeds	4.2	5.0	2.7	4.5	1.4	4.8	4.0	1.6	1.8	1.3	2.9	1.2
Horticulture	3.6	2.5	7.5	3.5	0.5	3.9	3.5	1.3	1.5	1.0	2.2	1.0
Export crops	2.6	2.8	3.7	1.9	1.3	2.9	2.5	1.2	1.5	0.8	2.0	1.0
Other crops	5.8	4.8	5.4	7.4	5.8	5.9	5.8	3.3	3.9	2.6	5.2	2.8
Livestock	10.6	9.1	6.8	11.6	28.3	11.6	10.1	8.6	9.0	8.1	10.4	8.1
Other agriculture	6.3	6.0	7.8	6.4	3.6	5.6	6.7	2.4	3.4	1.1	3.3	2.1
Industry	25.7	24.1	30.9	24.3	29.4	21.7	27.6	44.7	41.4	48.8	36.2	47.1
Manufacturing	24.9	23.4	30.3	23.3	28.6	20.8	26.8	41.2	39.0	43.8	33.5	43.3
Agroprocessing	12.2	11.7	14.2	11.3	15.2	11.2	12.7	16.1	16.7	15.4	19.1	15.3
Other industry	0.8	0.7	0.6	1.0	0.8	0.8	0.8	3.5	2.4	4.9	2.8	3.8
Services	20.6	22.5	21.9	18.6	13.8	19.0	21.4	28.4	27.5	29.4	21.4	30.3

SOURCE: Ethiopian Development Research Institute social accounting matrix (Ahmed et al. 2009).

FIGURE 8.4 Changes in real market prices from the baseline under the "all agriculture" scenario, 2005–15



SOURCE: Results from the Dynamic Regional Economywide Model of Ethiopia (DREME).
NOTE: These are real price changes for selected products relative to the prices achieved under the baseline scenario (adjusted for changes in the overall consumer price index). They therefore show how additional production places downward pressure on some commodities' prices, but rising incomes and demand allow some commodities' prices to rise when growth is accelerated.

linkages to upstream processing and foreign markets, which means that their prices are quite stable, even in the all agriculture scenario.

Exploring the Effectiveness of Nonagricultural Growth in Reducing Poverty

In the "nonagriculture" scenario (Simulation 5), we accelerate productivity growth in only the nonagriculture-related sectors such that the same rate of total GDP growth (that is, 6.88 percent per year) is achieved as in the all agriculture scenario. This is shown in Table 8.3. Faster nonagricultural growth stimulates the demand for agriculture, helping raise agriculture's GDP growth, albeit only slightly. Within the agricultural sector, the increase in demand for agricultural products is greater for cereals and livestock, which form a larger share of the consumption baskets of urban households and nonagricultural workers, whose incomes are rising as a result of faster nonagricultural growth.

Nonagricultural growth is also effective in reducing poverty. Given that the same total GDP growth rate is achieved in both the all agriculture and the nonagriculture scenarios, the national poverty headcount rate declines only slightly less when growth is nonagriculture led (see Figure 8.2). Although the production linkages mentioned earlier are one reason for nonagriculture's poverty effect, another reason is that the marketing and demand constraints facing rapid increases in agricultural production are partially relieved by faster income growth outside of agriculture.

In summary, DREME results indicate that the CAADP agricultural growth target of 6 percent is ambitious. It will require substantial improvements in crop yields and livestock productivity over a relatively short period of time (that is, seven years). If these crop- and subsector-level targets can be achieved, the resulting broader-based agricultural growth is likely to benefit households in both rural and urban areas. However, the higher growth potential of certain export crops and better market conditions in certain parts of the country may cause uneven income growth and poverty reduction. The livestock subsectors also contribute to agricultural growth and poverty reduction throughout the country. Finally, accelerating nonagricultural growth can take advantage of production linkages while also reducing some of the demand constraints on agricultural growth. An agriculture-led growth strategy therefore needs to be supported by growth in other sectors if it is to be sustainable and achieve the greatest possible poverty reduction.

Comparing Subsector Growth in Terms of Growth and Poverty Reduction

The previous section highlighted the potential contributions of different crops and subsectors in increasing agricultural growth and poverty reduction. However, the different sizes of these subsectors make it difficult to compare the effectiveness of sector growth in reducing poverty. Understanding how growth–poverty linkages vary at the subsector and household levels is important in designing pro-poor growth strategies in different parts of the country. In this section, we calculate poverty–growth elasticities that allow us to compare the "pro-poorness" of growth in alternative subsectors. These elasticities are endogenous outcomes from the model results. Growth affects individual households differently due to heterogeneity across household groups. The previous analysis has shown how, with differences in household and farm characteristics, changes in income and consumption across households can differ considerably from average changes at the national level. Thus, to capture growth–poverty linkages, changes in the distribution of incomes, which are primarily determined by a country's initial conditions, need to be understood. In the previous section, we saw how households in certain regions have better opportunities to produce export-oriented crops and are thus better positioned to benefit from export crop–led agricultural growth. However, export crop–producing households are typically less poor than other rural households. Thus, agricultural growth driven by export crops may have less of an impact on poverty, especially among the poorest households. By contrast, the cereals sector tends to be a more important source of agricultural incomes for poorer households. Thus, growth in cereals may be more effective in reducing poverty than is similar growth in export crops.

"Poverty–growth elasticities" measure the responsiveness of the poverty rate to changes in per capita agricultural GDP growth. More specifically, elasticity measures the percentage change in the poverty rate caused by a 1 percent increase in agricultural GDP per capita. Table 8.8 shows the calculated poverty–growth elasticities in the different growth scenarios. The results indicate that agricultural growth driven by cereals is particularly effective in reducing poverty in the drier regions (Zones 2 and 3), where households are generally poorer and depend more heavily on incomes from cereal production. Poverty in the pastoralist region (Zone 3) is also greatly affected by cereal-led growth due to the importance of these crops in poorer households' consumption baskets (see Table 8.7). For a similar reason, cereal-led growth is also effective in reducing poverty in smaller urban centers, where households are poorer than in larger centers and thus spend a larger share of their incomes on purchasing cereals and milled grains.

In contrast, expanding export crops is most effective in reducing poverty in the humid *enset* region (Zone 1b) and among households in larger urban centers, who are better endowed with capital and the other assets needed to produce export crops. Finally, livestock production is especially effective in reducing poverty in urban areas and among rural households in the pastoralist region (Zone 3). Urban consumers spend a larger share of their incomes on meat and dairy products and so benefit more when production in this sector expands

TABLE 8.8 Poverty–growth elasticities from the model scenarios: Percentage change in the poverty headcount rate from a 1 percent increase in national agricultural GDP, by rural–urban place of residence and sector, 2009–15

Rural zone (zone number), urban center	Sector		
	Cereal-led	Export crops–led	Livestock-led
National	–1.17	–1.08	–0.36
Rural zone	–1.27	–1.13	–0.35
Humid cereals (1a)	–1.16	–1.03	–0.12
Humid *enset* (1b)	–1.06	–1.44	–0.46
Drought-prone (2)	–1.48	–1.06	–0.42
Pastoralist (3)	–1.94	–0.93	–1.50
Small urban centers	–0.62	–0.65	–0.42
Large urban centers	–0.50	–0.92	–0.50

SOURCE: Results from the Dynamic Regional Economywide Model of Ethiopia (DREME).

NOTES: The poverty headcount is the percentage of the population living below the poverty line. We assign the poverty line so that 40 percent of the population is classified as poor (that is, in the bottom two expenditure quintiles). GDP = gross national product.

(see Table 8.7). Overall, however, it is the cereals sector that is most effective in reducing national poverty, because a larger share of poor households depend on cereals for their incomes and because more poor consumers (in rural and urban areas) spend a greater share of their income on cereals and milled grains.

The previous section concluded that to increase agricultural growth and reach the 6 percent growth target, it will be necessary to encourage growth in a number of agricultural subsectors. The poverty–growth elasticities suggest that cereals should be afforded a high priority in any strategy aimed at substantially reducing poverty. Moreover, cereals already form a large part of the agricultural sector and have high enough growth potential to substantially raise agricultural and national GDP. Cereals are therefore a priority sector for increasing investments.

Conclusions

A new economywide modeling framework was developed and used to examine the contribution of accelerating growth in alternative agricultural crops and subsectors and to assess how Ethiopia can achieve the CAADP target of 6 percent agricultural growth. The impact of agricultural growth at the macro- and microeconomic levels, as well as its effect on poverty, was estimated. The four major conclusions of this chapter are summarized here.

Six Percent Agricultural Growth Is Ambitious but Not Unattainable

The CGE model results indicated that if Ethiopia can meet its targets for crop yields and livestock productivity, it should be able to reach and sustain the 6 percent agricultural growth target during 2006–15. Even though these yield targets are below the maximum potential yields identified by agricultural field trials, they are still ambitious given the short time frame of the CAADP initiative (that is, seven years). However, agricultural growth of 6 percent per year would increase overall GDP growth by 1 percentage point per year. This higher growth rate would reduce national poverty to 18.36 percent by 2015, which is lower than the 22.67 percent poverty rate that would have been achieved without additional agricultural growth. This means that the higher rate of growth in the accelerated agricultural growth scenario would lift an additional 3.7 million people above the poverty line by 2015.

Not Everyone Will Benefit Equally in the CAADP Growth Scenario

Most households are expected to benefit from faster agricultural growth. However, some agroecological zones that grow higher-value cereals and export-oriented crops and are better situated with regard to larger urban markets (for example, the rain-sufficient highlands) stand to gain more than other parts of the country. Furthermore, poverty among households in some zones will remain high, despite faster agricultural growth. Finally, both rural and urban households benefit from faster agricultural growth, although rural households benefit more. This is because agricultural incomes are most important for rural households, but food commodities are an important part of the consumption baskets of both urban and rural households.

The Composition of Agricultural Growth Matters

Comparing the effectiveness of growth driven by different subsectors in reducing poverty and encouraging broader-based growth, we find that additional growth driven by cereals has a greater impact on poverty reduction, especially in rural areas. This is because these crops already demonstrate strong growth and so can contribute substantially to achieving broad-based agricultural growth. Yield improvements in these crops not only benefit households directly, by increasing incomes from agricultural production, but also allow farmers to diversify their land allocation toward other higher-value crops. Cereals are also effective in raising rural real incomes and reducing poverty, especially among the poorest households. Thus, high priority should be afforded to improving cereal yields and opening market opportunities for upstream processing to reduce demand constraints.

Nonagricultural Growth Is Also Effective in Reducing Poverty

Finally, although our analysis focused on agriculture, we also considered the effectiveness of nonagricultural growth in driving poverty reduction and economywide growth. We found that nonagriculture has a crucial role to play in helping overcome the demand constraints that hinder agricultural development. Therefore, even though Ethiopia's development strategy is centered on agriculture, high nonagricultural growth (in excess of the usual growth linkage effects emanating from agricultural growth) is required to boost demand for agricultural products if an agriculture-led strategy is to be both successful and sustainable.

Appendix: Specification of the CGE and Microsimulation Model

DREME is the name of the CGE model that was developed to assess sector-specific growth options and their poverty impacts (see Table 8A.1 at the end of this appendix for the model sets, parameters, and variables and Table 8A.2 for the model equations). The model is calibrated to EDRI's 2005/06 SAM, which provides information on demand and production for 69 detailed sectors (see Table 8.1).[7] The model further disaggregates agricultural activities across agroecological regions using data from the 2005 agricultural sample survey. Based on the SAM, the production technologies across all sectors are calibrated to

7. The model is a variant of the basic neoclassical CGE model developed by Dervis, de Melo, and Robinson (1982) and Lofgren, Harris, and Robinson (2001).

their current situation, including each sector's use of primary inputs, such as land, labor, and capital, as well as intermediate inputs. To capture existing differences in labor markets, the model classifies employed labor into different subcategories, including skilled, semiskilled, and unskilled workers, based on occupational categories. Information on employment and wages by sector and region is taken from the 2004/05 HICES (Ethiopia, CSA 2007).

Most workers in the model can migrate between regions and sectors. These workers are disaggregated according to occupational categories (that is, administrators; professional, skilled, and unskilled workers). Agricultural family labor is region specific but mobile across agricultural subsectors. Both agricultural and nonagricultural capital investments move freely across regions and within the broad nonagriculture sector. Capital is accumulated through investment financed by domestic savings and foreign inflows. Increased capital is allocated across sectors and regions according to their relative profitability. Once invested, capital becomes sector specific and can be adjusted only through exogenously determined depreciation and the attraction of new investments. Incomes from employment accrue to households according to employment and wage data from the HICES. This detailed specification of production and factor markets in the model allows it to capture the changing scale and technology of production across sectors and subnational regions and therefore how changes in the economic structure of growth influence its distribution of incomes.

The growth–poverty relationship is examined by combining DREME with a microsimulation model. An important factor determining the contribution of agriculture to overall economic growth is its linkages with the rest of the economy. Agriculture's proponents argue that agriculture has strong growth linkages. The model captures production linkages by explicitly defining a set of nested constant elasticity of substitution (CES) production functions that allows producers to generate demand for both factors and intermediates. DREME also captures forward and backward production linkages between sectors. Import competition and export opportunities are modeled by allowing producers and consumers to shift between domestic and foreign markets depending on changes in the relative prices of imports, exports, and domestic goods. More specifically, the decision of producers to supply domestic or foreign markets is governed by a constant elasticity of transformation function, while there are possibilities for substitution between imports and domestically supplied goods under a CES Armington specification. In this way the model captures how import competition and the changing export opportunities of agriculture and industry can strengthen or weaken the linkages between growth and poverty.

Incomes from production, trade, and employment accrue to different households according to employment and wage data from the HICES. As in the case of production, households are defined at the regional level and, within each region, by rural and urban areas and by poor and nonpoor categories. Poverty is defined as being in the bottom two quintiles of per capita expenditure. Income and expenditure patterns vary considerably across these household groups. These differences are important for distributional change because incomes generated by agricultural growth accrue to different households depending on their location and factor endowments. Each representative household in the model is an aggregation of a group of households in the HICES. Households in the model receive income through the employment of their factors in both agricultural and nonagricultural production; they then pay taxes, save, and make transfers to other households. The disposable income of a representative household is allocated to commodity consumption derived from a Stone–Geary utility function (that is, a linear expenditure system of demand). In order to retain as much information on households' income and expenditure patterns as possible, DREME is linked to a microsimulation module based on the HICES. Endogenous changes in commodity consumption for each aggregate household in the CGE model are used to adjust the level of commodity expenditure of the corresponding households in the survey. Real consumption levels are then recalculated in the survey, and standard poverty measures are estimated using this updated expenditure measure.

DREME makes a number of assumptions about how the economy maintains macroeconomic balance. These "closure rules" concern the foreign or current account, the government or public-sector account, and the savings–investment account. For the current account, a flexible exchange rate maintains a fixed level of foreign savings. This assumption implies that the country cannot simply increase its foreign debt but has to generate export earnings in order to pay for imported goods and services. While this assumption realistically limits the degree of import competition in the domestic market, it also underlines the importance of the agricultural and industrial export sectors. For the government account, tax rates and real consumption expenditure are exogenously determined, leaving the fiscal deficit to adjust to ensure that public expenditures equal receipts. For the savings–investment account, real investment adjusts to changes in savings (that is, savings-driven investment). These two assumptions allow the models to capture the effects of growth on the level of public investment and the crowding-out effect from changes in government revenues.

Finally, DREME is recursive dynamic, which means that some exogenous stock variables in the model are updated each period based on intertemporal behavior and results from previous periods. The model is run over the period 2005–15, with each equilibrium period representing a single year. It also exogenously captures demographic and technological change, including changes in population, labor supply, human capital, and factor-specific productivity. Capital accumulation occurs through endogenous linkages with previous-period investment. Although the allocation of newly invested capital is influenced by each sector's initial share of gross operating surplus, the final allocation depends on depreciation and sector profit rate differentials. Sectors with above-average returns in the previous period receive a larger share of the new capital stock in the current period.

In summary, DREME incorporates distributional change by (1) disaggregating growth across subnational regions and sectors, (2) capturing income effects through factor markets and price effects through commodity markets, and (3) translating these two effects for each household in the HICES according to its unique factor endowment and income and expenditure patterns. The structure of the growth–poverty relationship is therefore defined explicitly ex ante based on observed country-specific structures and behavior. This allows the model to capture the poverty and distributional changes associated with agricultural growth.

For the simulations of agricultural productivity gains presented in this chapter, total factor productivity growth in specified crop, livestock, or industrial sectors is exogenously increased according to the structure of each particular simulation. The productivity shock simulations are cumulative, with each successive simulation including the productivity shocks from the earlier simulations. Thus, for example, the export crop scenario (Simulation 2) includes the productivity gains from the cereals scenario (Simulation 1) plus additional productivity gains for export crops. Similarly, the livestock scenario (Simulation 3) includes the productivity gains for both cereals and export crops (Simulation 2) plus additional productivity gains in the livestock sector. As noted in footnote 4, all simulations use the same productivity growth rates for all sectors from 2005 to 2008. The productivity shocks differ across simulations only from 2009 onward.

TABLE 8A.1 Computable general equilibrium model sets, parameters, and variables

Symbol	Explanation	Symbol	Explanation
Sets			
$a \in A$	Activities	$c \in CMN\ (\subset C)$	Commodities not in *CM*
$a \in ALEO\ (\subset A)$	Activities with a Leontief function at the top of the technology nest	$c \in CT\ (\subset C)$	Transaction service commodities
		$c \in CX\ (\subset C)$	Commodities with domestic production
$c \in C$	Commodities	$f \in F$	Factors
$c \in CD\ (\subset C)$	Commodities with domestic sales of domestic output	$i \in INS$	Institutions (domestic and rest of world)
$c \in CDN\ (\subset C)$	Commodities not in *CD*	$i \in INSD\ (\subset INS)$	Domestic institutions
$c \in CE\ (\subset C)$	Exported commodities	$i \in INSDNG\ (\subset INSD)$	Domestic nongovernment institutions
$c \in CEN\ (\subset C)$	Commodities not in *CE*	$h \in H\ (\subset INSDNG)$	Households
$c \in CM\ (\subset C)$	Aggregate imported commodities		
Parameters			
$cwts_c$	Weight of commodity *c* in the consumer price index	pwm_c	Import price (foreign currency)
$dwts_c$	Weight of commodity *c* in the producer price index	$qdst_c$	Quantity of stock change
ica_{ca}	Quantity of *c* as intermediate input per unit of activity *a*	$\overline{qg}_c$	Base-year quantity of government demand
$icd_{cc'}$	Quantity of commodity *c* as trade input per unit of *c′* produced and sold domestically	$\overline{qinv}_c$	Base-year quantity of private investment demand
$ice_{cc'}$	Quantity of commodity *c* as trade input per exported unit of *c′*	$shif_{if}$	Share of domestic institution *i* in income of factor *f*
$icm_{cc'}$	Quantity of commodity *c* as trade input per imported unit of *c′*	$shii_{ii'}$	Share of net income of *i′* to *i* ($i' \in INSDNG'$; $i \in INSDNG$)
$inta_a$	Quantity of aggregate intermediate input per unit of activity output	ta_a	Tax rate for activity *a*
		$\overline{tins}_i$	Exogenous direct tax rate for domestic institution *i*
iva_a	Quantity of value added per unit of activity output	$tins01_i$	0–1 parameter, with 1 for institutions with potentially flexed direct tax rates
$\overline{mps}_i$	Base savings rate for domestic institution *i*		
$mps01_i$	0–1 parameter, with 1 for institutions with potentially flexed direct tax rates	tm_c	Import tariff rate
		tq_c	Rate of sales tax
pwe_c	Export price (foreign currency)	$trnsfr_{if}$	Transfer from factor *f* to institution *i*

(*continued*)

TABLE 8A.1 Continued

Symbol	Explanation	Symbol	Explanation
Greek symbols			
α_a^a	Efficiency parameter in the constant elasticity of substitution (CES) activity function	δ_{cr}^t	CET function share parameter
α_a^{va}	Efficiency parameter in the CES value-added function	δ_{fa}^{va}	CES value-added function share parameter for factor *f* in activity *a*
α_c^{ac}	Shift parameter for the domestic commodity aggregation function	γ_{ch}^m	Subsistence consumption of marketed commodity *c* for household *h*
α_c^q	Armington function shift parameter	θ_{ac}	Yield of output *c* per unit of activity *a*
α_c^t	Function shift parameter for the constant elasticity of transformation (CET)	ρ_a^a	CES production function exponent
		ρ_a^{va}	CES value-added function exponent
β^a	Capital sectoral mobility factor	ρ_c^{ac}	Domestic commodity aggregation function exponent
β_{ch}^m	Marginal share of consumption spending on marketed commodity *c* for household *h*	ρ_c^q	Armington function exponent
δ_a^a	CES activity function share parameter	ρ_c^t	CET function exponent
δ_{ac}^{ac}	Share parameter for the domestic commodity aggregation function	η_{fat}^a	Sector share of new capital
		QF_{fa}	Quantity demanded of factor *f*
δ_{cr}^q	Armington function share parameter		
υ_f	Capital depreciation rate		
Exogenous variables			
$\overline{CPI}$	Consumer price index	$\overline{MPSADJ}$	Savings rate scaling factor (= 0 for base)
$\overline{DTINS}$	Change in domestic institution tax share (= 0 for base; exogenous variable)	$\overline{QFS}_f$	Quantity of factor supplied
		$\overline{TINSADJ}$	Direct tax scaling factor (= 0 for base; exogenous variable)
$\overline{FSAV}$	Foreign savings (foreign currency unit, or FCU)		
$\overline{GADJ}$	Government consumption adjustment	$\overline{WFDIST}_{fa}$	Wage distortion factor for factor *f* in activity *a*
$\overline{IADJ}$	Investment adjustment factor		

Endogenous variables			
AWF^{a}_{ft}	Average capital rental rate in time period *t*	PVA_a	Value-added price (factor income per unit of activity)
$DMPS$	Change in domestic institution savings rates (= 0 for base; exogenous variable)	PX_c	Aggregate producer price for commodity *c*
DPI	Producer price index for domestically marketed output	$PXAC_{ac}$	Producer price of commodity *c* for activity *a*
EG	Government expenditures	QA_a	Quantity (level) of activity
EH_h	Consumption spending for household	QD_c	Quantity sold domestically of domestic output
EXR	Exchange rate (local currency unit per FCU)	QE_{cr}	Quantity of exports
$GSAV$	Government savings	QG_c	Government consumption demand for commodity *c*
MPS_i	Marginal propensity to save for domestic nongovernment institution (exogenous variable)	QH_{ch}	Quantity consumed of commodity *c* by household *h*
PA_a	Activity price (unit gross revenue)	QHA_{ach}	Quantity of household home consumption of commodity *c* from activity *a* for household *h*
PDD_c	Demand price for commodity produced and sold domestically		
PDS_c	Supply price for commodity produced and sold domestically	$QINTA_a$	Quantity of aggregate intermediate input
PE_{cr}	Export price (domestic currency)	$QINT_{ca}$	Quantity of commodity *c* as an intermediate input to activity *a*
$PINTA_a$	Aggregate intermediate input price for activity *a*		
PK_{ft}	Unit price of capital in time period *t*	$QINV_c$	Quantity of investment demand for commodity *c*
PM_{cr}	Import price (domestic currency)		
PQ_c	Composite commodity price	QM_{cr}	Quantity of imports of commodity *c*

(*continued*)

TABLE 8A.1 Continued

Symbol	Explanation	Symbol	Explanation
QQ_c	Quantity of goods supplied to domestic market (composite supply)	$TINS_i$	Direct tax rate for institution i ($i \in INSDNG$)
		$TRII_{ii'}$	Transfers from institution i' to i (both in the set $INSDNG$)
QT_c	Quantity of commodity demanded as trade input	WF_f	Average price of factor
QVA_a	Quantity of (aggregate) value-added	YF_f	Income of factor f
QX_c	Aggregated quantity of domestic output of commodity	YG	Government revenue
		YI_i	Income of domestic nongovernment institution
$QXAC_{ac}$	Quantity of output of commodity c from activity a	YIF_{if}	Income to domestic institution i from factor f
RWF_f	Real average factor price	ΔK^a_{fat}	Quantity of new capital by activity a for time period t
$TABS$	Total nominal absorption		

SOURCE: Authors, based on the structure of the Dynamic Regional Economywide Model of Ethiopia (DREME).

TABLE 8A.2 Computable general equilibrium model equations

Production and price equations

$$QINT_{ca} = ica_{ca} \cdot QINTA_a \tag{1}$$

$$PINTA_a = \sum_{c \in C} PQ_c \cdot ica_{ca} \tag{2}$$

$$QVA_a = \alpha_a^{va} \cdot \left(\sum_{f \in F} \delta_{fa}^{va} \cdot \left(\alpha_{fa}^{vaf} \cdot QF_{fa} \right)^{-\rho_a^{va}} \right)^{-\frac{1}{\rho_a^{va}}} \tag{3}$$

$$W_f \cdot \overline{WFDIST}_{fa} = PVA_a \cdot QVA_a \cdot \left(\sum_{f \in F'} \delta_{fa}^{va} \cdot \left(\alpha_{fa}^{vaf} \cdot QF_{fa} \right)^{-\rho_a^{va}} \right)^{-1} \cdot \delta_{fa}^{va} \cdot \left(\alpha_{fa}^{vaf} \cdot QF_{fa} \right)^{-\rho_a^{va}-1} \tag{4}$$

$$QF_{fa} = \alpha_{fa}^{van} \cdot \left(\sum_{f' \in F} \delta_{ff'a}^{van} \cdot QF_{f'a}{}^{-\rho_{fa}^{van}} \right)^{-\frac{1}{\rho_{fa}^{van}}} \tag{5}$$

$$W_{f'} \cdot WFDIST_{f'a} = W_f \cdot WFDIST_{fa} \cdot QF_{fa} \cdot \left(\sum_{f'' \in F} \delta_{ff''a}^{van} \cdot QF_{f''a}{}^{-\rho_{fa}^{van}} \right)^{-1} \cdot \delta_{ff'a}^{van} \cdot QF_{f'a}{}^{-\rho_{fa}^{van}-1} \tag{6}$$

$$QVA_a = iva_a \cdot QA_a \tag{7}$$

$$QINTA_a = inta_a \cdot QA_a \tag{8}$$

$$PA_a \cdot (1 - ta_a) \cdot QA_a = PVA_a \cdot QVA_a + PINTA_a \cdot QINTA_a \tag{9}$$

$$QXAC_{ac} = \theta_{ac} \cdot QA_a \tag{10}$$

$$PA_a = \sum_{c \in C} PXAC_{ac} \cdot \theta_{ac} \tag{11}$$

$$QX_c = \alpha_c^{ac} \cdot \left(\sum_{a \in A} \delta_{ac}^{ac} \cdot QXAC_{ac}{}^{-\rho_c^{ac}} \right)^{-\frac{1}{\rho_c^{ac}-1}} \tag{12}$$

$$PXAC_{ac} = PX_c \cdot QX_c \left(\sum_{a \in A'} \delta_{ac}^{ac} \cdot QXAC_{ac}^{-\rho_c^{ac}} \right)^{-1} \cdot \delta_{ac}^{ac} \cdot QXAC_{ac}^{-\rho_c^{ac}-1} \tag{13}$$

$$PE_{cr} = pwe_{cr} \cdot EXR - \sum_{c' \in CT} PQ_c \cdot ice_{c'c} \tag{14}$$

$$QX_c = \alpha_c^t \cdot \left(\sum_r \delta_{cr}^t \cdot QE_{cr}^{\rho_c^t} + \left(1 - \sum_r \delta_{cr}^t \right) \cdot QD_c^{\rho_c^t} \right)^{\frac{1}{\rho_c^t}} \tag{15}$$

(continued)

TABLE 8A.2 Continued

$$\frac{QE_{cr}}{QD_c} = \left(\frac{PE_{cr}}{PDS_c} \cdot \frac{1 - \sum_r \delta^t_{cr}}{\delta^t_c} \right)^{\frac{1}{\rho^t_c - 1}} \tag{16}$$

$$QX_c = QD_c + \sum_r QE_{cr} \tag{17}$$

$$PX_c \cdot QX_c = PDS_c \cdot QD_c + \sum_r PE_{cr} \cdot QE_{cr} \tag{18}$$

$$PDD_c = PDS_c + \sum_{c' \in CT} PQ_{c'} \cdot icd_{c'c} \tag{19}$$

$$PM_{cr} = pwm_{cr} \cdot (1 + tm_{cr}) \cdot EXR + \sum_{c' \in CT} PQ_{c'} \cdot icm_{c'c} \tag{20}$$

$$QQ_c = \alpha^q_c \cdot \left(\sum_r \delta^q_{cr} \cdot QM_{cr}^{-\rho^q_c} + (1 - \sum_r \delta^q_{cr}) \cdot QD_c^{-\rho^q_c} \right)^{-\frac{1}{\rho^q_c}} \tag{21}$$

$$\frac{QM_{cr}}{QD_c} = \left(\frac{PDD_c}{PM_c} \cdot \frac{\delta^q_c}{1 - \sum_r \delta^q_{cr}} \right)^{\frac{1}{1 + \rho^q_c}} \tag{22}$$

$$QQ_c = QD_c + \sum_r QM_{cr} \tag{23}$$

$$PQ_c \cdot (1 - tq_c) \cdot QQ_c = PDD_c \cdot QD_c + \sum_r PM_{cr} \cdot QM_{cr} \tag{24}$$

$$QT_c = \sum_{c' \in C'} (icm_{cc'} \cdot QM_{c'} + ice_{cc'} \cdot QE_{c'} + icd_{cc'} \cdot QD_{c'}) \tag{25}$$

$$\overline{CPI} = \sum_{c \in C} PQ_c \cdot cwts_c \tag{26}$$

$$DPI = \sum_{c \in C} PDS_c \cdot dwts_c \tag{27}$$

Institutional incomes and domestic demand equations

$$YF_f = \sum_{a \in A} WF_f \cdot \overline{WFDIST}_{fa} \cdot QF_{fa} \tag{28}$$

TABLE 8A.2 Continued

$$YIF_{if} = shif_{if} \cdot [YF_f - trnsfr_{row\,f} \cdot EXR] \tag{29}$$

$$YI_i = \sum_{f \in F} YIF_{if} + \sum_{i' \in INSDNG'} TRII_{ii'} + trnsfr_{i\,gov} \cdot \overline{CPI} + trnsfr_{i\,row} \cdot EXR \tag{30}$$

$$TRII_{ii'} = shii_{ii'} \cdot (1 - MPS_{i'}) \cdot (1 - \overline{tins}_{i'}) \cdot YI_{i'} \tag{31}$$

$$EH_h = \left(1 - \sum_{i \in INSDNG} shii_{ih}\right) \cdot (1 - MPS_h) \cdot (1 - \overline{tins}_h) \cdot YI_h \tag{32}$$

$$PQ_c \cdot QH_{ch} = PQ_c \cdot \gamma^m_{ch} + \beta^m_{ch} \cdot \left(EH_h - \sum_{c' \in C} PQ_{c'} \cdot \gamma^m_{c'h}\right) \tag{33}$$

$$QINV_c = IADJ \cdot \overline{qinv}_c \tag{34}$$

$$QG_c = \overline{GADJ} \cdot \overline{qg}_c \tag{35}$$

$$EG = \sum_{c \in C} PQ_c \cdot QG_c + \sum_{i \in INSDNG} trnsfr_{i\,gov} \cdot \overline{CPI} \tag{36}$$

System constraints and macroeconomic closures

$$\begin{aligned} YG = & \sum_{i \in INSDNG} \overline{tins}_i \cdot YI_i + \sum_{c \in CMNR} tm_c \cdot pwm_c \cdot QM_c \cdot EXR + \sum_{c \in C} tq_c \cdot PQ_c \cdot QQ_c \\ & + \sum_{f \in F} YF_{gov\,f} + trnsfr_{gov\,row} \cdot EXR \end{aligned} \tag{37}$$

$$QQ_c = \sum_{a \in A} QINT_{ca} + \sum_{h \in H} QH_{ch} + QG_c + QINV_c + qdst_c + QT_c \tag{38}$$

$$\sum_{a \in A} QF_{fa} = QFS_f \tag{39}$$

$$YG = EG + GSAV \tag{40}$$

$$\sum_{rc \in CMNR} pwm_{cr} \cdot QM_{cr} + \sum_{f \in F} trnsfr_{row\,f} = \sum_{rc \in CENR} pwe_{cr} \cdot QE_{cr} + \sum_{i \in INSD} trnsfr_{i\,row} + FSAV \tag{41}$$

$$\sum_{i \in INSDNG} MPS_i \cdot (1 - \overline{tins}_i) \cdot YI_i + GSAV + EXR \cdot FSAV = \sum_{c \in C} PQ_c \cdot QINV_c + \sum_{c \in C} PQ_c \cdot qdst_c \tag{42}$$

$$MPS_i = \overline{mps}_i \cdot (1 + MPSADJ) \tag{43}$$

(*continued*)

TABLE 8A.2 Continued

Capital accumulation and allocation equations

$$AWF_{ft}^{a} = \sum_{a} \left[\left(\frac{QF_{fat}}{\sum_{a'} QF_{fa't}} \right) \cdot WF_{ft} \cdot WFDIST_{fat} \right] \tag{44}$$

$$\eta_{fat}^{a} = \left(\frac{QF_{fat}}{\sum_{a'} QF_{fa't}} \right) \cdot \left(\beta^{a} \cdot \left(\frac{WF_{f,t} \cdot WFDIST_{fat}}{AWF_{ft}^{a}} - 1 \right) + 1 \right) \tag{45}$$

$$\Delta K_{fat}^{a} = \eta_{fat}^{a} \cdot \left(\frac{\sum_{c} PQ_{ct} \cdot QINV_{ct}}{PK_{ft}} \right) \tag{46}$$

$$PK_{ft} = \sum_{c} PQ_{ct} \cdot \frac{QINV_{ct}}{\sum_{c'} QINV_{c't}} \tag{47}$$

$$QF_{fat+1} = QF_{fat} \cdot \left(1 + \frac{\Delta K_{fat}^{a}}{QF_{fat}} - \upsilon_{f} \right) \tag{48}$$

$$QFS_{ft+1} = QFS_{ft} \cdot \left(1 + \frac{\sum_{a} \Delta K_{fat}}{QFS_{ft}} - \upsilon_{f} \right) \tag{49}$$

SOURCE: Authors, based on the structure of the Dynamic Regional Economywide Model of Ethiopia (DREME).

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9 Disaster Response and Emergency Risk Management in Ethiopia

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Agrarian communities dependent on rainfall are vulnerable to production shortfalls due to drought and other climatic shocks. The human suffering caused by such shocks is often amplified due to deficiencies in market fundamentals, such as roads, information, and risk management institutions. This has been the case in Ethiopia for several centuries, dating back to medieval chronicles of the ninth century (Pankhurst 1985; von Braun, Teklu, and Webb 1998), when droughts caused widespread food insecurities and, in extreme cases, famine.

However, sharp reductions in food production need not cause famines, nor are they the only cause of famines. Entitlement failures (households' loss of the ability to acquire sufficient food through their own production, other income, or transfers) can also result in widespread hunger even when the country's total food supply is adequate (Sen 1981). Moreover, inadequate consumption of macronutrients (calories, proteins, and fats and oils) or micronutrients (such as iron, vitamin A, and iodine) or insufficient absorption of nutrients due to disease or other health problems can result in severe malnutrition even when overall volumes of food consumption seem adequate (Bouis and Haddad 1992). Thus, food security can be more accurately viewed as a combination of availability of, access to, and use of food and nutrients (Devereux and Maxwell 2001). Both public policies and private responses can play a role in mitigating the dire consequences of shocks related to food availability, access, or entitlements and preventing widespread consumption declines. Therefore, it is important to understand how and why various aspects of food security deteriorate to cause famine, as well as what medium- or long-term policy forces are behind those outcomes. The literature has already indicated that the complex causes of famine include agricultural and overall economic development policies, instability and military conflict, market structure and performance, and the effectiveness of response by both the government and nongovernmental organizations (NGOs) (Webb and von Braun 1994; Devereux and Maxwell 2001). However, there remains a continued need for an examination of the types of policies and pro-

*This chapter reflects the author's viewpoint and does not necessarily reflect the views of the U.S. government.

grams that can help combat famines that occur as a result of drought and other shocks. This chapter presents an account of food shortages and policy responses in Ethiopia over the past four decades, as well as the perspectives of an insider to the policy process related to donor and government agencies. The objectives of this chapter are to review the history of famine in Ethiopia in the context of responses by the different regimes, donor agencies, and NGOs; discuss the major reforms that have taken place over the decades; and finally review the current food security environment in Ethiopia. One significant observation that underlies this chapter is that since the 1990s there has not been another widespread famine causing large-scale deaths in Ethiopia. Thus, the country's recent history has diverged sharply from the pre-1990s legacy.

The History of Food Insecurity and Famine in Ethiopia through 1992

The most severe drought-related famines in Ethiopia were recorded in Tigray in 1958, in Wollo in 1966 and 1973, and in Hararghe, Tigray, and Wollo in 1983. The estimated deaths from these famines vary, but commonly cited numbers are 100,000 deaths in 1958, an estimated 250,000 deaths in 1966 and 1973, and 590,000 deaths in 1984 (Africa Watch 1991).[1] Table 9.1 presents an overview of these famines and food shortfalls in Ethiopia. The occurrence of these four famines in such a short interval resulted in a common perception that rain shortfalls and subsequent famines would be on a 7- to 11-year cycle, which subsequently has not proven to be true.[2] In the last two decades, rain failures have caused grave food shortages in different parts of Ethiopia; fortunately they have not caused widespread famines, proving that appropriate policies and institutions can play important roles in averting famines.

Famine before 1972

The first and worst of the famines in "modern" Ethiopian history was the rinderpest famine of 1888–92. Caused by the introduction of new livestock into neighboring Eritrea, rinderpest, an infectious viral disease found among cattle, was introduced to the vulnerable, unexposed native cattle populations. With no prior exposure, Ethiopian cattle were unable to fight off the disease. Livestock mortality reached immense proportions. Although estimates vary, some claim that 90 percent of the cattle of Ethiopia perished, and Robert Skinner, the first US envoy to Ethiopia, later reported that not more than 7 or 8 percent were

1. For example, von Braun, Teklu, and Webb (1998) report that nearly 1 million people died during the 1983–84 famine.

2. Rainfall remains highly variable, however, and there are indications that rainfall is increasingly affected by climate change and is becoming less reliable. In particular, the early *belg* rains from February to May across much of the highland areas of Ethiopia were less than expected in recent years, while rainfall is declining in the south of the country—particularly the southeast (Eilerts 2009).

TABLE 9.1 A historical account of Ethiopian famines and major food shortages, geographic locations, and attributed causes, 1888–2009

Date	Region affected	Attributed causes and severity
1888–92	Ethiopia	Rinderpest affected the cattle population. An estimated 90 percent of livestock lost, and an estimated 2 million dead.
1957–58	Tigray and Wollo	Rain failure in 1957. Locusts and epidemic in 1958.
1964–66	Tigray and Wollo	Not properly documented, but some writers have argued that this crisis was worse than that in 1972–74.
1972–74	Ethiopia	A sequence of rain failures. An estimated quarter million dead and 50 percent of livestock lost in Tigray and Wollo.
1978–79	Southern Ethiopia	Failure of the *belg* rains.
1982	Northern Ethiopia	Late *meher* rains.
1984–85	Ethiopia	A sequence of rain failures. Eight million affected; an estimated 1 million dead, and much livestock loss.
1987–88	Ethiopia	Drought of undocumented severity in peripheral regions.
1990–92	Northern, eastern, and southwestern Ethiopia	Rain failure and regional conflicts. An estimated 4 million people suffered food shortage.
1993–94	Tigray, Wollo, and Addis Ababa	Due to droughts, 4 million people required food assistance, including demobilized army and Somali refugees. New droughts.
1997–2000	Eritrea and northern Tigray	Localized food shortages due to conflict.
1999–2000	Somali region	Food security crisis due to rain failures and decline in prices of livestock, the main source of pastoralists' income.
2002–03	Ethiopia	Drought-induced crop shortages; 12.6 million people were affected.
2008–09	Southern Ethiopia	Localized drought; 6.4 million people were affected.

SOURCES: 1888–92: Pankhurst (1964); 1957–94: Webb and von Braun (1994); 1997–2009: Dorosh, Schmidt, and Taffesse (2010).

spared (Pankhurst 1964). Unlike most of the affected Sub-Saharan African areas, Ethiopia had a long tradition of plow-based rather than hoe-based agriculture, so the country was hit doubly hard. Not only did rinderpest wipe out milk and meat production, it also wiped out crop production as plow oxen died.[3] As a result, a terrible famine gripped the country. Weakened populations suc-

3. Drought may have also contributed to the mortality of livestock and crop losses (Pankhurst 1985).

cumbed to a variety of diseases, including cholera. Rough estimates are that at least 2 million people, around one-third of the total Ethiopian population at that time, died (Pankhurst 1964; Zewde 2002).[4]

The 1972–74 Famine

The proximate cause of the 1972–74 famine can be identified as a sequence of rainfall failures and the consequent drought. Poor infrastructure, weak agricultural growth, and the absence of a specific disaster response strategy compounded the effects of the famine (Webb and von Braun 1994). In addition, the relief response to the crisis was seriously hampered and the impact of the famine exacerbated by government reluctance to admit the severity of the situation.[5]

As in all famines, the scale of deaths in 1972–74 is hard to determine, with estimates ranging from 40,000 to 80,000 in the immediate aftermath of the famine (Seaman and Holt 1975) to over 300,000 in a 1991 study (Ofcansky and Berry 1991). That famine has become one of the most studied events in humanitarian experience. Sen (1981) used it as one of the case studies in his seminal work on famine, describing the Wollo famine as an entitlement failure. He contended that there was no shortage in the overall food supply in Ethiopia, nor were there unusually high prices for food in Wollo; it was simply a case in which the poor did not have sufficient production or the money to buy food, which was exacerbated by a lack of both internal and external assistance. There is room for debate over this claim; other sources have documented large increases in grain prices (Webb and von Braun 1994) and the failure of the government to prevent the famine (de Waal 1997).

National pride and perhaps a concern that accepting outside help would diminish the standing of the government to the advantage of political opponents could explain the reluctance of the regime to accept the severity of the crisis. This was evident from an official response to the UNICEF report on the 1972–74 famine, which stated in clear terms that the description of the food security situation in the report was embarrassing for the country and that the government did not want any international assistance if such a description was necessary (Scholler and Brietzke 1976). For the vice minister of planning, who articulated that response, the underlying concern was the political embarrassment, not the severity of hunger and deprivation.

4. The gradual solution to the rinderpest famine was the natural selection process by which only the cattle most resistant to the disease were able to survive and reproduce. Although rinderpest remained a scourge for many decades, it never devastated the herds in the same way again. One hundred and twenty years after its arrival, rinderpest was the first animal disease to have officially been declared eliminated in Ethiopia.

5. Denial and apparent unwillingness to act were also major reasons that the droughts of 1958 and 1966 led to famines with very little organized response either from the Ethiopian government or the international community (de Waal 1997).

It is interesting to note that the 1972–74 famine, which started with such a clear denial by the vice minister of planning, ended up launching the modern response to famines in Ethiopia in spite of government authorities rather than because of them. The famine was exposed to the international community by the BBC news when Jonathon Dimbleby received permission to film the situation on the ground in Ethiopia. When his program "The Unknown Famine" came out, it helped to instigate a heightened protest against the Haile Selassie regime, which culminated in its overthrow (Gill 2010). The government began to allow aid organizations to respond to the famine, and a worldwide response fueled NGOs to set up feeding camps where the hungry gathered, although it was already too late for many Ethiopians (Gill 1986; Zewde 2002).[6]

One of the positive outcomes of the 1972–74 famine was the development of the Relief and Rehabilitation Commission (RRC). Founded under the Derg regime in 1974, the RRC eventually grew to be arguably the largest and most powerful part of the Ethiopian government with the exception of the military. Fueled by genuine concern over the high number of deaths in the 1972–74 famine, the RRC was initially focused on generating information to help prevent famine. According to many existing studies, the RRC produced some of the finest analyses of poverty and famine in Ethiopia and achieved impressive standards in its implementation of relief measures (de Waal 1997). Its performance during the 1984–85 famine, however, was far less satisfactory.

The 1984–85 Famine

A BRIEF REVIEW OF CAUSES AND CONSEQUENCES. There were four broad causes of the 1984–85 famine: military conflict, drought and crop failure, government policies regarding land reform and investment, and market failures (Webb and von Braun 1994). Ongoing wars against the regime of Mengistu Haile Mariam by the Eritrean People's Liberation Front and the Tigray Peoples' Liberation Front (TPLF) not only resulted in loss of life and serious injuries but also reduced the labor force available for crop cultivation and diverted scarce resources away from needed investments in agriculture. Drought-induced crop failure and loss of livestock played major roles as well; per capita production of cereals declined from 154.1 kilograms in 1982–83 to only 91.2 kilograms in 1985–86.[7] Even with imports (including food aid) of approximately 800,000 tons per year in 1985–86 and 1986–87, per capita availability fell from 151.5 kilograms in

6. Julius Holt, formerly with Save the Children UK, recounted a similar story in which Save the Children UK finally received a visit from the emperor at a dismal feeding camp in Wollo made up of thousands of tents. The emperor arrived in his characteristic Rolls Royce, walked around part of the camp staring into the mid-distance as he was wont to do, and paused before climbing back into the car. Gazing at the rows of tents, he said to an underling, "Look at the terrible conditions these foreigners keep our people in" before leaving (Holt, pers. comm.).

7. Data, including Eritrea, from FAO (various years a). Note that the FAO reports 1983–84 production as 1983.

1982–83 to 100.1 kilograms in 1985–86 and 110.2 kilograms in 1986–87 (Dorosh, Schmidt, and Taffesse 2010).

Government land reform policies, including abolishing private landownership in 1975 and imposing a ceiling of 10 hectares per farm on private land access rights, were welcomed in much of central and southern Ethiopia (von Braun and Webb 1994); however, subsequent government investment in agriculture was allocated mainly to state farms and producer cooperatives instead of to independent small farmers. Finally, market restrictions (regulations and bans on interregional movement of grain and labor), requirements for licensed private traders to make 50 percent of their purchases available to the Agricultural Marketing Corporation at fixed prices, and poor market infrastructure all contributed to a lack of market integration (Dorosh, Schmidt, and Taffesse 2010).

THE POLITICAL ECONOMY OF THE FAMINE RESPONSE. The famine of 1984–85 triggered a worldwide response, arguably creating much of the international humanitarian response that exists today. The scale and publicity of the famine was a testament to failure—the failure to respond to the warnings of famine. The RRC had turned into a politicized body and, as a result, failed to raise the alarm before the massive famine of 1984–85. The head of the RRC during the famine, Dawit Wolde Giorgis, documented his firsthand experience in a 1989 report. He complained that the information that the RRC generated regarding the growing famine, as well as its attempts to draw Mengistu's attention to the problem, was thwarted by political considerations. This was particularly so because the famine coincided with the Derg regime's preparation for the 10-year anniversary of the birth of the "Workers and Peasants Paradise"; they did not want the embarrassment of a famine on their hands. The Derg regime, like the Haile Selassie regime, failed to act to prevent the death of "peasants" from starvation.[8]

The main exacerbating factor in the famine of 1984–85 was the war with Eritrean and Tigrayan insurgents, who were operating in many of the affected regions. Not only did this divert state resources and attention from humanitarian concerns to military efforts, but also food and starvation became weapons of war. In the northern areas, the government used the drought to starve out the peasantry, which they believed was supporting the insurgents. This strategy eventually backfired, leaving the government with an even more embittered peasantry, as well as insurgents greatly strengthened by the international support given to them through Sudan to get food into the stricken areas. However, the situation did not go unnoticed for long. Eventually a response to the famine

8. Nonetheless, there were efforts on the part of the RRC to warn the donor community of the impending famine even in October 1983, a full year before the famine became global news (Wolde Giorgis 2004). Note, though, that the Ethiopian government also ignored the RRC warnings, and none of these warnings was covered in the state media.

was mounted; although late in arriving, it was massive. The major catalyst for the response was the international community, specifically the media. The BBC broke the news of the famine in October 1984, followed by a report from the Canadian Broadcasting Corporation a few days later. Once television screens worldwide were filled with images of starving masses from Korem and Mekelle, a strong international response began.[9] The response was so massive that it overwhelmed any sense of resistance from Ethiopian government officials.

Responding to famines in a sovereign state does not just require overall permission from that state; it also requires a myriad of bureaucratic agreements to facilitate the arrival and movement of aid workers (not to mention rock stars), food aid, and medical aid.[10] Faced with many bureaucratic hurdles in the 1984–85 famine (Gill 1986; Wolde Giorgis 1989), relief poured into Ethiopia in spite of ideological differences between western governments and the Derg regime.[11] Having been unsuccessful in covering up the massive human suffering, the greater embarrassment to the Ethiopian government would have come from not responding.[12]

Much has been written about the 1984 famine, and almost everyone involved has received criticism for not doing more and better sooner. Peter Gill's *A Year in the Death of Africa* methodically tracks the blame for the lack of early response; in the book the World Food Programme (WFP) and the UN system in general come across as highly complicit in downplaying the problem. OXFAM International is heavily criticized by Tony Vaux, former head of emergencies for OXFAM, in his book *The Selfish Altruist* (2001), which chronicles the failure of the country representative in Ethiopia to respond to the situation urgently for ideological reasons—both a desire to focus on long-term development rather than respond to emergencies and a reluctance to criticize the Derg government because of his ideological sympathy with the communist cause.

In the aftermath of the famine, a number of different policy and program approaches were adopted. These included improving the early warning system and the logistics of moving food and nonfood supplies in response to nutrition,

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9. Some NGOs were also doing their best to get the information on the famine out, including Save the Children, which raised a famine alert in January and moved swiftly to set up emergency intensive feeding and medical programs (Gill 2010). See also Gill (1986).

10. Bob Geldof, of the band Boomtown Rats, played an instrumental role in raising awareness of the Ethiopian famine in 1984 (Geldof 2007).

11. The famous line "A hungry child has no politics," which Ronald Reagan used to justify US aid to Ethiopia, was adopted only after the global news story had broken, although the line had first been used by USAID almost one year previously (Teltsch, *New York Times,* August 19, 1983, as quoted by Arulananthan 2008).

12. Kissi (2005), in his article "Beneath International Famine Relief in Ethiopia," goes so far as to argue that the willingness of the communist regime of Ethiopia to accept aid from the highly anticommunist Reagan administration in the White House was a triumph over their mutual antagonism. Suffice it to say that the world responded, and the Ethiopian government allowed and even facilitated it.

health, and agricultural rehabilitation needs. Although there was some progress in these areas, even in the difficult and war-ridden final years of the Derg, these efforts were overwhelmed by other factors.

In the postfamine period, the Derg regime needed to reconstruct its image both internally and externally. However, the same old centralized, patronizing, and oppressive thinking still prevailed, and the policies subsequently adopted were disastrous. Zewde (2002, 255) writes:

> As if to compensate for its initial tardiness, the government then embarked on an ambitious project of resettling peasants from the drought-prone areas of northern and central Ethiopia to the relatively fertile provinces of the west and south-west. On the surface this appeared to be a logical move. In reality, the forcible nature of the resettlement, as well as the effort to combine it with the government's cherished objective of collectivization, made it a highly unpopular move, both at home and abroad.

Following quickly on the heels of resettlement was the even more unpopular villagization program, which grouped scattered households into villages, ostensibly to provide better services that rarely appeared. The relocation from cherished household land was highly unpopular, and "it thereby contributed to the disaffection of a significant portion of the northern peasantry and the advances that guerillas opposed to the regime were able to make in the late 1980s" (Zewde 2002, 255).

After the Derg Regime: Institutional Change and the Somali Food Crisis

The Ethiopian People's Revolutionary Democratic Front (EPRDF) government came to power in 1991. The EPRDF government understood the role that famine had played in its victory. Unlike in the case of previous governments, the core members of the EPRDF had fought in famine conditions in the northern part of the country. The Tigrayan core of the new government had experienced all three major droughts in the country (1984, 1987, and 1989), when it had received substantial international assistance to help in the famine-affected "liberated zones" that it had held within Ethiopia. These experiences had shaped a set of beliefs among the core EPRDF members that greatly influenced their thinking regarding food security and humanitarian assistance.

The EPRDF believed that famines resulted from poor government policies and responses, as evidenced by both the imperial and the Derg regimes. They expected the peasant-centered ideology, which the new government professed, to soon overcome vulnerabilities and make famines history.

The new government concluded that the RRC was a powerful Derg-era institution that needed to be brought down to size and turned to the will of the new government. The expectation was that it would ultimately become unnecessary. Furthermore, the EPRDF deduced that humanitarian assistance could be used for subversive purposes (as it had been when the TPLF was supported) or to prop up hostile regimes (as it had been when used to support the Derg); thus NGOs could not be trusted. On the other hand, the EPRDF government found UN organizations weak and oriented to the needs of their client governments, which made them compliant partners. Thus, from 1991–95 the Transitional Government brought in a variety of new policies and strategies regarding emergency preparedness and response. These included dismantling the RRC, significantly reforming the strategic food reserves programs, launching the Productive Safety Net Programme, and restructuring the Disaster Prevention and Preparedness Commission.

Post–Derg Era Policies

As the RRC became politicized near the end of the Derg regime, the core of the EPRDF embarked on a series of drastic reforms that included a variety of new policies and strategies regarding emergency preparedness and response, capped by the 1993 National Policy on Disaster Prevention and Management (NPDPM). This was a state-of-the-art policy formulated by government and foreign experts that built on the National Disaster Prevention and Preparedness strategy that had been drafted, but never adopted, in the dying days of the Derg regime. The NPDPM included an early warning system linking relief to development through community-centered "employment generation schemes" and a section governing the administrative requirements and activities of NGOs. The newly formed Disaster Prevention and Preparedness Commission (DPPC), which replaced the former RRC, was given the mandate to manage the NPDPM with direct responsibility for food aid and coordination of nonfood responses through other government ministries.

Ethiopia was blessed with a series of good rainfall years in the mid-1990s, which gave the impression that the new government policies were eradicating the threat of famine. The large harvest of 1996 suggested to some that the DPPC was no longer needed, and many government officials and members of the international community were eager to close it down. However, rainfall failures in various parts of the country occurred in the spring of 1997, and it became clear that there were problems with the implementation of the NPDPM. On the emergency response side, the DPPC requested and controlled food aid and was considered to be working well. Yet, due to a lack of real administrative authority, the DPPC had no power to coordinate nonfood responses through other departments such as Health and Water. Therefore, the main functions of the DPPC (however flawed) remained early warning and emergency food response.

In August 2008, the DPPC was closed and replaced by the Disaster Risk Management and Food Security Service (DRMFSS), led by a state minister of the Ministry of Agriculture and Rural Development. At the same time, the federal-level staff was reduced to 300 from over 1,000 during the RRC tenure and 700 during that of the DPPC (Lautze, Raven-Roberts, and Erkineh 2009). The official position was that the DRMFSS would rely more on decentralized disaster risk reduction and response. The Government of Ethiopia is serious about the implementation of this approach, but it is too early to judge its effectiveness.

Improvements in Early Warning and Emergency Response

Ethiopia has a long history of early warning (EW) systems. The first such system was established in early 1974 under the imperial regime after the 1972–74 famine and was further developed after the disastrous 1984 drought. With the promulgation of the NPDPM in 1993, the Ethiopian government and its development partners recognized that the EW system needed to be strengthened further.

This proved particularly true during 1997–99, when the EW system was inadequate to elicit a sufficient response to failures of the *belg* rains in the Wollo area in the north and the Hararghe area in the east. Under the EW system at the time, the number of emergency beneficiaries was identified by local *woreda* officials, who passed this number on for compilation to zonal-level officials, who in turn passed it to the regional level and from there to the federal level. In early 1999, three *woredas* in East Hararghe —Fedis, Gursum, and Babile—sent reports to the zonal level that a combined estimate of 200,000 people were affected by failed rains. Zonal officials for East Hararghe assumed that the *woreda* officials were exaggerating and cut their number in half, to 100,000, passing this number to regional officials, who in turn cut the figure down to 50,000. Federal officials did the same, allocating assistance only for 25,000 beneficiaries in the three *woredas.*[13] The issue was resolved only by a flood of desperate food seekers who trekked from the three *woredas* to the main center of Harar, proving the seriousness of the situation.

That same year in South Wollo, government and WFP officials had decided that all food aid would be distributed from May to September, the "hungry season" before the main *meher*-season harvest. However, for many farmers in this region the main harvest is the *belg*-season harvest in April, and the hungry period is from November to March. Thus, the restriction on the timing of food aid distribution brought severe hardship to drought-affected households in early 1999 until the policy was reversed and food aid was allowed to be distributed in March.

Major changes in the EW system were not made until after the Somali drought and famine of 1999–2000, in which tens of thousands of children died from malnutrition and measles (Devereux 2000; Salama et al. 2001). In this case, the system failed to generate enough convincing evidence to elicit an adequate response when it was needed in the fall of 1999. Ultimately, it was a BBC documentary on the situation in Gode, a city in Somali region, that finally prompted a response in April 2000.

13. Personal account of the first author based on his work in the area at the time.

During the drought, the nutritional assessments conducted by NGOs (14 in 1999–2000) lacked a consistent and comparable methodology. Most of the surveys were not undertaken according to the accepted 30 × 30 cluster methodology, and of those only 9 percent (six surveys) met the minimum methodological requirements (Spiegel et al. 2004).[14] Clearly, there was a need for improvement in the nutritional assessment system. Subsequently, the Emergency Nutrition and Coordination Unit recently formed within the DPPC was strengthened through the development of new nutritional guidelines to provide standards and consistency. The guidelines institutionalized the 30 × 30 cluster methodology in Ethiopia and contributed to the consistency and comparability of nutritional assessments in the 2002/03 droughts and beyond. The nutritional assessment methodology continues to evolve, with recent analysis working on the different weight-for-height characteristics of many pastoralist communities.

An alternative assessment methodology proposed by UNICEF under the Enhanced Outreach Strategy (EOS) for child food supplementation adopts the weight-for-length and mid–upper arm circumference methodologies for identifying malnourished children, employing local health officials to undertake the measurements. Some measurements using this system have been highly controversial because they indicate very high levels of child malnutrition. However, overall the EOS system has captured areas of malnutrition and provided response through therapeutic food programs on an ongoing basis. On the nutrition response side as well, huge strides have been made since 1999–2000. Two assessments were undertaken on therapeutic feeding (Collins 2001; Stevens 2003). Major concerns of these assessments are that (1) the technical requirements for outpatient therapeutic care (OTC) were onerous and difficult to scale up sufficiently during a major emergency, (2) the gathering of children and mothers in therapeutic centers increased the spread of disease (in this case, a measles outbreak), and (3) the expense of therapeutic feeding made it difficult to reach large caseloads of patients.

Save the Children UK and other NGOs tried an alternative to OTC in 2000 called community therapeutic feeding (CTF), which involved leaving children and mothers in their communities if possible or meeting them on a scheduled basis to provide ready-to-use therapeutic foods to malnourished children. This was positively reviewed as addressing all of the major problems identified earlier and considered a good approach for managing acute malnutrition in

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14. The 30 × 30 cluster survey consists of two-stage sampling. In the first stage, a population is grouped into small geographical units (or clusters). Clusters are chosen proportional to the population size; the recommended number is 30. The second stage involves selection of households and then children for anthropometric measurements; again the recommended number of children is 30. The choice of 30 clusters hinges on statistical considerations for stability and distribution of means and proportion; the choice of 30 children per cluster is dictated by the number of children necessary for sufficient precision and the number who can reasonably be measured in one day (Spiegel et al. 2004).

emergencies (Grobler-Tanner and Collins 2004). CTF has since been widely adopted in Ethiopia and has become the main approach to combat malnutrition, complemented by OTC when needed.

Save the Children UK—working closely with the regional government and with the support of the United States Agency for International Development (USAID), the EU, the WFP, and others—launched a Household Economy Analysis–based early warning system specifically for the Somali region in the aftermath of the crisis. This system was running in time for the 2002–03 droughts and yielded a timely food aid and therapeutic feeding response that prevented any measurable excess mortality (OCHA 2003). To better understand and anticipate the severe effects of production shocks on food security, the Livelihoods Integration Unit was incorporated within the Ministry of Agriculture and Rural Development as part of the government's EW system. Under this new approach, baseline data were collected on the income and food consumption patterns of low-, middle-, and high-income groups of households, including the most food insecure. Disaggregating data by livelihood zones allows analysis of household food security that can identify problems that may not be captured in regional analyses. For example, the impacts of production losses of *enset* and sweet potatoes in 2008 on some households would not have been identified in a timely manner without disaggregated data that identify regional pockets of food-insecure areas.[15]

Improved information flows, as well as enhanced national and regional capacity for monitoring emerging food insecurity patterns over space, have improved the country's capacity for early warning and response planning. A more decentralized response system (via joint government and international organizational planning and regional logistics arrangements) has improved the timeliness of responses to serious hunger threats before they evolve into dire famine conditions.

The Emergency Food Security Reserve

The establishment of a strategic grain reserve was first recommended by an FAO study in 1974.[16] The central rationale was that stocks managed by parastatals proved inadequate to address fast-hitting emergencies. A key challenge in such emergencies is that procurement of food, food aid, or commercial imports require at least three to four months of lead time. In the case of food aid, there are two lead times: one is the time elapsed between pledge and actual commitment, and the other is the time needed to deliver the food to the beneficiaries after the donors make the commitment. Thus, both the Ethiopian government and its development partners were convinced that the country needed to

15. Data from the Livelihoods Integration Unit on consumption patterns of pastoralists are presented in Chapter 7.

16. This section relies heavily on Rashid and Lemma (2010).

have an emergency food stock that could feed the vulnerable population for at least four months.

A follow-up study launched by the FAO in 1979 recommended building up a stock of 180,000 tons within four years. This recommendation resulted in the establishment of the Emergency Food Security Reserve Administration (EFSRA) in 1982 as an additional unit attached to the RRC. Subsequently, a joint study conducted by the WFP and the Overseas Development Administration of the United Kingdom recommended revising the stock level upward to 204,600 tons in 1987. Under the transitional government, the EFSRA went through a significant institutional change in October 1992, with the EFSRA becoming an autonomous agency and important changes made in the operational modalities. After the emergencies of 2003, the reserve level was reevaluated and a new stock level of 407,000 tons was established in 2004. The increase was largely dictated by the increase in the vulnerable population in the country and the assumption that it would take four months to bring a new shipment of food to the country.

The EFSRA is credited for effectively addressing several emergencies since the early 1990s. According to a FAO study conducted for the New Economic Partnership for Africa's Development, the national food security reserves played a key role in handling the 1994 emergency by releasing 94,000 tons of food to NGOs and another 52,000 tons of free draw-down by government relief agencies; the EFSRA was the only immediate source of supplies during the 1997 *belg* crop failures and the 1999–2000 droughts (FAO 2004). Likewise, Rashid and Lemma (2010) conclude that the EFSRA has managed grain reserves in a cost-effective way. The study identified three key factors behind this success. First is the institutional design of the EFSRA, reflecting a very high level of commitment from both the government and its development partners. Chaired by the head of the DRMFSS, the EFSRA board consists of the EFSRA manager and representatives from the Ministries of Finance, Agriculture, and Rural Development, as well as the Ministry of Trade. At a second level is a technical committee that consists of the general manager of the EFRSA, representatives from the Ethiopian Grain Trading Enterprise and the WFP, and a representative of the national and international NGOs engaged in emergency operations. Although the board is responsible for broad policy guidance, day-to-day operations are generally overseen by the EFSRA general manager in consultation with this technical committee.[17]

The second key factor behind the EFSRA's success is the separation of its operation from food price stabilization policies. Unlike similar agencies in many other countries that have grain reserve programs, the EFSRA does not engage in buying, selling, transporting, or distributing grain. Instead, it serves as a custodian of the grain stock built through donor and government contribu-

17. For detailed operational modalities, see Rashid and Lemma (2010).

tions. The government's key responsibility is to lend grain to recognized national and international relief organizations, as well as to government agencies engaged in food security operations, under agreed-upon conditions of repayment in a prespecified time frame and locations. As a result, the agency does not have to carry out any monetary transactions or physical transactions of food, which in many instances breed corruption and lead to other inefficiencies. Also, through linkages with social safety nets and other food security programs, the agency has developed an efficient mechanism of stock rotation, resulting in lower waste and costs of stock holdings.

The final factor behind the EFSRA's success is that stocks are kept at a minimum. Although the original target was set at 407,000 tons, the EFSRA has not held a stock larger than 332,000 tons in any given quarter since 2004; the stock averaged only about 240,000 tons during 2004–05 and 135,000 tons during 2007–08 (Table 9.2).

TABLE 9.2 Quarterly average cereal stocks of the Emergency Food Security Reserve Administration (EFSRA), 2004–08 (metric tons)

Year	Quarter	Wheat	Maize	Total
2004	1	273,265	58,460	331,726
	2	226,586	47,288	273,874
	3	199,976	44,292	244,268
	4	170,636	56,478	227,115
2005	1	109,451	57,152	166,603
	2	106,473	47,859	154,333
	3	205,578	53,123	258,700
	4	210,170	61,783	271,953
Average		187,767	53,304	241,072
2006	1	185,738	46,449	232,187
	2	128,624	46,338	174,963
	3	86,528	36,128	122,656
	4	156,004	55,770	211,774
2007	1	164,267	59,776	224,043
	2	134,939	24,282	159,221
	3	59,485	21,925	81,410
	4	98,304	70,722	169,027
2008	1	58,926	75,791	134,717
	2	29,044	25,591	54,635
	3	6,243	1,371	7,614
	4	35,477	17,850	53,327
Average		95,298	40,166	135,465

SOURCE: Ethiopia, EFSRA (2008).

It should be noted that there are differing views as to Ethiopia's management of food reserves in response to incipient food crises. The system failed to alleviate the 1984 famine two years after its establishment, though reserves did play a role in dealing with the crisis of 1987–88 (Jones 1994). Depletion of stocks to very low levels in 1999–2000 and 2008–09 is also cited as a failure of the system. However, other factors have to be considered before coming to such conclusions. For instance, depletion of stocks to only 60,000 tons in 1999–2000 was not the result of stock mismanagement but rather a consequence of disagreements between the donors and the government. Donors were slow to refill the EFSRA before the emergency because of international disapproval of the war with Eritrea and a questioning of the emergency request figures (Barrett and Maxwell 2005). Likewise, the sharp drawdown of stocks in 2008–09 was not the cause of food price increases but was the consequence of inaccurate crop forecasts as well as macroeconomic factors (overall inflation and shortages of foreign exchange). Moreover, although maintaining a minimum level of stocks is generally desirable, drawing down stocks to meet critical food needs of vulnerable populations may take precedence in some situations.

The Public Food Distribution and Social Safety Net Programs

After the 1984–85 famine, the international community continued to inject large amounts of assistance into Ethiopia, which arguably prevented the return of famine, particularly in the poor production year of 1987. The massive excess of donations surpassed immediate needs in 1985, providing a "surplus" of food aid that was largely put to use in food-for-work programs. In the aftermath of the famine, most agencies turned their attention to "rehabilitation" and sought to use development activities to safeguard against future famine threats. Free food distribution in normal times was considered a disincentive to food production; providing food in exchange for work was the preferred approach. By 1986–87, when the peak of the crisis had passed in most regions, a public works boom started (Webb and Kumar 1995). The massive results of this public works boom can still be seen in Ethiopia today in the visible terracing on the road from Dire Dawa to Harar.

Under the Transitional Government (1991–95), the Employment Generation Scheme (EGS) was launched as the successor to food-for-work programs. Although pilot programs were successfully launched and agriculture experts and development agents lent their support to public works undertaken by beneficiaries of emergency food, the program was not sustainable or replicable. One of the main reasons for this failure was mismanagement. The EGS was formally under the control of DPPC but relied mainly on the Ministry of Agriculture and Rural Development (MoARD), which had no interest in taking directions from or coordinating with the DPPC. The MoARD never took responsibility for the EGS and never integrated it into their work plans, so the system worked only if an NGO aggressively followed up with government officials. (Eventually the EGS was transformed into the Productive Safety Net Programme, directly under the MoARD.)

In 2005, the Government of Ethiopia revised its strategy of distributing food aid and aimed to replace the emergency appeals and ad hoc distribution program with a standing safety net in areas suffering from chronic food insecurity. Since January 2005, the Productive Safety Net Programme (PSNP) has been implemented as part of a broader Food Security Program. The objective of the PSNP is to provide households with enough income (cash or food) to meet their food needs, thereby protecting their households' assets from depletion, and to build community assets to address the root causes of food insecurity. The PSNP delivers cash or food transfers to 7–8 million rural Ethiopians for six months of every year, either through public works (85 percent) or—for those chronically food-insecure households whose members cannot work, such as the disabled, elderly, and others (15 percent)—for free as direct support. It is the largest social protection program operating in Sub-Saharan Africa with the exception of South Africa. A detailed program description of the PSNP is provided by Gilligan, Hoddinott, and Taffesse (2009), and a discussion of the targeting of PSNP beneficiaries appears in Chapter 10.

Droughts, Food Insecurity, and Food Aid Inflow

Despite severe drought-related production shortfalls, Ethiopia has not suffered a major famine causing widespread deaths since 1991. The country has been hit by four large-scale droughts since 1991 that have affected millions of people, but according to the Emergency Event Database of the Centre for Research on Epidemiology and Disaster (CRED), none of them led to large-scale deaths as in the past (CRED 2011). In fact, when ranked in terms of total number of affected people, the drought of 2002–03—which affected 12.6 million people—turns out to have been the worst drought in the country's history (Table 9.3). Yet, there were few reported drought-related deaths. By contrast, although only 3 million people were affected by the 1973 drought, there were about 100,000 estimated drought-related deaths. Similarly, although the 2008 drought affected twice as many people (6.4 million) as that of 1973 (3.0 million), there were no reported drought-related deaths.

The policy and institutional reforms described earlier have played a significant role in averting famines or major food security crises in recent years. Targeted and efficient emergency operations, social safety nets, effective coordination across government agencies and their development partners, and emergency food reserves have been central to effectively managing disasters in recent years. For instance, having a large-scale safety net program like the PSNP greatly helped the country in 2008 when a major drought coincided with the global food crisis. However, other factors—such as improvement in infrastructure and information, absence of prolonged civil strife, and relative openness in information sharing—have also played important roles. Due to improve-

TABLE 9.3 Major droughts and drought-related consequences, 1965–2008

	Number of deaths and affected people (thousands)	
Year of drought, by severity	Total number of deaths	Total number of people affected
1983	300	7,750
1973	100	3,000
1965	2	8,000
1987	0.4	7,000
1989	n.a.	6,500
1999	n.a.	4,900
2003	n.a.	12,600
2005	n.a.	2,600
2008	n.a.	6,400

SOURCE: Based on the top 10 list of disasters in Ethiopia since 1900 of the Centre for Research on Epidemiology and Disaster (CRED 2011).

NOTES: The table is sorted by total number of deaths and then chronologically by year. n.a. = not available.

ments in infrastructure and information, the response time of the government and its development partners was much shorter in recent years compared to the past. In addition, carrying out emergency operations has become much easier in the absence of civil strife. Note that the conflict with Eritrea (May 1998–June 2000) was largely confined to the borders and had little direct influence on most households in what is now Ethiopia.

Although the country has managed to avert widespread famine since 1991, localized food shortages continue to be a recurrent phenomenon. Food aid has been one of the key instruments for dealing with these emergencies. Historically, Ethiopia has featured prominently as a large recipient of food aid. In 2008, the amount of food aid received in Ethiopia expressed as a percentage of total domestic consumption was quite high (del Ninno, Dorosh, and Subbarao 2007). Although food aid as a share of domestic consumption declined to zero in India, 1.9 percent in Bangladesh, and 3.8 percent in Zambia, it remained at 5.0 percent in Ethiopia in 2008.

There are three reasons for the decline in food aid. First, as shown in Table 9.4, food aid inflow to the country has fluctuated widely, with substantially greater inflow during the drought years until 2005. This was true in 1999–2000 and again during 2002–03. However, this was not the case during 2008–10, when the domestic prices of cereals skyrocketed. In this instance, the market price inflation was to some extent mitigated by government imports, a reintroduction of rationing systems, and perhaps more importantly a depletion of the strategic grain reserves (Dorosh and Ahmed 2009). Second, accord-

TABLE 9.4 Food production and food aid in Ethiopia, 1996–2008

Year	Total cereal production (thousands of metric tons)	Total cereal consumption (thousands of metric tons)	Total food aid delivery (thousands of metric tons)[a]	Aid as a percentage of production	Aid as a percentage of consumption
1996	10,328	7,274	120	1.2	1.6
1997	10,437	7,713	548	5.3	7.1
1998	8,103	7,983	463	5.7	5.8
1999	8,867	8,431	1,031	11.6	12.2
2000	9,234	8,944	1,199	13.0	13.4
2001	11,039	9,373	299	2.7	3.2
2002	10,371	9,635	1,214	11.7	12.6
2003	11,536	9,886	947	8.2	9.6
2004	10,627	10,235	600	5.6	5.9
2005	12,574	10,490	699	5.6	6.7
2006	14,412	10,945	504	3.5	4.6
2007	15,573	11,376	285	1.8	2.5
2008	16,872	12,513	626	3.7	5.0
2009	17,117	17,861	1,112	7.7	6.3
2010	18,076	18,249	1,401	9.0	7.7

SOURCES: World Food Programme–Ethiopia for 2005–08; FAO (various years b) for the remainder.
[a]*Food aid* refers to cereals only.

ing to government statistics, the production situation has improved dramatically. As a result, food aid as a share of production has been on the decline since 2004. Finally, introduction of cash transfers under the PSNP and other policy responses discussed earlier have contributed to the decline in food aid imports since 2005.

Deeper policy debate and change are requirements for sustainable responses to food crises. Some of the central issues that continue to influence food insecurity are these: (1) landholdings are too small for most farming households to achieve food production self-sufficiency, (2) population increases reduce landholdings further and place intolerable stress on an already fragile natural resource base, (3) already low soil fertility is declining due to intensive cultivation and limited application of yield-enhancing inputs, (4) recurrent droughts add food production shocks to abnormally low yields, and (5) limited off-farm employment opportunities restrict diversification and migration options, leaving people trapped in increasingly unviable agriculture (Devereux 2000). Therefore, although policy developments have contributed to averting a major national famine in Ethiopia, there continues to be room for improvement. Regional and localized food insecurity can still occur, as evidenced by food crises in Somali region in 1999–2000 and regional food insecurity in 2008–09.

The 1999–2000 Food Security Crisis in Somali Region

Despite developments in early warning and response in the highlands of Ethiopia, the Somali food crisis of 1999–2000 demonstrated the special challenges and the need for tailored response programs in the pastoralist areas of Ethiopia. Although they represent about 60 percent of the land area and contain over 10 percent of the total population, pastoralist areas are generally remote and neglected; emergency response in these areas has also been poor. However, there has been improvement in identifying and responding to emergencies in the last nine years.

In 1999, successive failures of rain in Somali region weakened the coping mechanisms of pastoralists, who had already suffered price declines because of the 1997 ban on livestock imports from the Horn of Africa into Saudi Arabia and other parts of the Middle East, the largest market for sheep and goats from Somali region. When the rains failed in late 1999, the normally resilient pastoralists, who had survived severe droughts as recently as 1993 without significant outside assistance, were thrown into a devastating food crisis. Thousands of people died, mostly children under five years of age. Although some NGOs rang the alarm, they were generally not believed, and a rancorous debate dragged on for months. Finally, a BBC broadcast on April 4, 2000, showing children dying of hunger elicited a response. But significant food aid did not arrive until the beginning of May; ultimately perhaps 80,000–120,000 children died of malnutrition and measles (Salama et al. 2001; Howe and Devereux 2004).

In assessing the causes of the food insecurity–related deaths, the Government of Ethiopia and the international community recognized that a number of measures had to be in place for the pastoralist regions. These included good EW and nutrition assessment systems, regular and emergency measles vaccination campaigns, and the development of health facilities, as well as better and more efficient emergency response programs for food aid distribution and the administration of therapeutic feeding. Following this assessment in 2001, a group of agencies, led by Save the Children UK and funded by USAID and the EU, worked with the Somali Regional Government to set up an early warning system based on Household Economy Analysis, as described above.

The payoff was immediate. By the time the next drought hit Somali region in 2002–03, the system was sufficiently in place to initiate a response and provide direct emergency assistance to the most affected areas. The EW system has subsequently been used to identify the numbers and locations of emergency beneficiaries on an annual basis. Full sustainability of the program in the government has not yet been achieved, however, due to a high rate of staff turnover and limited budget commitment. A four-year program for the final handover of the system to the Somali Regional Government from Save the Children UK is now underway, with the government promising to commit financial resources to the system in its annual budget.[18]

Regional Food Insecurity in 2008–09

In 2008, localized droughts in both crop-producing and pastoralist areas caused over 12 million people to need food assistance, including safety net beneficiaries. This was the second-highest number of food-insecure people in any given year in Ethiopia's history. Conditions were exacerbated by high food price inflation. Given that official agricultural production figures indicated a good national harvest and safety nets were in place to protect most of the people who were still vulnerable to shocks, there was a delay in declaring a food emergency. It was only after the media reported escalating food insecurity that a substantial response was launched.

The situation was repeated in early 2009. Although this was a better rainfall year than 2008, there were still many vulnerable areas that were badly hit, and child malnutrition again spiked in many parts of the Southern Nations, Nationalities, and People's Region. Again there were delays in organizing a concerted response, due in part to disagreements over the need for NGOs to assist with therapeutic feeding.[19] Logistical factors, such as port capacity and internal transportation, continue to complicate relief response. For example, when shiploads of Ethiopian fertilizer and food aid arrived around the same time in 2008, Djibouti port could not off-load both cargoes simultaneously due to a capacity constraint. Because the planting season was approaching, the government prioritized off-loading fertilizer at the cost of a delay in food aid arrival.

Conclusions

In the past two decades, Ethiopia has avoided widespread famines even though the country has faced droughts that are more severe than the ones that triggered famines in the 1970s and 1980s. Although food shortages played a major role in past famines, various other factors contributed to the severity of famines, including military conflict, poor infrastructure, detrimental economic policies, lack of a specific disaster response strategy, and political considerations related to relief response. Lessons from the famines indicated that there was a need to institutionalize the capacity to identify and respond to emergencies and to co-

18. In addition, substantial improvement in the treatment and prevention of measles was achieved through an emergency measles vaccination campaign during the drought of 2002–03. Vaccination campaigns are extremely difficult to conduct in remote areas, but the coverage rates were sufficient to ward off a measles threat.

19. Based on the first author's fieldwork and personal communications.

ordinate the efforts of all actors, including aid agencies and the government (von Braun, Teklu, and Webb 1998). Further policy debate is needed on issues that continue to influence food insecurity, such as landholdings, population increases, soil fertility and yield enhancement, and off-farm employment opportunities and migration options (Devereux 2000).

Disaster management is mostly focused on food aid, though the nonfood aid response in emergencies is also essential and needs to be improved. Evaluations of the 2002–03 drought response quite rightly criticized the response for being "food first" oriented and for not focusing enough on nonfood, particularly health, needs (Lautze et al. 2003). An evaluation of the 2002–03 drought response led by the DPPC and the UN Office for the Coordination of Human Affairs also advocated stronger responses in areas outside of food aid, including many areas in which there has since been follow-up, such as livestock, EW systems, and nutrition (OCHA 2003). However, little progress has been made on improved health and water responses, apart from the addition of shopping list–style requests from UN agencies to the appeals from the government. Arguably, disease prevention has been addressed through improvements in vaccination coverage in many parts of the country, but in pastoralist areas it remains problematic.

Climate change may increase weather volatility, and inevitably there will be a severe drought in Ethiopia at some point. Although there have been a few major droughts in Ethiopia since 1983–84, affecting large numbers of people, large-scale mortalities have been effectively averted. In part, this reflects more effective EW systems, absence of major conflicts, and better government response to warnings. However, the increasing vulnerability of the growing rural populations means that even minor droughts can affect a much larger number of people than ever before. Although 8 million were affected by the severe drought of 1983, 12.6 million were affected by the relatively minor regional drought of 2003. A major drought now could easily affect 20–25 million rural Ethiopians. The scale of the emergency response needed to deal with an emergency of that scale would be a serious challenge to existing systems. It would require an early acknowledgment of the scale of the problem and extraordinary measures by the international community to avert the calamitous outcomes experienced during past famines. Further, there will be a large and continuing need for public expenditures to support safety net programs and to deal with the regular emergencies.

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10 Targeting Food Security Interventions in Ethiopia: The Productive Safety Net Programme

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In Ethiopia, as in many other African countries, there is a pressing need to improve household food security. An emerging consensus suggests that this is most easily accomplished through two development strategies with two complementary dimensions: investments that facilitate income generation and asset accumulation, discussed elsewhere in this book, and interventions that protect the poorest from hunger, prevent asset depletion, and provide a platform for the growth interventions. Because resources for such interventions are limited, there needs to be a mechanism for allocating these.

In this chapter we consider this issue in the context of Ethiopia's Productive Safety Net Programme (PSNP), a federal government program implemented almost entirely through government systems with harmonized donor support. Before 2005, the Government of Ethiopia (GoE) launched emergency appeals for food aid and other forms of emergency assistance almost annually. Although these succeeded in averting mass starvation, they did not banish the threat of further famine and did not prevent asset depletion by marginally poor households affected by adverse rainfall shocks. In response, the GoE and a consortium of donors implemented a new response to chronic food insecurity in rural Ethiopia. Rather than mounting annual appeals for assistance and ad hoc distributions, they established the PSNP.

The PSNP "provides transfers to the food insecure population in chronically food insecure *woredas* in a way that prevents asset depletion at the household level and creates assets at the community level" (FDRE 2004, 2). Unlike the annual emergency appeals, it was conceived as a multiyear program to provide recipients with predictable and reliable transfers. Most beneficiaries undertake public works. From 2005 to 2007, these paid beneficiaries either Ethiopian birr (ETB) 6 per day (increased to ETB 8 in 2008 and ETB 10 in 2010) in cash or three kilograms of cereals for work (depending on where they lived) on labor-intensive projects building community assets. A smaller number of beneficiaries received unconditional transfers called direct support. Initially, the PSNP was complemented by a series of food security activities called the Other Food Security Programme (OFSP). The OFSP included access to credit;

assistance in obtaining livestock, small stock or bees, tools, and seeds; and assistance with water-harvesting schemes, soil conservation, and improvements in pastureland. In some cases, beneficiaries were provided with subsidized credit to purchase "packages," combinations of agricultural inputs sometimes based on a business plan developed with support from the extension service. In 2009 the OFSP was redesigned and renamed the Household Assets Building Program (HABP), with an emphasis on increased contact and coordination with agricultural extension services.

As discussed by Gilligan, Hoddinott, and Taffesse (2009) and Berhane et al. (2012), the PSNP—where implemented according to program design—has increased food security. Participants who have received public works employment for five years have increased their food security by just over one month and their livestock holdings by 0.4 tropical livestock units (TLUs). There are synergies between the PSNP and the OFSP/HABP. Having both the PSNP and the OFSP/HABP increased food security by 1.53 months and livestock holdings by 1.001 TLUs. Although these are important impacts, they do not tell us whether the households that obtained these benefits were the intended beneficiaries. Were they poor, food-insecure households? Or did elite capture mean that benefits went to the better off? To answer these questions, we examine targeting of the PSNP in two ways: (1) through an assessment of whether it was targeted as designed and (2) how well it compares to other programs internationally.

Data: The 2006 and 2008 Ethiopian Food Security Surveys

This analysis is based on longitudinal quantitative survey data collected at the household and locality levels in the four major regions covered by the PSNP: Tigray, Amhara, Oromiya, and the Southern Nations, Nationalities, and People's Region (SNNPR). The first survey was implemented in June–August 2006. The follow-up survey was implemented in June and early July 2008. Differences between rounds due to seasonality considerations are not large.

The design of the 2006 Ethiopian Food Security Survey (EFSS) sample was based on power calculations conducted to determine the minimum number of sample enumeration areas and households needed to identify program impacts.[1] The sample is clustered at the *woreda* level, the administrative unit at which program participation is assigned. *Woredas* were randomly sampled proportional to size from a list of 153 chronically food-insecure *woredas* stratified by region; 19 *woredas* were sampled in Oromiya and the SNNPR, 18 in Amhara, and 12 in Tigray. In each *woreda,* sample *kebeles* serving as enumeration areas were randomly selected from a list of *kebeles* with active PSNPs. The

1. Gilligan et al. (2007) provide a complete description of the baseline sample and the survey instruments.

sample had two *kebeles* or enumeration areas (EAs) per *woreda* in Amhara, Oromiya, and the SNNPR and three EAs per *woreda* in Tigray. In each EA, 15 beneficiary and 10 nonbeneficiary households were sampled from separate lists for each group, yielding a sample of 25 households per EA. This yielded a sample of 146 EAs, and, because a few sampled households were not interviewed, a sample of 3,688 households.

The households surveyed in 2006 were reinterviewed in EFSS 2008; attrition was relatively small. A total of 137 households (or 3.7 percent of the baseline sample) dropped out, a third of which were concentrated in two EAs that could not be resurveyed. As part of the initial data cleaning we investigated the quality of the tracing and reinterviewing of households by comparing demographic, land, and housing quality variables across rounds. We identified 78 households that appeared not to match the households interviewed in 2006, and these were also dropped from the sample. Overall attrition, therefore, was 6 percent.[2]

Evaluating the Targeting Performance of the PSNP

The PSNP uses a mix of geographic and community-based targeting to identify chronically food-insecure households in chronically food-insecure *woredas*. The figures on historic receipt of food aid were used to determine the number of eligible beneficiaries in each region and *woreda*. *Woreda* administrators then selected the chronically food-insecure *kebele,* assigning the *woreda*'s "PSNP quota" to these areas. In each program *kebele,* community-based targeting is used to identify eligible households, which are then assigned to public works or direct support depending on the available labor (FDRE 2006). In 2008, the program operated in the 290 most food-insecure *woredas* in rural Ethiopia.

This approach built on the experience of distributing food aid to rural areas. Food aid targeting in Ethiopia has a long history of relying on community-based targeting systems that have been seen as effective. The PSNP adopted this system while further refining the targeting criteria to capture chronic food insecurity, defined as a food gap of three months or more and receipt of food aid for three consecutive years. Additionally, the program focused geographically on those regions and *woredas* that had received food aid for the preceding three years or longer as a proxy for chronic food insecurity (FDRE 2006; World Bank 2009). Constructing the targeting system in this way enabled the program to harness existing implementation capacity in an environment with severe capacity constraints. It also pragmatically drew on existing data sources to measure the extent of chronic food insecurity, given that there was no experience with household-level means testing or national data with which to objectively identify eligible households (Wiseman, Van Domolen, and Coll-Black 2010).

2. Gilligan, Hoddinott, and Taffesse (2009) provide further details.

Given the objective of alleviating chronic food insecurity, household-level targeting for the PSNP initially focused on selecting households that had been persistent recipients of emergency food aid. However, communities were given substantial discretion to modify this approach and to update their lists of food-insecure households annually based on local criteria. This allowed for a flexible community-based targeting strategy that takes advantage of local knowledge of households' circumstances to identify the neediest households. A risk of this approach is that it allows room for some local interest groups to exert undue influence on the targeting process.

As set out in the Program Implementation Manual (PIM), four bodies take part in the process of selecting household beneficiaries, with responsibilities at different points in the formation of targeting criteria and the selection of beneficiaries. These are the Woreda Food Security Task Force (WFSTF), the Kebele Council, the Kebele Food Security Task Force (KFSTF), and the Community Food Security Task Force (CFSTF). The WFSTF is responsible for adapting the national guidelines on criteria for beneficiary selection to make them relevant to the *woreda* and for training the KFSTF. The KFSTF is responsible for establishing a CFSTF in each village and familiarizing it with the approach to beneficiary selection. The Kebele Council is primarily responsible for hearing and resolving complaints. The CFSTF is responsible for screening households for program eligibility and for developing the lists of beneficiaries.

The PIM states that beneficiary households should consist of members of the community who are chronically food insecure, that is, households that have faced continual food shortages (usually a food gap of three months or more) in the past three years. Also included are households who suddenly became more food insecure as a result of a severe loss of assets and are unable to support themselves, as well as any household without family support or other means of social protection and support.

Having made the initial selection based on the basic criteria, the CFSTF was to examine the following characteristics so as to verify and refine the selection of eligible households: household assets (landholdings, quality of land, food stocks on hand, and so on), income from nonagricultural activities and from alternative sources of employment, and support or remittances from relatives or other community members. Within these guidelines, the WFSTF and KFSTF were responsible for refining the criteria to be used for selection of beneficiary households. Starting with a list of past food aid beneficiaries, the CFSTF would then update the beneficiary list based on the refined beneficiary selection criteria. For this the CFSTF would estimate the current annual number of months of unmet food needs (the food gap) for each household, taking into account family size and composition and expected household food production. This process would be repeated annually to respond to changes in household food security status.

After being determined eligible for the PSNP based on these criteria, households are assigned to public works or direct support: eligible households with able-bodied adults receive transfers for their participation in public works projects, while households that cannot provide labor or other means of support receive unconditional transfers. Most beneficiary households participate in public works; a much smaller proportion receives direct support.

Community Criteria for Selecting Beneficiary Households

In the 2006 community survey, local officials with knowledge of the operation of the PSNP were asked to report the selection criteria used in their localities to select beneficiaries for public works employment and direct support payments. Respondents were asked to list up to five eligibility criteria, in order of priority; in Table 10.1 we tabulate the results. We found an emphasis on using poverty as a leading eligibility criterion. Nearly 78 percent of communities listed poverty among their top five eligibility criteria for public works. Poverty was the highest-priority selection criterion in 53 percent of communities in the sample. If households with small land and livestock holdings and those targeted as "healthy but poor" are also included in the poverty category, 54 percent of all eligibility criteria reported have a poverty focus.

Household food insecurity was rarely reported as an explicit targeting criterion for public works. Only 9 percent of communities ranked food insecurity as the highest priority, and fewer than 20 percent included food insecurity

TABLE 10.1 Targeting criteria for public works, by priority, 2006 (percentage of communities reporting criteria used)

	Priority						
Targeting criterion	1	2	3	4	5	Total	Share
Food insecure	11	6	2	3	3	25	5.8
Poor	69	19	6	3	3	100	23.0
Those with small land or livestock holdings	14	38	36	13	6	107	24.7
Old people	4	7	10	2	3	26	6.0
Disabled	2	5	3	7	0	17	3.9
Women	0	2	0	0	1	3	0.7
Many children < 10 years	0	0	1	0	1	2	0.5
Those with no spouse	0	0	1	4	1	6	1.4
Healthy people who are poor	11	12	3	0	2	28	6.5
Large household size	3	6	9	5	1	24	5.5
Those involved in resettlement	0	1	1	1	0	3	0.7
Orphans	0	1	1	3	1	6	1.4
Those affected by drought	1	1	1	3	1	7	1.6
Other than above	14	17	26	15	8	80	18.4
Total	129	115	100	59	31	434	100.0

SOURCE: Ethiopia Food Security Survey, 2006 (Community Survey).

as a targeting criterion for public works. This may reflect the relative difficulty of ascertaining degrees of household food insecurity. If poverty and food insecurity are highly correlated, the emphasis on poverty in the selection criteria may adequately capture food insecurity as well.

A list of other characteristics generally received low priority and varied considerably by community. Households with more elderly, disabled, female, or orphaned members or those that were resettled or affected by drought received priority in some communities, but none of these categories represented more than 7 percent of the top five rankings in all communities.

The approach to targeting for direct support differed, with priority given to households with limited labor endowments. Table 10.2 shows the number of communities ranking each selection criterion by priority. Households with elderly or disabled members as household heads or primary income earners received the highest priority in 119 out of 136 communities (88 percent) reporting. Among the five possible criteria listed by these communities, elderly and disabled status accounted for 57 percent of the priorities awarded, and there was little regional variation in this. If we add households in the orphan category, which would, on average, also have relatively low labor endowments, one of these groups was given nearly 70 percent of the top five targeting priorities. A

TABLE 10.2 Targeting criteria for direct support, by priority, 2006 (percentage of communities reporting criteria used)

	Priority						
Targeting criterion	1	2	3	4	5	Total	Share
Old people who have no help	77	38	14	2	1	132	29.3
Disabled who do not work	42	56	20	5	2	125	27.7
Orphans	4	10	23	16	3	56	12.4
Poor	8	17	14	5	3	47	10.4
Pregnant	0	3	8	5	1	17	3.8
Sick	1	5	12	7	4	29	6.4
Widows who have no help	0	1	4	1	1	7	1.6
Breast-feeding women	0	0	0	2	0	2	0.4
Resettled people	1	0	1	2	0	4	0.9
HIV-affected people	1	0	1	1	0	3	0.7
Many children < 10 years	0	0	4	0	1	5	1.1
Female sex workers	0	0	1	0	0	1	0.2
Those affected by drought	0	1	1	1	1	4	0.9
Women	0	0	1	3	0	4	0.9
People residing in the *kebele*	0	0	1	0	1	2	0.4
Others	2	3	4	2	2	13	2.9
Total	136	134	109	52	20	451	100.0

SOURCE: Ethiopia Food Security Survey, 2006 (Community Survey).

poverty criterion, on the other hand, was unevenly applied. Although 35 percent of communities claimed to use poverty as a targeting criterion for direct support, at the regional level this ranged from 58 percent (Amhara) to 14 percent (the SNNPR).

Households' Understanding of the Targeting Criteria

Tables 10.3 and 10.4 provide descriptive statistics on households' understanding of how the public works and direct support components of the PSNP were targeted. Respondents were allowed to list as many criteria as they knew, so the percentages reported in each row correspond to the percentage of respondents giving that particular criterion as a response. Responses can be loosely categorized into four categories: poverty (people who are seen to be poor, have small or no landholdings, or have few or no cattle or oxen), demographics (household composition, age, or disability), connections (religious or ethnic groups, family or friends of project staff, or village leadership), and other (chosen randomly, by quota, or as a result of a drought shock).

TABLE 10.3 Criteria used to select public works participants, by region and year, 2006 and 2008 (percent)

Criterion used as reported by households	Tigray		Amhara		Oromiya		SNNPR	
	2006	2008	2006	2008	2006	2008	2006	2008
Poverty status								
People who are seen to be poor	42.4	62.1	55.7	75.9	45.3	67.3	68.0	72.4
People with small or no landholdings	32.7	44.5	33.4	55.1	42.0	40.6	44.4	54.5
People with few or no cattle or oxen	9.6	22.1	10.6	30.2	20.4	15.4	18.0	25.3
Demographics								
Household composition	14.3	27.2	15.1	18.3	9.7	9.4	12.2	11.4
Old or disabled people	8.4	5.9	9.1	11.0	12.3	21.9	18.8	24.2
Connections								
Religious or ethnic groups	0.3	1.3	0.4	0.6	0.5	0.3	1.2	2.6
Family friends of project staff or village leadership	3.2	3.0	5.0	2.8	8.4	14.3	4.5	2.1
Other								
Random	2.3	1.5	1.8	3.0	2.7	2.5	1.2	8.0
Quota for each *kebele*	11.7	17.5	11.3	7.3	10.6	5.4	2.5	10.8
People badly affected by drought	14.1	19.1	14.7	22.0	28.2	13.7	16.6	26.3

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTE: SNNPR = Southern Nations, Nationalities, and People's Region.

TABLE 10.4 Criteria used to select direct support beneficiaries, by region and year, 2006 and 2008 (percent)

Criterion used, as reported by household	Tigray		Amhara		Oromiya		SNNPR	
	2006	2008	2006	2008	2006	2008	2006	2008
Demographics								
Household composition	1.7	7.4	2.9	6.3	2.3	5.1	8.7	11.3
Old people	70.8	84.0	64.3	73.5	65.7	69.5	65.5	67.7
Disabled	55.9	75.1	54.6	72.6	59.5	59.1	69.4	74.0
Connections								
Religious or ethnic groups	0.1	0.0	0.0	0.0	0.2	0.5	0.3	2.3
Family friends of project staff or village leadership	1.5	1.0	1.9	1.6	3.0	8.5	1.1	0.9
Other								
Random	0.3	4.2	1.7	0.9	2.0	1.2	0.4	5.7
Quota for each *kebele*	4.9	7.3	1.2	0.5	3.1	1.4	0.3	6.6
Poor people or those badly affected by drought	28.3	31.9	19.3	40.9	28.2	32.2	23.5	43.0

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTE: SNNPR = Southern Nations, Nationalities, and People's Region.

Table 10.3 indicates that the proportion of households identifying poverty-related characteristics as a reason why households were selected for public works rose markedly in Tigray, Amhara, and Oromiya and, to a lesser extent, in the SNNPR, where the initial level of awareness of poverty-related criteria had been higher. In 2008, people being seen to be poor was listed as a criterion by 62 percent of respondents in Tigray, 76 percent in Amhara, 67 percent in Oromiya, and 72 percent in the SNNPR. Over time, in Tigray, Amhara, and the SNNPR, respondents were also able to list more specific criteria, such as small landholdings or lack of livestock as criteria.

The results for demographic criteria changed less dramatically, though surprisingly—and a little disconcertingly—in that there was an increase in the percentage of respondents who identified being old or disabled as an eligibility criterion for public works in Oromiya and the SNNPR. More reassuringly, households did not generally perceive that religious affiliation, ethnicity, or personal connections affected the likelihood of selection for public works; the one exception was in Oromiya, where approximately 14 percent of respondents stated that family or friendship connections were used as inclusion criteria. Finally, although there were relatively few cases in which selection was perceived to be random, the perception that there was a quota system was found in all regions, especially in Tigray. Being affected by drought was also seen as a common criterion for selection.

Table 10.4 lists selected responses to questions about perceptions about selection for direct support payments. In Tigray, Amhara, and the SNNPR, it was well understood that the elderly and disabled were the intended recipients of direct support. In Oromiya, most responses reported these characteristics, but the increase in the percentage of households reporting these criteria was smaller than in other regions. Oromiya was the only region where a nonnegligible percentage of respondents indicated that connections played a role in the selection of direct support beneficiaries.

Selection into Public Works Employment

Table 10.5 provides descriptive statistics on the consistency of public works participation. A participant household was one in which at least one household member undertook public works employment under the PSNP in the first five months of 2006, 2007, or 2008. Outside the SNNPR, fewer than half of participating households received employment in 2006, 2007, and 2008. In all regions, most particularly in Oromiya, a considerable fraction of 2006 beneficiaries did not receive employment in 2007 or 2008. In Tigray, there is some evidence of employment sharing across years, with nearly 10 percent of 2006 participating households not receiving work in 2007 but employed in 2008. In Amhara, nearly 20 percent of households were dropped after 2006, and only 62 percent received transfers in both 2007 and 2008.

Examining the characteristics of these different groups can tell us something about how the targeting of public works changed, or did not change, over time. Three broad sets of characteristics observed at baseline remain the focus: demographics, wealth, and proxies for household connections. Of greatest interest is a comparison of the four categories of public works participants: households that never received employment (that is, households not reporting

TABLE 10.5 Regional participation of households in the public works component of the PSNP, 2006–08 (percent)

Region	Number of households	2006, 2007, and 2008	2007 and 2008	2006 and 2007	2006 and 2008	2006 only	2007 only	2008 only
Tigray	522	40.42	25.48	2.11	9.77	14.75	2.30	5.17
Amhara	429	34.73	27.27	6.99	5.13	17.95	5.13	2.80
Oromiya	457	45.51	13.35	5.91	4.81	24.29	3.72	2.41
SNNPR	441	68.48	11.56	2.27	0.45	16.78	0.45	0.00
Total	1,849	47.05	19.58	4.22	5.25	18.33	2.87	2.70

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Survey).

NOTES: Sample restricted to households receiving payments for public works in the first five months of at least one year: 2006, 2007, or 2008. PSNP = Productive Safety Net Programme; SNNPR = Southern Nations, Nationalities, and People’s Region.

employment in the first five months of 2006, 2007, and 2008); those reporting employment in all three years; households that were employed in 2006 but not afterward (that is, households dropped from the program); and households that, although not reporting having worked in 2006, worked in 2007 or 2008 (entrants).

In Tigray, households employed in all three years—relative to those who never received employment—had younger heads of household; were slightly less likely to be headed by females; were larger; had more adult males of working age and fewer men ages 65 and older (in fact, this particular pattern can be seen in all regions); were poorer as measured by median landholdings, median livestock holdings, and holdings of oxen; and were very slightly improved if measured in terms of the head of household's educational attainment. Compared to those that remained in the program for all three years, households dropped after 2006 tended to have slightly older household heads and to be headed by females. Smaller households and those with fewer working-age males had similar landholdings but had more livestock. Those that entered public works were, relative to those that dropped, less likely to be female headed and had larger households with more adult males. Family connections, measured by whether the head of household was born in the locality and by the prominence of the head of household's father in the community, appear to have had no meaningful effect on participation in the public works component of the PSNP in Tigray.

In Amhara participants tended to come from households headed by younger individuals and households that were poorer as measured by livestock or landholdings. Participants in Amhara came from slightly larger households than those that had never received employment and were less likely to be headed by women. The differences in demographic and wealth characteristics between households never employed and those employed in all three years were much less pronounced than in Tigray. Those employed in all three years were less likely to be female headed and held slightly less land. Those dropped tended to have more schooling and larger landholdings but less livestock. By contrast, entrants, relative to those dropped, tended to have less schooling and smaller landholdings but more livestock. However, entrants, relative to those who never received employment, were poorer as measured by human capital, landholdings, or livestock holdings.

In Oromiya, households employed in all three years were, relative to those never employed, much less likely to be female headed and larger in size. There was no consistent difference in wealth measurements between these groups. Households that were dropped after 2006 tended to be poorer and were more likely to be female headed than were those that had employment in all three years. New entrants after 2006 were poorer than households that never received employment. Interestingly, in spite of households' perceptions to the contrary, there is no strong evidence of favoritism based on observable family connections; in fact, households were more likely to be dropped after 2006 if they were born in the locality.

In the SNNPR, households employed in all three years, relative to those that never received employment, had younger heads and were slightly less likely to be headed by females. Other demographic characteristics did not differ markedly across groups. What is striking about the SNNPR, however, is the inclusion after 2006 of very poor households as measured by holdings of livestock.

A limitation of these descriptions is that discerning causal relations is not straightforward. For example, is public works participation really targeted toward younger household heads? Or is employment targeted toward poorer households in Tigray, and do poorer households just happen to have younger heads? To address this issue, we use probit regressions. The dependent variable equals one if the household was employed in PSNP public works, zero otherwise. The independent variables fall into three broad categories: household demographics, wealth, and connections. In addition, a control for household location by region is used. The coefficients presented in Table 10.6 have been transformed into marginal effects; for example, the coefficient –0.002 found in column 1 associated with the age of the head of household means that every additional year of age of the household head reduces the likelihood that the household was paid for public works employment by 0.2 percentage points (0.002 × 100). Dummy variables, such as whether the household head is female, are interpreted as switching the variable from zero to one. The coefficient –0.065 for female head of household in column 1 means that a female-headed household is 6.5 percentage points less likely to participate in the public works component of the PSNP than an otherwise identical male-headed household. For the full sample results, the calculation of standard errors takes into account the clustered nature of the sample.

The first column of Table 10.6 looks at whether, over the three-year period 2006–08, a sampled household participated in public works employment. Controlling for household location, as household wealth increased—as measured by ownership of oxen, the value of all livestock holdings, and per capita landholdings—the likelihood of participation in public works declined. The magnitude of these effects is meaningful. For example, ownership of two oxen in 2005 reduced the probability of participation by 10.0 percentage points. Compared to a household with no land, a household with landholdings of 1 hectare per person had its probability of participation reduced by 16.9 percentage points. Demographic characteristics—particularly labor availability—also mattered. Each additional adult male and female increased the likelihood of participation by 3 percentage points. However, the likelihood of participation was lower for households with older heads or female heads and for households with high dependency ratios (the number of household members aged 0–14 and 60 or older divided by the number of members aged 15–59). Experiencing a drought shock increased the likelihood of participation; being born in the village of current residence raised the likelihood of being selected for public works employment, although this is not precisely measured.

TABLE 10.6 Correlates of access to public works, 2006–08

Household characteristic	Any payment for public works in 2006, 2007, or 2008 (1)	Any payment for public works, 2006 (2)	Any payment for public works, 2007 (3)	Any payment for public works, 2008 (4)
Age of head of household (years)	–0.002	–0.001	–0.002	–0.002
	(1.90)*	(1.07)	(2.12)**	(2.03)**
Household head is female	–0.065	–0.057	–0.060	–0.075
	(2.15)**	(1.81)*	(2.00)**	(2.62)***
Males age 65 or older	–0.082	–0.068	–0.058	–0.071
	(1.71)*	(1.52)	(1.20)	(1.52)
Females age 65 or older	–0.074	–0.047	–0.061	–0.085
	(1.62)	(0.98)	(1.46)	(2.02)**
Dependency ratio	–0.011	–0.009	–0.009	–0.013
	(1.87)*	(1.67)*	(1.39)	(1.94)*
Males ages 15–59	0.030	0.024	0.028	0.025
	(2.31)**	(2.02)**	(1.51)	(1.40)
Females ages 15–59	0.031	0.033	0.021	0.014
	(1.82)*	(2.09)**	(1.00)	(0.65)
Grades completed by household head	–0.001	–0.000	–0.000	–0.001
	(0.57)	(0.02)	(0.18)	(0.46)
Oxen owned, 2005	–0.050	–0.054	–0.059	–0.043
	(4.12)***	(4.02)***	(3.97)***	(2.82)***
Log value of livestock, 2005	–0.011	–0.009	–0.010	–0.018
	(1.89)*	(1.71)*	(1.67)*	(2.96)***

(*continued*)

TABLE 10.6 Continued

Household characteristic	Any payment for public works in 2006, 2007, or 2008 (1)	Any payment for public works, 2006 (2)	Any payment for public works, 2007 (3)	Any payment for public works, 2008 (4)
Per capita landholdings, 2005	–0.169	–0.121	–0.146	–0.130
	(2.28)**	(1.57)	(1.88)*	(1.70)*
Head of household born in this locality	0.045	0.058	0.044	0.049
	(1.49)	(1.89)*	(1.53)	(1.68)*
Experienced drought in 2005–07	0.094			
	(3.31)***			
Experienced drought in 2005		0.052		
		(1.42)		
Experienced drought in 2006			0.123	
			(2.21)**	
Experienced drought in 2007				0.112
				(4.28)***
Amhara	–0.145	–0.129	–0.053	–0.175
	(2.23)**	(1.69)*	(0.73)	(2.44)**
Oromiya	–0.189	–0.056	–0.127	–0.217
	(3.15)***	(0.93)	(1.95)*	(3.11)***
SNNPR	–0.273	–0.082	–0.141	–0.251
	(4.47)***	(1.36)	(2.12)**	(3.74)***
Observations	3,260	3,260	3,061	3,000

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTES: Coefficients are expressed in terms of their marginal effects. Robust (clustered) *z*-statistics are in parentheses. Characteristics as observed in 2006 unless otherwise noted. Blank cell indicates variable excluded from specification. SNNPR = Southern Nations, Nationalities, and People's Region. * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Columns 2, 3, and 4 allow us to look at the determinants of participation by year. The striking feature here is the stability of the coefficients over time. This suggests that for the sample as a whole, the use of these characteristics as means of targeting households does not change meaningfully over time.

Note that many of these magnitudes are meaningfully large. Consider two households. Household A has two adult males and two adult females and owns no oxen; Household B has one adult male and one adult female and owns two oxen. In all other respects, they are identical. The results reported in Table 10.6, column 1, indicate that the probability of Household A's participation in PSNP public works is about 16 percentage points higher than that of Household B.

Selection into Direct Support

Access to direct support has evolved over time. Table 10.7 presents some basic statistics for those households that received at least one direct support payment in the first five months of 2006, 2007, or 2008. The sample sizes are considerably smaller than those reported in the analogous table for public works. This reflects the considerably lower coverage of direct support in the PSNP. Few households received direct support in all three years, but there appears to have been some effort to expand direct support coverage. This is most clear for Tigray, where the number of direct support households was largest and where 75 percent of these beneficiaries received transfers in both 2007 and 2008. The number of households receiving direct support benefits also rose in Amhara and, to a lesser extent, in the SNNPR, but from a low base. In Oromiya, by contrast, a large fraction of those households receiving direct support obtained these transfers only in 2006.

Table 10.8 provides descriptive characteristics of direct support recipients disaggregated into four categories: households that never received payments,

TABLE 10.7 Household participation in the direct support component of the PSNP, by region, 2006–08 (percent)

Region	Number of households	2006, 2007, and 2008	2007 and 2008	2006 and 2007	2006 and 2008	2006 only	2007 only	2008 only
Tigray	224	35.27	39.73	0.45	2.68	11.61	2.23	8.04
Amhara	125	29.60	52.00	0.00	0.00	8.80	5.60	4.00
Oromiya	181	16.57	20.44	2.76	1.66	47.51	6.63	4.42
SNNPR	124	34.68	24.19	3.23	0.00	37.10	0.00	0.81
Total	654	32.36	33.79	1.53	1.38	25.84	3.67	4.89

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTES: Sample restricted to households receiving direct support payments in the first five months of at least one year, 2006, 2007, or 2008. PSNP = Productive Safety Net Programme; SNNPR = Southern Nations, Nationalities, and People's Region.

TABLE 10.8 Household characteristics, by participation in the direct support component of the PSNP and region, 2006–08 (percent)

Household characteristic	Region	Never received direct support	Received direct support every year	Received direct support only in 2006 (dropped)	Received direct support in 2007 or 2008 (entered)
Mean age of household head (years)	Tigray	44.8	63.0	51.0	55.6
	Amhara	46.6	61.0	62.5	56.5
	Oromiya	40.4	65.1	45.0	50.5
	SNNPR	40.6	59.7	45.4	51.6
Household head is female (percent)	Tigray	22.8	59.5	38.5	36.3
	Amhara	22.0	73.0	45.5	55.6
	Oromiya	21.0	56.7	25.6	45.0
	SNNPR	15.9	53.5	36.2	44.0
Mean household size	Tigray	5.2	2.6	5.0	3.8
	Amhara	4.5	2.4	4.5	4.0
	Oromiya	5.2	3.7	5.5	4.4
	SNNPR	5.4	4.1	5.3	4.7
Mean number of males 65 and older	Tigray	0.07	0.27	0.23	0.32
	Amhara	0.12	0.14	0.36	0.20
	Oromiya	0.05	0.23	0.05	0.15
	SNNPR	0.05	0.23	0.19	0.08
Mean number of males ages 15–64	Tigray	1.25	0.41	1.04	0.83
	Amhara	0.47	0.24	0.82	0.14
	Oromiya	1.09	0.50	1.13	0.71
	SNNPR	1.24	0.67	1.09	0.93
Median landholdings (hectares)	Tigray	1.05	0.88	0.78	0.84
	Amhara	1.15	0.63	0.88	0.94
	Oromiya	1.13	0.53	0.93	1.03
	SNNPR	0.56	0.50	0.56	0.50

Grades of schooling completed by household head	Tigray	2.45	1.10	1.00	2.26
	Amhara	3.75	0.73	0.00	2.31
	Oromiya	1.62	0.83	2.45	2.53
	SNNPR	2.52	1.21	1.59	1.44
Median value of livestock holdings, 2006	Tigray	3,370	1,320	2,610	2,437
	Amhara	2,800	914	1,025	900
	Oromiya	2,700	1,400	2,440	1,403
	SNNPR	1,503	1,190	1,208	1,137
Mean number of oxen, 2006	Tigray	1.12	0.49	0.88	0.79
	Amhara	0.92	0.19	0.09	0.53
	Oromiya	0.53	0.20	0.45	0.52
	SNNPR	0.57	0.30	0.43	0.32
Household head was born in this locality	Tigray	89.6	72.2	84.6	81.3
	Amhara	82.7	75.7	90.9	86.7
	Oromiya	76.3	70.0	81.4	57.5
	SNNPR	81.7	51.2	68.1	64.0
Parent of household head held an official position in this village	Tigray	4.2	10.1	7.7	4.4
	Amhara	6.2	0.0	0.0	0.0
	Oromiya	5.6	3.3	2.3	2.5
	SNNPR	10.4	2.3	4.3	8.0
Father of household head was important in social life of village	Tigray	45.8	48.1	38.5	53.8
	Amhara	38.9	24.3	27.3	24.4
	Oromiya	46.4	30.0	43.0	40.0
	SNNPR	58.7	51.2	66.0	52.0

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTE: PSNP = Productive Safety Net Programme; SNNPR = Southern Nations, Nationalities, and People's Region.

those that received payments in all three years, those that received payments in 2006 only, and those that received payments only in 2007 or 2008. The striking feature of these descriptive statistics is how closely they conform to the intention of the direct support component of the PSNP. Households receiving these payments have heads of household that are considerably older, and these households tend to be smaller, with much lower labor endowments. They are poorer when measured by livestock holdings and by landholdings. There is evidence of some retargeting, with larger households and those with more adult male labor dropped and replaced with smaller and, to a certain extent, older households.

Next we report the results of probit regressions, in which the dependent variable equals one if the household received direct support payments and zero otherwise. Table 10.9 examines these for the full sample across all years and for each year individually. Correlates of access at the regional level for 2006 and 2008 are available on request.

Table 10.9 shows that demographic characteristics dominated the likelihood that a household received direct support. Households with older heads, older men, and fewer younger men were more likely to receive these payments. A female-headed household was also more likely to be a direct support recipient. Characteristics related to poverty played a much smaller role in determining selection, suggesting that infirmity (as proxied by age) and absence of labor power were the factors driving selection. Unlike in the case of public works, households reporting a drought shock were only marginally more likely to receive direct support. Also by contrast, there appear to have been fewer differences across regions, with two notable exceptions: female-headed households in Oromiya were less likely to receive direct support, and households experiencing a drought shock in Tigray were more likely to receive these payments.

The magnitudes of these effects are meaningfully large. As in our discussion of public works, consider two households. Household A has a female head aged 70; household B has a male head aged 40. In all other respects, they are identical. The results reported in Table 10.9, column 1, indicate that the probability of receipt of direct support by household A was 22.9 percentage points higher than that for household B. Assuming that advanced age is correlated in these settings with reduced work capacity, these results, together with the descriptive statistics presented earlier, indicate that the targeting principles laid out in the PIM for direct support were being followed.

The Targeting of the PSNP from an International Perspective

Method

Although our analysis tells us that the criteria used on the ground correspond to those found in the PIM, it does not tell us how well, by international standards, the PSNP is targeted when the community-based targeting is combined with the geographic focus on chronically food-insecure *woredas* identified by historic receipt of food aid. Such comparisons are, by their very nature, tricky to undertake. Studies of targeting effectiveness in other countries have used different definitions and methods (to say nothing of means of presenting these) in a way that makes comparison difficult. Faced with this issue, Coady, Grosh, and Hoddinott (2004) focused on the incidence and proportion of total transfers received by individuals or households falling within the bottom 40, 20, or 10 percent of national income distribution. Specifically, they developed a measure based on a comparison of actual performance to a common reference outcome, the outcome that would result from neutral (as opposed to progressive or regressive) targeting. Their indicator is constructed by dividing the actual outcome by the appropriate neutral outcome. For example, if the bottom 40 percent of the income distribution receives 60 percent of the benefits, the indicator of performance is calculated as (60/40) = 1.5; a higher value is associated with superior targeting performance. A value greater than one indicates progressive targeting; a value of less than one reflects regressive targeting, with unity denoting neutral targeting.

To construct this measure, households receiving PSNP benefits should be placed in a nationally representative distribution of households as ranked by a welfare measure. To explain how this is done, it is helpful to begin by explaining the data sources available to us.

The most recent nationally representative surveys are the Household Income, Consumption, and Expenditure Survey (HICES) and the Welfare Monitoring Survey (WMS). The HICES collected data on the level, distribution, and pattern of household income, consumption, and expenditure. The most recent HICES to which we have access was collected over two rounds: from July 4, 2004, until August 3, 2004, and between February 4, 2005, and March 5, 2005. However, the HICES has limited information on household characteristics such as demographic details and assets, and the consumption and income aggregates collected in the EFSS are not directly comparable to those collected in the HICES.

The WMS is conducted mainly for the purpose of assessing nonincome dimensions of poverty such as education, health, and vulnerability. It provides extensive information on different dimensions of poverty and deprivation such as access to education and health facilities, achievements in education, anthropometric measures, and assets. WMSs are completed in a single interview; these surveys do not collect data on income or consumption. The most recent WMS was completed in late 2004.

Although these disparate data sources may appear unpromising, there are two additional features of the data collected that are worth noting. First, those conducting the 2004/05 HICES interviewed a subset of households sampled by the WMS—19,000 households appear in both—and it is possible to apply population weights to these so that the merged (HICES and WMS) data are nation-

TABLE 10.9 Household characteristics correlated with receipt of direct support, by year, 2006–08

Household characteristic	Any direct support payments (1)	Direct support payments, 2006 (2)	Direct support payments, 2007 (3)	Direct support payments, 2008 (4)
Age of household head	0.003	0.002	0.003	0.003
	(6.06)***	(3.28)***	(6.12)***	(5.48)***
Household head is female	0.109	0.064	0.100	0.088
	(7.00)***	(4.34)***	(6.72)***	(6.26)***
Males age 65 or older	0.058	0.070	0.050	0.060
	(2.52)**	(2.78)***	(2.21)**	(2.72)***
Females age 65 or older	0.022	0.099	0.010	0.024
	(1.19)	(5.14)***	(0.63)	(1.44)
Dependency ratio	0.001	0.006	–0.000	0.003
	(0.35)	(2.05)**	(0.00)	(1.04)
Males ages 15–59	–0.030	–0.016	–0.027	–0.027
	(3.66)***	(2.20)**	(3.63)***	(3.42)***
Females ages 15–59	–0.013	0.006	–0.013	–0.011
	(1.39)	(0.83)	(1.40)	(1.35)
Grades completed by household head	0.001	–0.002	0.001	0.001
	(1.33)	(1.18)	(1.37)	(1.03)
Oxen owned, 2005	–0.010	–0.027	–0.011	–0.010
	(1.34)	(3.61)***	(1.48)	(1.27)
Log value of livestock, 2005	–0.006	–0.000	–0.005	–0.005
	(2.43)**	(0.17)	(2.39)**	(2.02)**

Per capita landholdings	–0.005	0.010	–0.006	0.005
	(0.21)	(0.44)	(0.30)	(0.21)
Household head born in this PA	–0.034	–0.002	–0.007	–0.026
	(2.12)**	(0.12)	(0.50)	(1.79)*
Experienced drought in 2005–07	0.037			
	(2.81)***			
Experienced drought in 2005		0.026		
		(1.60)		
Experienced drought in 2006			0.039	
			(1.99)**	
Experienced drought in 2007				0.026
				(1.70)*
Amhara	–0.070	–0.056	–0.054	–0.067
	(2.66)***	(2.15)**	(1.93)*	(2.77)***
Oromiya	–0.068	0.026	–0.056	–0.068
	(3.77)***	(0.71)	(3.00)***	(3.80)***
SNNPR	–0.086	–0.002	–0.058	–0.073
	(6.01)***	(0.05)	(3.53)***	(5.06)***
Observations	2,994	3,190	2,994	2,933

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTES: Coefficients are expressed in terms of their marginal effects. Robust (clustered) *z*-statistics are in parentheses. Characteristics as observed in 2006 unless otherwise noted. Blank cell indicates variable excluded from specification. PA = peasant association; SNNPR = Southern Nations, Nationalities, and People's Region. * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

ally representative. Second, the design of the EFSS questionnaires drew, in part, on the WMS surveys. As a result, there are comparable measures of household demographics and assets in both the merged HICES/WMS and the EFSS. Further, the 2006 EFSS contained retrospective questions on these assets that predated (and therefore were unaffected by) the implementation of the PSNP.

Using the merged HICES/WMS data, we estimate a regression model of the correlates of per capita consumption. The correlates are household characteristics—demographic characteristics, assets, and location—measured in broadly comparable ways and appearing in both the merged HICES/WMS and the EFSS. Table 10.10 reports the results of estimating this regression at the national level and separately for Tigray, Amhara, Oromiya, and the SNNPR. Note that these correlates, broadly speaking, have the correct signs and reasonable magnitudes. Assets are associated with higher levels of consumption; larger households and households with a greater proportion of dependents have lower levels of consumption per capita. Further, these regressions account for more than a third of the variation in the dependent variable, and in some cases (such as the results for the SNNPR) considerably more than this.

Using the parameter estimates from this regression, we predict consumption levels for the HICES/WMS sample, then use these predicted consumption levels to calculate the values for the 10th percentile, 20th percentile, and 40th percentile (and so on). Because we use population weights, the completion of this step means that a nationally representative distribution of consumption is available. Applying the parameter estimates calculated in the regression model to the EFSS data on demographics, assets, and location entails multiplying the parameters by the values for these variables and adding these up for each household: doing this allows us to generate a predicted level of per capita household consumption for households in the EFSS dataset. Finally, we compute what proportion of PSNP beneficiaries have predicted consumption levels below the constructed centiles. We combine this information with the data we have on the value of transfers to construct the Coady–Grosh–Hoddinott measure of targeting. Specifically, we use the values of both in-kind and cash transfers received by beneficiary households both as payments for public works employment and as transfers received under the direct support component of the PSNP. Using transfer data that the EFSS collected for the calendar year 2007 has two advantages: using data for a full 12-month period means our targeting estimates are not confounded by wage arrears that were more severe in some regions than in others, and in 2007 cash and in-kind payments for public works employment were roughly equivalent, so our targeting assessment is not confounded by the fact that some households received cash while others received food.

There are two limitations to this approach. First, its success relies critically on the ability to predict consumption levels. Although the regressions reported earlier account for a reasonable amount of variation in consumption levels, a considerable amount remains unaccounted for, and this will affect our estimates of targeting effectiveness. For example, although the HICES/WMS dataset indicates whether households have access to land, it is not possible to calculate how much land. Because access to land is an important determinant of income in Ethiopia, this may adversely affect our ability to predict consumption levels. Second, although the coverage of the HICES and WMS was widespread, it was not exhaustive. Specifically, both surveys included only the sedentary population of Ethiopia. Three zones in Afar, six zones in Somali region, and all zones in Gambella region were excluded from the HICES and WMS, as were residents of collectives, the homeless, and foreigners. To the extent that these groups are, on average, poorer than the households surveyed in the HICES, the results reported here will overstate the targeting of the PSNP.

Basic Results

Table 10.11 reports the basic results of calculating the Coady–Grosh–Hoddinott (CGH) indexes for the full EFSS sample and also separately by region and decile. CGH values are calculated separately for public works payments and direct support transfers.

The top left set of cells report the CGH indexes based on all PSNP transfers (that is, for public works and direct support) by deciles for the full sample and by region. Starting with the results for the full sample, the CGH values are 1.69 when assessed for the poorest decile, 1.46 when assessed for the poorest two deciles (that is, the poorest quintile), and 1.26 when assessed for the poorest four deciles (that is, the poorest 40 percent) of households, with these deciles based on households' predicted per capita consumption. In all cases, these values exceed one, implying that the PSNP is progressively targeted. Second, the median global value for the CGH index (that is, the median value for the sample of 78 safety net programs summarized by Coady, Grosh, and Hoddinott [2004]) is 1.25, indicating that the PSNP is better targeted than the average global safety net program, any of the African safety net programs reported by Coady, Grosh, and Hoddinott (2004), all but one of the safety net programs found in the Middle East and North Africa, and 14 of the 22 safety net programs assessed in South and East Asia. However, there is considerable variation in this measure of targeting performance across regions. Targeting is, by international standards, considerably above average in Tigray and Oromiya, slightly below average but still progressive in Amhara, and poor in the SNNPR.

The middle and bottom panels on the lefthand side of Table 10.11 report CGH values separately for the public works and direct support components of the PSNP. Given that public works payments make up nearly 90 percent of all transfers, it is not surprising that the values for public works are close to those for all transfers. It is also not surprising that their regional patterns mirror those for all transfers.

In a comparative international context, the targeting of the public works in Tigray and Oromiya is really quite good—both regions fall into the top 30 percent of programs ranked by Coady, Grosh, and Hoddinott (2004). What is surprising, however, is how poorly—stunningly poorly in some cases—direct

TABLE 10.10 Household characteristics correlated with per capita expenditures in the Household Income, Consumption, and Expenditure Survey, by region, 2004–05

Household characteristic	All (1)	Tigray (2)	Amhara (3)	Oromiya (4)	SNNPR (5)
Female-headed household	–0.034**	–0.051	–0.068**	0.023	–0.040
	(–2.541)	(–1.481)	(–2.111)	(0.631)	(–1.335)
Log household size	–0.558***	–0.530***	–0.530***	–0.546***	–0.569***
	(–33.17)	(–10.36)	(–14.46)	(–12.28)	(–14.31)
Single-person household	0.098***	0.308**	–0.127	0.209	0.057
	(3.007)	(2.382)	(–0.951)	(1.637)	(0.291)
Log age of household head	0.044**	0.041	0.092**	0.009	0.043
	(2.319)	(0.565)	(2.049)	(0.204)	(0.746)
Percentage of household adult females	–0.163***	–0.129	–0.169	–0.232	0.107
	(–4.207)	(–1.134)	(–1.486)	(–1.562)	(0.759)
Percentage of household female children	–0.368***	–0.335*	–0.467***	–0.308*	–0.249*
	(–7.660)	(–1.701)	(–4.034)	(–1.906)	(–1.728)
Percentage of household male children	–0.511***	–0.388**	–0.691***	–0.477**	–0.308
	(–8.712)	(–2.570)	(–4.682)	(–2.611)	(–1.472)
Percentage of household elderly males	–0.589***	–0.040	–0.768***	–0.026	–0.611
	(–5.264)	(–0.130)	(–3.582)	(–0.0766)	(–1.601)
Percentage of household elderly females	–0.488***	–0.471**	–0.389**	–0.737***	–0.001
	(–5.182)	(–2.089)	(–2.173)	(–2.827)	(–0.00394)

Grades completed by household head	0.012***	–0.008	0.010	–0.002	0.015***
	(5.746)	(–0.744)	(1.366)	(–0.369)	(2.854)
Has access to land	0.054***	0.087	0.157***	–0.029	–0.002
	(3.412)	(1.353)	(2.663)	(–0.419)	(–0.0157)
Owns cattle	0.062***	0.054	0.060***	0.050	–0.016
	(4.281)	(1.620)	(2.667)	(1.279)	(–0.410)
Number of oxen owned	0.034***	0.021	0.076***	0.032*	0.057***
	(5.182)	(1.047)	(6.136)	(1.779)	(3.620)
Durables owned, sum	0.036***	0.050	0.053*	0.118***	0.003
	(3.074)	(1.468)	(1.794)	(3.008)	(0.0906)
Durables owned, squared sum	0.013***	0.012	0.006	–0.007	0.019*
	(5.236)	(0.926)	(0.588)	(–0.629)	(1.908)
Can access ETB 100 in 7 days	0.110***	0.030	0.121***	0.051	0.191***
	(8.237)	(0.907)	(4.890)	(0.929)	(5.528)
Lives in urban area	0.063***				
	(2.669)				
R-squared	0.349	0.352	0.347	0.387	0.460

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTES: Standard errors are in parentheses; standard errors are robust to heteroscedasticity. In the regression for all households, regional dummy variables are included. For each region regression, zone dummy variables are included. Durables owned is the sum of the ownership of the following items: beds, watches, radios, televisions, sofas, tables, bicycles, and carts. Blank cell indicates variable excluded from specification. ETB = Ethiopian birr; SNNPR = Southern Nations, Nationalities, and People's Region. * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

TABLE 10.11 Coady–Grosh–Hoddinott index values by region, consumption decile, and transfer type, 2007

	Deciles based on predicted per capita consumption			Deciles based on predicted household consumption		
Region	Poorest decile	Poorest quintile	Poorest two quintiles	Poorest decile	Poorest quintile	Poorest two quintiles
All PSNP transfers						
All regions	1.69	1.46	1.26	1.49	1.50	1.40
Tigray	2.05	1.68	1.49	1.81	1.79	1.47
Amhara	1.14	1.04	1.10	1.92	1.77	1.70
Oromiya	2.68	2.15	1.66	1.27	1.58	1.58
SNNPR	0.82	0.91	0.77	0.96	0.90	0.97
Public works payments						
All regions	1.86	1.55	1.33	1.26	1.29	1.37
Tigray	2.32	1.87	1.63	1.46	1.40	1.48
Amhara	1.28	1.09	1.13	1.49	1.56	1.59
Oromiya	2.90	2.20	1.69	1.20	1.41	1.51
SNNPR	0.87	0.95	0.80	0.89	0.87	0.96
Direct support transfers						
All regions	0.48	0.87	0.83	3.34	2.72	1.94
Tigray	0.11	0.44	0.57	5.79	4.13	2.32
Amhara	0.45	0.85	0.93	4.09	2.80	2.24
Oromiya	1.04	1.75	1.41	1.81	2.85	2.13
SNNPR	0.38	0.58	0.45	1.50	1.15	1.09

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTES: Deciles based on predicted per capita consumption. PSNP = Productive Safety Net Programme; SNNPR = Southern Nations, Nationalities, and People's Region.

support transfers appear to be targeted. Based on the share of transfers going to households predicted to be in the bottom two quintiles based on per capita consumption, the CGH value is 0.83. This implies that the targeting of direct support is regressive; targeting could be improved if it were random.

Before taking these results at face value, however, it is helpful to look at the righthand columns in Table 10.11, where households' percentile ranks are based on total household consumption without any adjustment for household size or composition. Beginning with the results for direct support, a dramatically different picture emerges. Here the CGH values are very high; the 2.72 value when using the results for the rankings at the 20th percentile puts the direct support component of the PSNP among the top five programs globally ranked by Coady, Grosh, and Hoddinott (2004). By contrast, compared to the CGH values with deciles based on per capita consumption, the CGH values for the public works component are lower when based on the poorest decile and the poorest quintile, though slightly higher when based on the poorest two quintiles of households.

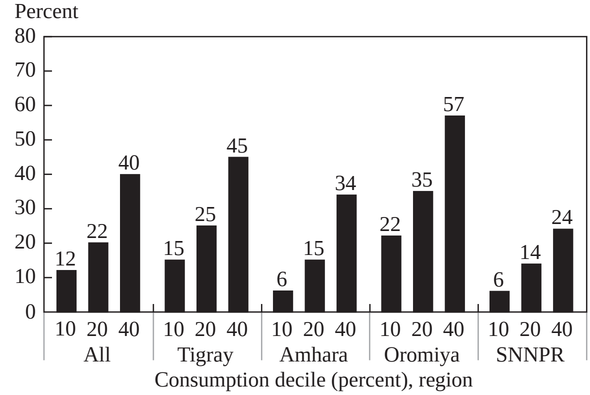
Taken collectively, these results suggest that although the PSNP is reasonably well targeted, the disjuncture between the results based on per capita and total household consumption is puzzling. However, it is helpful to recall three points. First, the PIM (FDRE 2006) makes relatively little reference to expressing poverty and food insecurity in per capita terms. Further, as Gilligan et al. (2009) show, when asked how beneficiaries are chosen, local communities make reference to total household resources as measured in terms of land, livestock, oxen, and other resources and little, if any, reference to household size. Second, the CGH index captures the combined effects of the selection of households and the level of transfers to each beneficiary household. Third, in the allocation of work, larger households were supposed to receive more days' work than smaller households.

Given all this, it is helpful to disaggregate the CGH in terms of its two component parts; Figures 10.1a–10.1f and Tables 10.12a–10.12c do just that. The figures show the incidence of the PSNP, that is, the proportion of households in each predicted decile that receives PSNP transfers. For this measure, the PSNP is considered progressive if the proportion of households selected exceeds the size of the decile (so, for example, the program is progressive if the proportion of the households receiving PSNP benefits in the poorest quintile exceeds 20 percent). The figures show the incidence of transfers for the PSNP (Figures 10.1a and 10.1b) and, separately, for public works (Figures 10.1c and 10.1d) and direct support (Figures 10.1e and 10.1f). In all three pairs of figures, incidence is shown for rankings based on per capita consumption and total household consumption. Starting with Figures 10.1e and 10.1f, there is a striking difference between the former and the latter. Based on per capita rankings, the targeting of direct support is terrible. But—assuming that in fact local communities do indeed target households without adjusting for size—it is excellent. Across the full sample, just under 80 percent of direct support beneficiaries are predicted to be in the poorest two quintiles, and this figure is even higher in some regions (an astonishing 93 percent in Tigray). In terms of public works, incidence is also enhanced when households are ranked using total household consumption, though the improvement is less marked when compared to direct support.

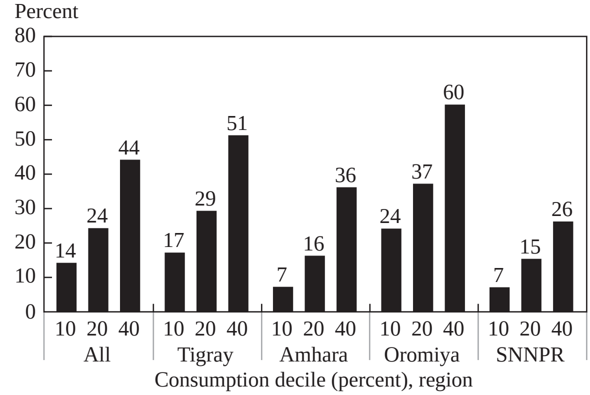
Of course, even if selection of households is uniform across the distribution of per capita consumption, a program can still be progressive if poorer households receive higher transfers relative to other beneficiaries. For example, in the context of the PSNP, poorer or more food-insecure households (or households in more food-insecure *woredas*) might receive more work and therefore higher transfer levels even if it is difficult to select, or exclude, beneficiary households. Tables 10.12a–10.12c provide information on this issue. They show, based on a ranking of households in terms of their predicted total consumption levels, the level of transfers (in both total and per capita terms) relative to average transfers for the region as a whole. So, for example, in Table

FIGURE 10.1 Incidence of PSNP, public works, and direct support transfers, by region and per capita or total consumption decile, 2007

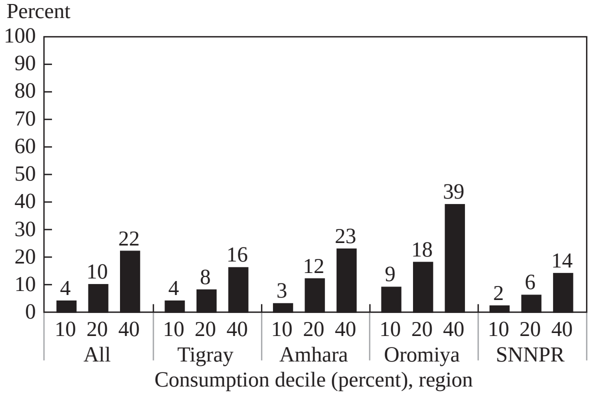
a PSNP transfers, by predicted per capita consumption decile



c Public works transfers, by predicted per capita consumption decile

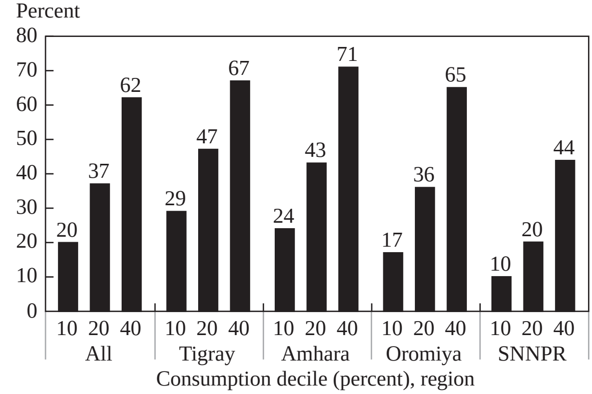


e Direct support transfers, by predicted per capita consumption decile

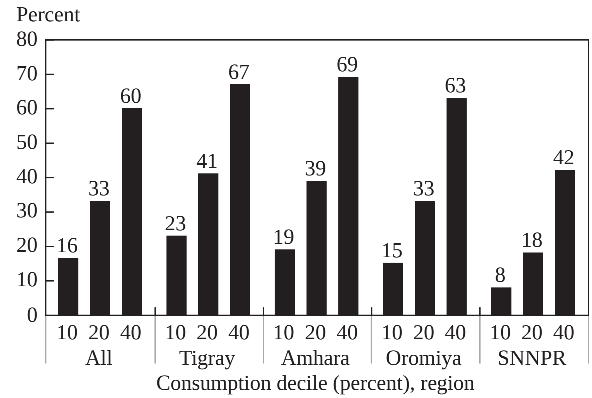


SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).
NOTE: PSNP = Productive Safety Net Programme; SNNPR = Southern Nations, Nationalities, and People's Region.

b PSNP transfers, by predicted total consumption decile



d Public works transfers, by predicted total consumption decile



f Direct support transfers, by predicted total consumption decile

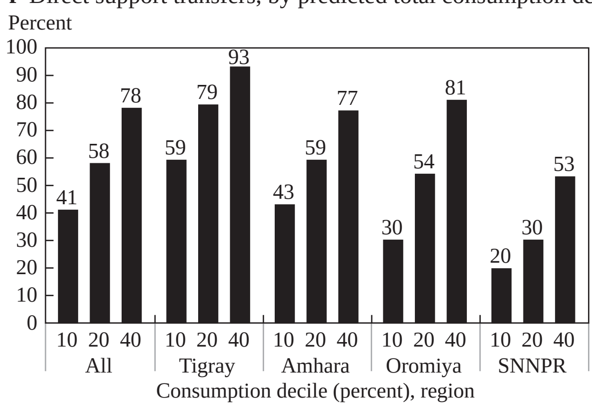


TABLE 10.12a Size of PSNP transfers relative to mean transfers, by region and consumption decile, 2007 (percent)

		How are transfers measured?	
Region	Percentile rank in terms of total household consumption	Total transfers	Transfers per capita
Tigray	10	63	126
	20	76	119
	40	87	108
Amhara	10	81	140
	20	82	119
	40	95	111
Oromiya	10	74	141
	20	88	128
	40	96	113
SNNPR	10	93	162
	20	90	137
	40	89	116

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTE: PSNP = Productive Safety Net Programme; SNNPR = Southern Nations, Nationalities, and People's Region.

TABLE 10.12b Size of public works transfers relative to mean transfers, by region and consumption decile, 2007 (percent)

		How are transfers measured?	
Region	Percentile rank in terms of total household consumption	Total transfers	Transfers per capita
Tigray	10	65	125
	20	69	120
	40	89	108
Amhara	10	79	132
	20	81	116
	40	92	108
Oromiya	10	81	153
	20	87	128
	40	96	114
SNNPR	10	106	173
	20	95	139
	40	91	116

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTE: SNNPR = Southern Nations, Nationalities, and People's Region.

TABLE 10.12c Size of direct support transfers relative to mean transfers, by region and consumption decile, 2007 (percent)

		How are transfers measured?	
Region	Percentile rank in terms of total household consumption	Total transfers	Transfers per capita
Tigray	10	98	131
	20	105	118
	40	100	105
Amhara	10	94	143
	20	94	124
	40	117	124
Oromiya	10	61	112
	20	105	130
	40	105	112
SNNPR	10	74	163
	20	77	143
	40	82	122

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTE: SNNPR = Southern Nations, Nationalities, and People's Region.

10.12a the figure 140 in the row for Amhara at the 10 percentile ranking in the column "Transfers per capita" means the following. We rank households in Amhara by total predicted household consumption. With this ranking we focus attention on households predicted to be in the poorest decile and assess the size of PSNP transfers per capita for beneficiaries in this decile relative to all PSNP beneficiaries in Amhara. The figure 140 tells us that PSNP beneficiaries in the poorest predicted decile in Amhara receive per capita PSNP transfers that are 40 percent higher than those given to the average PSNP beneficiary in that region. The striking feature of Tables 10.12a–10.12c, for both types of transfers and for all regions, is that the reported percentages are all greater than 100 when looking at transfers per capita and almost always below 100 when looking at total transfers. This indicates that, if they are selected into the PSNP, larger households receive greater transfers.

Correlates of Positive Targeting Outcomes at the Locality and the Woreda *Levels*

The previous material tells us what targeting outcomes are obtained; it does not tell us why targeting is superior in some localities than in others, and it tells us nothing about the process by which these targeting outcomes have been obtained. But the EFSS survey data allow for an examination of which factors are correlated with positive targeting outcomes in these communities.

This is particularly important because the PSNP introduced a number of reforms to promote community participation in the targeting process to improve transparency and accountability. The grievance procedures were separated from the targeting process in 2007 with the establishment of the Kebele Appeal Committees. Beneficiary lists are posted in public locations and debated during public meetings.

Our analysis begins with an exploration of the process indicators associated with targeting: whether households perceived that they were given the opportunity to comment on beneficiary selection, whether they perceived the process as fair, and whether they felt that they were well informed about how the PSNP operates (including the selection of beneficiaries) in their communities. The distribution of these outcomes across localities is reported in Table 10.13. Just under 70 percent of households reported that they were well-informed about how the PSNP worked. Fewer (47 percent) perceived the selection process as fair, and only a third had the opportunity to comment on the

TABLE 10.13 Local-level targeting-related outcomes: Distributions and means, by region, 2008

Region	25th percentile	Median	75th percentile	Mean
	Proportion of households reporting that they were allowed to comment on beneficiary selection			
Tigray	0.25	0.40	0.62	0.41
Amhara	0.08	0.33	0.40	0.32
Oromiya	0.04	0.17	0.28	0.20
SNNPR	0.20	0.38	0.51	0.37
All	0.13	0.29	0.48	0.33
	Proportion of households perceiving that the selection process was fair			
Tigray	0.39	0.52	0.70	0.51
Amhara	0.32	0.48	0.62	0.49
Oromiya	0.16	0.32	0.47	0.34
SNNPR	0.36	0.51	0.70	0.53
All	0.28	0.48	0.64	0.47
	Proportion of households perceiving that they were well informed about how the PSNP works			
Tigray	0.67	0.75	0.85	0.75
Amhara	0.45	0.65	0.87	0.62
Oromiya	0.30	0.58	0.91	0.58
SNNPR	0.76	0.92	1.00	0.82
All	0.50	0.75	0.93	0.69

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTES: Sample sizes: Tigray, 33; Amhara, 28; Oromiya, 34; SNNPR, 36. PSNP = Productive Safety Net Programme; SNNPR = Southern Nations, Nationalities, and People's Region.

selection process. Generally, Tigray and the SNNPR had the strongest process indicators, Oromiya the poorest.

Table 10.14 reports the means and standard deviations of the correlates of these process indicators; regression results are reported in Table 10.15. Several findings are noteworthy. First, households are more likely to be able to comment on beneficiary selection if they live in wealthier localities as measured by landholdings and if the head of household has any formal schooling, but these characteristics have no effect on perceptions of fairness or understanding of the program. Second, higher inequality is associated with higher perceptions of fairness, perhaps because it is easier to differentiate between food-secure and food-insecure households. A positive association is also found with the proportion of households where the head of household was born in the locality; in this

TABLE 10.14 Local-level targeting-related outcomes: Characteristics of correlates, 2008

Variable	Mean	Standard deviation
Mean household characteristics		
Age of head of household (years)	45.3	5.5
Female-headed household	1.24	0.12
Head of household has some schooling	0.23	0.18
Land size (hectares)	1.22	0.80
Inequality		
Land, interquartile range (hectares)	0.87	0.55
Social capital		
Head of household born in the locality	0.80	0.12
Related to task force members	0.19	0.18
Connectedness of locality		
Nearest road is all-weather	0.51	0.50
Locality has phone service	0.57	0.50
Characteristics of Community Food Security Task Force		
Has elderly members	0.88	0.32
Has youth members	0.88	0.33
Number of women	2.23	1.89
Number of development agents	1.87	1.38
Produces reports on activities	0.78	0.41
Perceives a need to hire some skilled labor	0.97	0.17
> 40 percent of current beneficiaries added in last 18 months	0.19	0.39
Updated list of PW beneficiaries since January 2008	0.88	0.33

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTES: Interquartile range equals the difference between the third and first quartiles. In the present case, it is measured as the difference between the third and first quartiles of landholdings in each locality. PW = public works.

TABLE 10.15 Correlates of locality-level targeting-related outcomes, 2008

Characteristic	Respondents perceive that they can comment on beneficiary selection (1)	Respondents perceive that the selection process is fair (2)	Respondents feel well informed about how well the PSNP works (3)
Mean household characteristic			
Age of household head	–0.004	0.004	0.005
	(–0.945)	(0.878)	(0.953)
Female-headed household	0.141	–0.085	0.087
	(0.550)	(–0.485)	(0.407)
Household head has some schooling	0.345**	0.098	0.018
	(2.499)	(0.751)	(0.0981)
Land size (hectares)	0.109**	–0.061	–0.050
	(2.036)	(–1.118)	(–0.946)
Inequality			
Land, interquartile range	–0.051	0.168***	0.087
	(–0.997)	(2.944)	(1.288)
Social capital			
Household head born in this PA	0.073	0.221**	0.028
	(0.473)	(2.357)	(0.199)
Related to task force members	0.314**	0.147	0.275**
	(2.497)	(1.230)	(2.027)
Connectedness of locality			
Nearest road is all-weather	0.122***	0.099**	0.072
	(2.971)	(2.300)	(1.450)

Locality has phone service	0.033	–0.022	0.157***
	(0.751)	(–0.483)	(2.683)
Characteristic of Community Food Security Task Force			
Has elderly members	0.121	0.027	0.122
	(1.436)	(0.443)	(1.058)
Has youth members	–0.019	–0.075	–0.088
	(–0.295)	(–1.177)	(–0.828)
Number of women	–0.024**	0.010	–0.009
	(–2.010)	(0.910)	(–0.610)
Number of development agents	–0.029**	–0.033**	–0.002
	(–2.073)	(–2.081)	(–0.124)
Produces reports on activities	0.005	0.082*	0.086
	(0.105)	(1.685)	(1.291)
Updated list of PW beneficiaries since January 2008	0.021	0.134*	0.044
	(0.235)	(1.823)	(0.511)
> 40 percent of current beneficiaries added in last 18 months	0.101	0.113**	0.019
	(1.473)	(2.428)	(0.261)
Perceives a need to hire some skilled labor	–0.298**	–0.339***	–0.121
	(–2.568)	(–3.967)	(–0.861)
R-squared	0.331	0.356	0.281

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTES: Interquartile range equals the difference between the third and first quartiles. In the present case, it is measured as the difference between the third and first quartiles of landholdings in each locality. *t*-statistics are in parentheses. Standard errors are robust to heteroscedasticity. Regional controls included but not reported. Sample size is 122 localities. PA = peasant association; PSNP = Productive Safety Net Programme; PW = public works. * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

case, the likelihood that households will have had more interactions over time with the members of the CFSTFs may be a factor. Third, the connectedness of the locality—access to all-weather roads or to phone services—is associated with better process indicators.

How the composition and activities of the CFSTF affect these process indicators is also assessed. Proper composition of the CFSTF (presence of the elderly, youth, women, and development agents) has few positive consequences for the CFSTF; however, some characteristics, such as the number of development agents, are associated with poorer process indicators. When CFSTFs are run well—as measured by the existence of reports on their activities and recently updated beneficiary lists—the likelihood that the selection process is perceived to be fair is higher. However, when selection processes are amended so as to favor nonpoor households (for example, when local leaders indicate that it is acceptable to hire some skilled labor to undertake public works tasks), the perception of fairness is lower. Interestingly, when this occurs, there is less likelihood that households can comment on the selection of beneficiaries. Finally, the fact that a number of locality characteristics, including livestock holdings, are not correlated with these process variables means that a household food gap (and the interquartile range of these variables), distance to local towns, access to electricity, sex of respondent, and past receipt of emergency food aid are also noted. Changes in functional form, such as adding quadratic terms or transforming variables into log form, have no appreciable effect either.

What is the relationship between these types of characteristics and targeting performance as measured by the CGH index and the incidence (percentage of households predicted to be in the poorest quintile who receive benefits) of the PSNP?[3] In Table 10.16, explorations of these associations at the *woreda* level (the lowest level of disaggregation at which we can construct the CGH index) are highlighted. We focus on the association between the CGH index as measured by the share of public works going to the poorest two quintiles as measured by predicted per capita consumption. We choose this outcome because, ranked at this level, the CGH values are largely unchanged when this outcome is assessed using per capita or total household consumption; as noted in Table 10.11, this is not the case for other measures. Further, public works transfers account for nearly 90 percent of all PSNP transfers.

Given less than 60 *woredas* to work with, the specification must be parsimonious. We start with the variables used in Table 10.14 and add variables that are correlated with the CGH index and the incidence of public works at the *woreda* level but not with the process indicators (the distribution of livestock holdings) and drop those that are not correlated with these targeting outcomes (landholdings and their distribution, along with social capital variables). The

3. We replicated these specifications using the ratios reported in Table 10.12 as the outcome, but the covariates used here had no association with this outcome.

TABLE 10.16 Correlates of targeting performance, public works transfers to the poorest two quintiles as measured by predicted per capita household consumption, 2008

Variables	(1) CGH index	(2) CGH index	(3) Incidence	(4) Incidence
Woreda characteristic				
Female-headed household	–1.733*	–1.980**	–0.488	–0.574*
	(1.985)	(2.474)	(1.427)	(1.830)
Livestock, interquartile range	0.141**	0.166***	0.058**	0.067***
	(2.330)	(3.136)	(2.288)	(2.938)
Percentage with electricity	0.308*	0.346*	0.076	0.089
	(1.776)	(1.799)	(1.141)	(1.323)
Characteristic of Community Food Security Task Force				
Has elderly members	0.204	0.186	0.059	0.053
	(0.732)	(0.739)	(0.589)	(0.545)
Has youth members	–0.092	–0.121	–0.006	–0.016
	(0.310)	(0.466)	(0.0569)	(0.177)
Number of women	0.068	0.033	0.010	–0.002
	(1.189)	(0.518)	(0.523)	(0.103)
Number of development agents	0.083*	0.087*	0.033	0.034
	(1.681)	(1.684)	(1.632)	(1.661)
Perceives a need to hire some skilled labor	–1.061** (2.063)	–1.283*** (2.721)	–0.399** (–2.048)	–0.477** (2.668)
Implementation characteristic				
Percentage of beneficiaries added after 2006 (log)	0.100*** (3.375)	0.102*** (3.334)	0.021* (1.781)	0.022* (1.981)
Percentage of beneficiaries dropped after 2006 (log)	0.076* (1.852)	0.063 (1.407)	0.014 (1.069)	0.010 (0.636)
Percentage of households perceiving that they can comment on beneficiary selection		–0.779** (2.327)		–0.272** (2.334)
R-squared	0.533	0.573	0.542	0.578

SOURCE: Ethiopia Food Security Surveys, 2006 and 2008 (Household Surveys).

NOTES: Interquartile range equals the difference between the third and first quartiles. In the present case, it is measured as the difference between the third and first quartiles of landholdings in each locality. *t*-statistics are in parentheses. Standard errors are robust to heteroscedasticity. Regional controls included but not reported. Sample size is 59 *woredas*. Blank cell indicates variable excluded from specification. CGH = Coady–Grosh–Hoddinott. * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

most interesting results pertain to the composition and activities of the CFSTFs affecting process indicators. Although the presence of the elderly and of women improve targeting performance as measured by the CGH index or the incidence of public works employment, these associations are not statistically significant. A similar impact for the number of development agents on the CFSTFs is noted, even though these agents are perceived to make selection processes less fair. When selection processes are amended to favor nonpoor households (for example, when local leaders indicate that it is acceptable to hire some skilled labor to undertake public works tasks), targeting performance is poorer. Table 10.16 also shows that there is an association between updating the lists of beneficiaries by adding and dropping households and improved targeting performance. Finally, and perhaps surprisingly, an increase in the percentage of respondents who say that they can comment on the selection of beneficiaries is associated with poorer targeting performance. The magnitude of this association is small. A 10 percent increase in the percentage of individuals reporting that they can comment is associated, for example, with a 2.7 percentage point reduction in incidence. However, if the mean percentage of individuals in the *woreda* who perceive that the selection process was fair is used as the dependent variable, the results show that this percentage is higher in *woredas* where more respondents report that they are allowed to comment on the selection process; by contrast, program incidence or the CGH value has no association with this outcome.

Conclusions

The PSNP is targeted toward households that are both food insecure and poor in terms of total household resources. Although there was regional variation in application of the PIM, overall the guidelines were followed. Public works projects targeted poor rather than food-insecure households for participation, but because poverty is highly correlated with food insecurity, food-insecure households were targeted as well. The program targeted direct support toward households with limited labor endowments rather than targeting households based on poverty. Over time, community understanding of the targeting criteria improved across most of the PSNP regions. Households' identification of poverty-related factors as reasons that households were selected for public works improved in most regions, and in most regions it was well understood that the elderly and disabled were the intended recipients of direct support. Family or friendship connections were not reported as major factors in a household's likelihood to receive public works or direct support except in Oromiya, where households identified connections as playing a role in both. There were regional variations in targeting. This is unsurprising, given that the PIM allows for community-based norms to be used in targeting.

From an international perspective, the PSNP is well targeted. Based on the Coady–Grosh–Hoddinott indexes calculated for this sample, targeting is progressive in general. The PSNP also scored better than the median global value of this index, indicating that the PSNP is better targeted than the average global safety net program. Moreover, the PSNP is better targeted than any of the African safety net programs reported by Coady, Grosh, and Hoddinott (2004). There is little evidence of elite capture throughout the regions where the PSNP is being operated. Differences in how the CFSTFs are run matter for targeting performance. In cases in which selection processes are amended to include nonpoor households, targeting performance is weakened.

These findings suggest that the PSNP has been able to target resources to the poorest households in rural areas using a combination of geographic and community-based targeting. The food aid targeting system was a useful foundation, identifying food-insecure *woredas* and establishing the community-based targeting system. However, the improvement in targeting outcomes since 2006 suggests that program size has important implications in terms of how well communities can target resources to the poorest, as well as the need for continuous capacity building and follow-up from higher-level implementers. Finally, there is some suggestion that the PSNP's aim to deliver a predictable safety net to households while also creating quality public works may undermine the effectiveness of the targeting through, for example, the need to hire skilled labor to deliver on this second objective.

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11 The Evolving Role of Agriculture in Ethiopia's Economic Development

PAUL DOROSH

Ethiopia is changing at an accelerating pace. Major investments in roads are bringing tens of millions of people effectively closer to major urban centers and services. Expansion of telecommunications, especially through cellular phones, likewise has connected much of the country and vastly improved the spread of information. The average electricity generation capacity during 1990–99 was 334 megawatts, and by 2010 that capacity had more than quadrupled, to 1,498 megawatts. During the same period, the capacity per capita almost tripled (from 6.0 watts to 17.4 watts). These advances are providing new opportunities for industrial production and modern services.

These changes are remarkable, particularly given Ethiopia's history as a country of widespread poverty, exacerbated by severe droughts and major famines in the 1970s and 1980s. In the past two decades, public investments in agricultural development and the provision of safety nets have dramatically increased food security. Although there remains some debate over the size of cereal production increases, there is strong evidence to suggest that food production has indeed increased substantially, particularly in the 2000s, and that food security has improved at both the national and the household levels. Official production figures indicate that there was an average annual growth rate of 12 percent in cereal production between 2004/05 and 2007/08.[1] Average per capita incomes rose from $131.7 in 2001 to $200.7 in 2009 (World Bank 2010).[2] Malnutrition estimates in the mid-2000s showed a substantial decline in child mortality.

The lack of nationally representative household data between 2005 and 2010 made it impossible to provide conclusive estimates of poverty and food insecurity when Ethiopia's new five-year Growth and Transformation Plan was

1. As noted in Chapter 1, many observers, including Dercon, Hill, and Zeitlin (2009), have questioned the high growth rates in these official estimates because of the relatively slow pace of adoption of improved seed varieties, the minimal expansion of irrigated area, and the apparent scarcity of land in the Ethiopian highlands, among other factors.

2. Gross domestic product per capita is measured in constant (2000) US dollars.

developed in 2010. Nonetheless, the apparent success of Ethiopia's agricultural and overall economic growth strategies prompted a major shift in development strategy, one involving a lesser role for agriculture and a much greater emphasis on industry and services for generating growth and poverty reduction.

From the Agricultural Development–Led Industrialization Strategy to Growth and Transformation

Beginning in the late 1990s, Ethiopia emphasized agricultural growth as the centerpiece of its Agricultural Development–Led Industrialization (ADLI) strategy. This represented a radical shift in policy from an "industry-first" approach adopted by the Derg regime to an "agriculture-first" policy, with a particular focus on peasant agriculture. Under ADLI, agricultural growth was expected to spur industrialization through backward and forward growth linkages (creation of demand for inputs, processing of agricultural outputs, and increased household demand for consumer goods). Moreover, agricultural development would be part of a broader rural development strategy including rural infrastructure development, expansion of education, and improved health services. ADLI thus provided the guiding framework for Ethiopia's development strategy in the 2000s, as outlined in the Sustainable Development and Poverty Reduction Program that was in place from 2002/03 to 2004/05 and the Plan for Accelerated and Sustained Development to End Poverty that was implemented from 2005/06 to 2009/10 (Table 11.1 and Box 11.1).

To a large extent, it appears that the ADLI strategy has succeeded. However, continued reliance on agriculture as a major driver of economic growth is increasingly seen as problematic, for three reasons. First, there are serious concerns about the prospects for continued growth in agriculture. Land and water resource constraints in the highlands and the drought-prone areas will make it

TABLE 11.1 Average sectoral growth rates under the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) and the Growth and Transformation Plan (GTP), 2005/06–2014/15 (percent)

Plan (scenario/result)	Agriculture	Industry	Service
		2005/06–2009/10	
PASDEP base	6.0	11.0	7.0
PASDEP high	6.4	18.0	10.3
PASDEP achieved	8.4	10.0	14.6
		2011/12–2014/15	
GTP base	8.6	20.0	10.6
GTP high	14.9	21.3	12.8

SOURCE: Ethiopia, MoFED (2006, 2010).

BOX 11.1 Ethiopia's Growth and Transformation Plan, 2010/11–2014/15

- The Growth and Transformation Plan (GTP) is the latest macrodevelopment agenda developed by the Government of Ethiopia. It succeeds the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) and will be effective from 2010/11 to 2014/15.
- The GTP concentrates on a locally driven economy and targets an economic growth rate of 14.9 percent. This growth target is higher than that in the PASDEP.
- The GTP maintains agriculture as a major source of economic growth, but it aims to create favorable conditions for the industry to play a key role in the economy.
- The GTP provides for investment in the expansion of infrastructure development (roads, electricity production, railway lines, and telephone infrastructure).
- The second Road Sector Development Program (2011/12–2014/15) seeks to achieve the following objectives by the end of the plan period:
  - reduce the average time to reach the nearest all-weather road from its current 3.7 hours to 1.2 hours,
  - reduce areas that are located farther than 5 kilometers from all-weather roads to 29 percent from their present 64 percent, and
  - connect all *kebele* in the country to nearby all-weather roads.
- By using modern technologies and local resources and mobilizing public–private partnerships, the GTP aims to expand the country's rail network. Some 2,000 kilometers of rail network will be under construction during the plan period.
- The GTP focuses on energy policy in terms of expanding the coverage and production of electricity; it aims to increase power generation to 10,000 megawatts by 2015, covering 75 percent of the country. The plan also aims to enhance Ethiopia's biofuel capacity.
- The telecommunications strategy in the GTP emphasizes upgrading the network already built to accommodate emerging latest information technologies and expanding fixed-line and mobile telephone services and Internet services.
- The GTP makes provision for significant expansion of irrigation and road, air, and maritime transportation capacities.
- Educational policy in the GTP is captured under the Education Sector Development Program, and it will focus on expanding functional adult literacy, providing Technical and Vocational Education and Training, and expanding higher education services.
- Improving access to and the quality of healthcare is a major component of the GTP's Health Extension Program. Reductions in maternal mortality, infant mortality, and the prevalence of malaria, as well as increases in immunization and tuberculosis detection rates, are some of the key objectives of the plan.

SOURCE: Author's compilation based on Ethiopia, MoFED (2010).

increasingly difficult to achieve high output growth rates in these areas, though major investments in irrigation and expansion of cultivation in rainfall-sufficient areas outside of the highlands (such as Benishangul-Gumuz and Gambella regions in western Ethiopia) may enable sizable gains in agricultural production in these regions.

Second, without continued (and even accelerated) growth in nonagriculture sectors, there would likely be insufficient demand for agricultural products. In general, consumption demand for major agricultural staples (particularly cereals) is income inelastic; that is, growth in household incomes generates a less than proportionate increase in demand (Chapter 7). Moreover, as incomes rise, the income elasticity of demand (the percentage of change in quantity demanded by a 1 percent increase in income) can be expected to fall. Thus, as Ethiopia's per capita income rises, further increases will generate even smaller increases in households' demand for key agricultural products. As a result, supply will increase faster than demand, and real prices of cereals will fall.[3] The simulation analysis in Chapter 8 shows that, even with growth in agricultural production of 6 percent per year, a moderately higher rate of growth in non-agricultural sectors of 8 percent per year is sufficient to generate enough demand to keep real prices for agricultural products relatively stable (real prices of teff and sorghum will be nearly constant; those of wheat and maize will fall by about 1 percent per year). More rapid growth in agriculture relative to industry and services, however, will likely result in steeper declines in real agricultural prices, reducing rural welfare and slowing overall growth as it discourages input use and productivity growth in agriculture.

Third, related to normal shifts in demand patterns as per capita incomes rise, economic growth almost always requires a structural transformation of the economy, from agriculture to industry and services. This shift in economic output is typically accompanied by growing urbanization, in part due to increases in productivity that occur due to agglomeration—clustering of firms, households, and workers that can enable larger and more efficient labor and product markets, as well as sharing of information and technologies. If Ethiopia follows this typical path of economic development, it will lead to even more rapid growth in industry and services and in the public and private investments needed to make this growth possible. Nonetheless, rapid agricultural growth remains necessary to achieve a rapid rise in living standards in Ethiopia, both in order to keep real food prices from rising excessively as incomes grow and

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3. Rapid overall (macroeconomic) inflation, as experienced in Ethiopia from 2007 to 2009, resulted in gains in the nominal (actual) prices of almost all commodities. Adjusting for overall inflation by expressing prices in real terms (for example, by dividing prices by a general price index, such as the consumer price index) gives a better indication of changes in incentives for production and consumption, as well as the extent to which supply is increasing more rapidly or slowly than demand.

to avoid the rise in rural poverty that could result from stagnation in the incomes of low-income rural households.

Major Challenges for Agricultural and Food Policy

To achieve high economic growth rates, reduce poverty, and enhance household food security in the coming decade, agricultural and food policy in Ethiopia must address five major challenges: sustaining growth in crop and livestock production, increasing market efficiency, providing effective safety nets, maintaining macroeconomic incentives and stability, and managing the rural–urban transformation.

Sustaining Growth in Crop and Livestock Production

Although Ethiopia successfully increased its crop production (especially for cereals) in the first decade of the 2000s, further increases will by no means be automatic. As noted earlier, increasingly binding land and water constraints will make it increasingly difficult to achieve production gains of both crops and livestock in the highlands without major investments in productivity-increasing technologies (including improved seeds and veterinary services, extension, and small-scale irrigation).[4] Current investment plans for the highlands (as outlined in the Agricultural Growth Programme) place a major focus on higher-potential areas where rainfall is generally sufficient for crop cultivation and there is sufficient forage. To achieve production gains, however, problems in seed multiplication and distribution must be overcome (Chapter 3). Likewise, the use of chemical fertilizers will likely have to increase. Ultimately, this may require a greater role for the private sector, allowing private traders to compete fairly with the agricultural cooperatives (Mellor and Dorosh 2010).

Prospects for the drought-prone areas are far less promising; there, promotion of nonfarm activities in rural areas and vibrant small cities may provide the most viable alternative for increasing food security (as is discussed later). Production from newly cultivated lands in rainfall-sufficient areas outside the highlands offers some prospect of national production gains, but infrastructure and marketing constraints must be overcome, and great care will be required to avoid environmental degradation.

Increasing Market Efficiency

Domestic markets for agricultural commodities have grown exponentially over the past two decades, resulting in increased competition, reduced seasonality,

4. Concerns about the implications for future agricultural growth of land constraints in the Ethiopian highlands have been noted by various analysts of Ethiopian agriculture, including the World Bank (2006) and Dercon, Hill, and Zeitlin (2009). Even if the official data on area expansion in the second half of the first decade of the 2000s are accurate, there is good reason to expect increasingly binding land shortages in the coming decade.

and the spatial integration of markets (Chapter 5). Gains in per capita incomes have generated increased effective demand for basic staples, as well as for animal products. Growth of cities has meant that much of this increase in demand is met from market purchases rather than from farmers' own consumption. Improvements in roads and the expansion of telecommunications have enabled more rapid transport of goods and almost instantaneous communication of market information.

Nonetheless, private markets continue to be viewed with suspicion by many in Ethiopia, and episodes of high and rising prices (such as in 2008 and 2011) are met by calls for restrictions on private trader price margins and stocks. At the same time, Ethiopia has created the Ethiopian Commodity Exchange, the largest commodity exchange in Sub-Saharan Africa outside of the Republic of South Africa. Since late 2008, contracts for almost all of Ethiopia's coffee exports have gone through this exchange. Yet a period of slow movement of coffee exports in late 2009 led to seizure of private trader stocks.

Thus, the role of private-sector trade in Ethiopia's agriculture remains, to a large extent, in a state of flux. There is reason for concern about the concentration of market power for internationally traded commodities, particularly given the country's reliance on only one port (Djibouti) and the difficult logistics of transport, handling, and storage involved in international trade. Promoting competition in these markets and paying attention to growing bottlenecks are crucial for market efficiency. Yet without vibrant, competitive private-sector trading, it will be extremely difficult for Ethiopia's export trade (and import trade in fertilizer and other key commodities) to prosper.

Similarly, in domestic markets, in most of Asia successful agricultural development has involved major roles for the private sector, even where governments have intervened to stabilize prices (Ahmed, Haggblade, and Chowdhury 2000; Rashid, Gulati, and Cummings 2008; Dorosh 2009). The implication for Ethiopia is that it is possible for competitive private markets in agricultural inputs and outputs to coexist with cooperatives (Mellor and Dorosh 2010). Early evidence on the effects of cooperatives suggests, however, that their impact on farmer output prices and incomes was small (Bernard et al. 2010).

Providing Effective Safety Nets

For decades Ethiopia relied on food aid both to increase the supply of food (especially after major crop production shortfalls) and to use for direct transfers to poor households. The shift to the Productive Safety Net Programme (PSNP) in 2005 as a means to provide a consistent and less ad hoc means of addressing chronic poverty and food insecurity was a major step in the design of an overall social protection program.

Given the high levels of poverty in Ethiopia, large-scale safety nets are likely to be an essential part of poverty alleviation programs. The PSNP has proven to be very successful, at least in terms of effectively targeting poor households with cash and food transfers (Chapter 10). Initial efforts to supplement these transfers through the Other Food Security Program also have had at least moderate success, but links to credit, skills training, and other programs to build household assets and sustainable livelihoods should be strengthened if PSNP participant households are to escape poverty (Gilligan, Hoddinott, and Taffesse 2009). In the medium term, effective safety nets for urban areas will likely be needed as well. These programs need not involve food transfers. Nonetheless, they can still make a major contribution to urban food security through increases in households' access to food.

Emergency food aid will continue to be required to address major production shortfalls. Much progress has been made in improving information flows and building national and regional capacity for monitoring emerging food insecurity problems. Nevertheless, strengthening a decentralized response system (via joint government and international organizational planning and regional logistics arrangements) will remain important to improve the timeliness of responses to serious hunger threats before they evolve into dire famine conditions.

Food aid need not provide the only or even the dominant means of increasing the supply of food in times of production shortfalls, however. Instead, private imports can make a major contribution to the stability of supplies, provided that government policy on the timing and levels of food aid inflows and distribution is transparent (Cody, Dorosh, and Minten 2009; Dorosh, Dradri, and Haggblade 2009).

Maintaining Macroeconomic Incentives and Stability

Macroeconomic instability, as reflected by high rates of domestic inflation (2007–09) and foreign exchange shortages (2009–10), had detrimental effects on agriculture and food security, as well as on the overall economy. High rates of domestic inflation, including rapid increases in the price of major staples, led to serious declines in real incomes and access to food, particularly for households relying on fixed or slowly adjusting salaries in urban areas. Foreign exchange shortages led to the rationing of foreign exchange and the inability of the private sector to import wheat (and thereby add to the total domestic supply and reduce domestic prices) when it would have been profitable to do so (Ahmed and Dorosh 2009). Foreign exchange rationing, put into place in lieu of a nominal and real exchange rate depreciation that would have brought supply and demand for foreign exchange more closely into balance, also reduced incentives for the production of tradable goods (including export crops such as coffee and sesame) and lowered the real incomes of most households (Dorosh, Robinson, and Ahmed 2009).

With the September 2010 devaluation of the Ethiopian birr, there was no longer a need for rationing, removing the major distortion in the foreign exchange market and Ethiopia's overall economy. Moreover, macroeconomic inflation already had been brought under control by late 2009 through sharp restrictions on domestic credit and other fiscal and monetary measures. Achieving and sustaining macroeconomic stability through judicious macroeconomic policies will be crucial to the success of Ethiopia's growth and poverty reduction efforts.

Managing the Rural–Urban Transformation

Ethiopia's spatial transformation has only just begun. Ethiopia remains one of the least urbanized countries in the world (with 16 percent urbanization, by official CSA estimates [see Table 2.9, p. 41], compared to an average of 30 percent in Sub-Sahara Africa). Measuring urbanization in terms of spatial agglomerations of people in and near cities of 50,000 or more shows that urbanization growth rates between the population census years 1984 and 2007 were much higher (between 8 and 9 percent) than estimates based on official definitions of urban (4.2 percent) (Dorosh et al. 2011).

One reason for the slow pace of urbanization in the past is that government policy has been designed to slow rural–urban migration through regulations prohibiting the sale of land, proscribing the loss of land rights for those who leave rural areas, and imposing registration requirements for new migrants. In the coming decade, allocation of public investments across sectors and between rural and urban areas, land policies, and various regulations on labor mobility will all likely be major determinants of economic growth and poverty reduction in Ethiopia.

There is some evidence suggesting that investments in increasing agricultural productivity, particularly in favorable agroecological environments and in a context of industrial productivity growth at rates similar to those in 2005–09, will provide the best pathway for overall reductions in poverty in Ethiopia (Dorosh et al. 2011). Moreover, removing the existing constraints to internal migration may speed the spatial and structural transformation of Ethiopia, promoting economic growth and urban industrial development. Much further analysis is needed, however, to support government policy regarding the appropriate balance of public investments to promote agricultural growth while providing enough urban infrastructure and services to prevent a rise in costs due to urban congestion.

Conclusions

Ethiopia has made enormous progress since the famines of the 1970s and 1980s. Widespread economic growth, food production increases, massive increases in infrastructure, improvements in telecommunications, more vibrant agricultural markets, and a well-functioning safety net are major achievements. The challenge now is to build on these successes and to accelerate development so as to maintain rapid overall growth and to sharply reduce poverty in both rural and urban areas.

Research and analysis related to the agricultural sector and food security can play an important role in facilitating effective policymaking and promoting growth and poverty reduction objectives. This will entail not only the work of research and analysis itself but the wide dissemination of data and materials, strengthening of the capacity of both individuals and key institutions (government agencies, universities and research organizations), and open dialogue and debate on policy design and impacts.

Food security in Ethiopia is likely to be a challenge for decades given the country's susceptibility to major droughts and other shocks. Successful policy will mean not only the avoidance of large-scale famines if and when major production shortfalls occur but also sustained improvements in food availability, access, and nutrition at the national and household levels.

The untimely death of Prime Minister Meles Zenawi in August 2012 was a profound shock to the country. Meles had led Ethiopia and its development efforts for over two decades, making key decisions through his active involvement in policy making. As of April 2013, the political transition has been smooth, with Deputy Prime Minister Hailemariam Desalegn formally named Prime Minister in September 2012.

How these developments will influence Ethiopia's policies and development remains to be seen. Macro-economic stability continues to be a major challenge and the debate over the relative emphasis on agriculture versus industry and rural versus urban in the country's development strategy may intensify. In this debate, it is hoped that the lessons of Ethiopia's successes in food and agriculture under the Meles regime outlined in this book may inform policies and investments that promote broad-based growth that improves the welfare of Ethiopia's rural and urban poor.

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Page numbers for entries occurring in boxes are followed by a *b;* those for entries in figures, by an *f;* those for entries in notes, by an *n;* and those for entries in tables, by a *t.*

The perception of Ethiopia projected in the media is often one of chronic poverty and hunger, but this bleak assessment does not accurately reflect most of the country today. In fact, since 2001, the per capita income in some rural areas has risen by more than 50 percent, and crop yields and availability have also increased. Higher investments in roads and mobile phone technology have led to improved infrastructure and thereby greater access to markets, commodities, services, and information.

In *Food and Agriculture in Ethiopia: Progress and Policy Challenges*, Paul Dorosh and Shahidur Rashid, along with other experts, tell the story of Ethiopia's political, economic, and agricultural transformation. The book is designed to provide empirical evidence to shed light on the complexities of agricultural and food policy in today's Ethiopia, highlight major policies and interventions of the past decade, and provide insights into building resilience to natural disasters and food crises. It examines the key issues, constraints, and opportunities that are likely to shape a food-secure future in Ethiopia, focusing on land quality, crop production, adoption of high-quality seed and fertilizer, and household income.

"Careful in-depth understanding, analysis, and evidence, of which there is much in this book, is essential to improve agricultural and food security policies in Ethiopia."

—*Stefan Dercon, Professor of Development Economics and Chief Economist, DFID, UK*.

"*Food and Agriculture in Ethiopia: Progress and Policy Challenges* gives an insightful assessment of the tremendous economic progress of the nation in the past two decades which was made possible by market-oriented economic reforms and a strategic policy focus on agricultural growth. As a consequence, the risks of famines have been sharply reduced and that is historical. [The] volume provides convincing guidance toward now needed broader development policies to further enhance resilience and prosperity."

—*Joachim von Braun, Director, Center Professor, Economics and Technological Change, for Development Research (ZEF Bonn), University of Bonn, Germany*

"This is an excellent book that offers valuable insights into the Ethiopian agriculture and food system [and makes an] immense contribution to the Ethiopian economic development efforts. The book could be extremely enlightening for policy makers, researchers, development partners, and practitioners."

—*Assefa Admassie, Executive Director, Ethiopian Economic Association/Ethiopian Economic Policy Research Institute (EEA/EEPRI)*

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