

Environment for Development

Discussion Paper Series

June 2008 ■ EFD DP 08-07

Rural Livelihoods, Poverty, and the Millennium Development Goals

Evidence from Ethiopian Survey Data

**Randall Bluffstone, Mahmud Yesuf, Bilisuma Bushie,
and Demessie Damite**



Environment for Development



RESOURCES
FOR THE FUTURE

Environment for Development

The **Environment for Development** (EfD) initiative is an environmental economics program focused on international research collaboration, policy advice, and academic training. It supports centers in Central America, China, Ethiopia, Kenya, South Africa, and Tanzania, in partnership with the Environmental Economics Unit at the University of Gothenburg in Sweden and Resources for the Future in Washington, DC. Financial support for the program is provided by the Swedish International Development Cooperation Agency (Sida). Read more about the program at www.efdinitiative.org or contact info@efdinitiative.org.

Central America

Environment for Development Program for Central America
Centro Agronómico Tropical de Investigación y Enseñanza (CATIE)
Email: centralamerica@efdinitiative.org



China

Environmental Economics Program in China (EEPC)
Peking University
Email: EEPC@pku.edu.cn



Ethiopia

Environmental Economics Policy Forum for Ethiopia (EEPFE)
Ethiopian Development Research Institute (EDRI/AAU)
Email: ethiopia@efdinitiative.org



Kenya

Environment for Development Kenya
Kenya Institute for Public Policy Research and Analysis (KIPPRA)
Nairobi University
Email: kenya@efdinitiative.org



South Africa

Environmental Policy Research Unit (EPRU)
University of Cape Town
Email: southafrica@efdinitiative.org



Tanzania

Environment for Development Tanzania
University of Dar es Salaam
Email: tanzania@efdinitiative.org



School of Business,
Economics and Law
UNIVERSITY OF GOTHENBURG



Rural Livelihoods, Poverty, and the Millennium Development Goals: Evidence from Ethiopian Survey Data

Randall Bluffstone, Mahmud Yesuf, Bilisuma Bushie, and Demessie Damite

Abstract

This paper provides an in-depth look at some of the key development issues facing households in Ethiopia, in the context of the Millennium Development Goals (MDG). Using household survey data from 2000, 2002, and 2005, we found that Ethiopia is making progress toward some vital MDG goals, but household incomes are shockingly low and hugely varied. Assets could potentially help smooth consumption when incomes vary, but because land is owned by the government, it cannot serve as a true, functioning asset. The current property rights structure excessively limits households' options.

Key Words: Millennium Development Goals, rural poverty, Africa, Ethiopia

JEL Classification Numbers: I31, I32, I38

© 2008 Environment for Development. All rights reserved. No portion of this paper may be reproduced without permission of the authors.

Discussion papers are research materials circulated by their authors for purposes of information and discussion. They have not necessarily undergone formal peer review.

Contents

Introduction.....	1
1. Literature on Outcomes and Contributors to Poverty in Low-Income Countries	5
2. Description of Data and Study Sites.....	6
3. Results	7
3.1 Household Makeup and Education	8
3.2 Income.....	10
3.3 Credit.....	14
3.4 Assets	15
3.5 Access to Clean Water and Sanitation	22
3.6 Health and Vaccinations	25
3.7 Social Capital and Group Coping Mechanisms	27
4. Conclusion	29
References.....	31

Rural Livelihoods, Poverty, and the Millennium Development Goals: Evidence from Ethiopian Survey Data

Randall Bluffstone, Mahmud Yesuf, Bilisuma Bushie, and Demessie Damite*

Introduction

Ethiopia is synonymous with poverty and hunger in worldwide parlance. Its relentlessly low incomes and major famines that have occurred every decade since the 1970s have engrained this impression in the popular psyche. With gross national income per capita a mere US\$ 160 per year, Ethiopia's average income is much less than \$1 per person per day, placing it 202nd out of 208 countries (World Bank 2006). Adjusting for purchasing power parity (PPP) increases the gross national income per person to approximately \$1000, but this is still less than \$3 per day: Ethiopia's rank climbs slightly to 193rd of 208 countries (World Bank 2006). In 2006, Ethiopia ranked 170th of 177 countries in the Human Development Index (UNDP 2006).

Furthermore, there is high variability in output, particularly in the agricultural sector, which employs over 85 percent of Ethiopians (MOFED 2004). For example, although agricultural output increased by 11.5 percent during 2000–2001, year-on-year output growth fell by 2.3 percent in 2001–2002 plus an additional 12.6 percent in 2002–2003, before increasing 18.9 percent the following year. Contractions in the agricultural sector and, indeed, the economy as a whole are due to lack of rain on which Ethiopian agriculture almost wholly depends.

* Randall Bluffstone, Portland State University, Department of Economics, PO Box 751 Portland, Oregon 97207-0751, (tel) 503-725-3938, (fax) 503-725-3945, (email) bluffsto@pdx.edu; Mahmud Yesuf, Environmental Economics Policy Forum for Ethiopia, Ethiopian Development Research Institute, Blue Building/Addis Ababa Stadium, P.O. Box 2479, Addis Ababa, Ethiopia, (tel) +251 11 5 506066, (fax) +251 115 505588, (email) mahmudyesuf@yahoo.com; Bilisuma Bushie, Addis Ababa University, Department of Economics, P.O.Box 1176, Addis Ababa, Ethiopia, (tel) +251 11 1223776, (email) bilisumabb@yahoo.com; Demessie Damite, Environmental Economics Policy Forum for Ethiopia, Ethiopian Development Research Institute, Blue Building/Addis Ababa Stadium, P.O. Box 2479, Addis Ababa, Ethiopia, (tel) +251 11 5 506066, (fax) +251 115 505588, (email) demdam2001@yahoo.com.

The authors would like to thank Sida (Swedish International Development and Cooperation Agency) and Gothenburg University for financial support and the Department of Economics at Addis Ababa University for making the data available. They also thank EDRI colleagues Teki Alemu for his work on data collection and management, Alemu Mekonnen for detailed comments on a draft of this paper, and Mulugeta Tadesse for developing the map showing the survey sites, and the participants in EDRI seminars for their thoughtful comments.

The purpose of this paper is to use detailed household data to analyze household incomes in a typical rural region of Ethiopia and give meaning and context to some of the above statistics. Reducing poverty and its correlates is now at the top of the international policy agenda. This is perhaps best illustrated by the eight Millennium Development Goals (MDGs), which were adopted unanimously by United Nations member nations in September 2000 and focus on improving human well-being in a variety of dimensions. (The eight MDG goals are listed in box 1, along with five targets that are most relevant to this paper.) There are 18 targets for the MDGs, seven of which relate to goal 8 and deal with issues of development assistance, market access, and debt relief for developing countries. However, perhaps the most crucial goal is to reduce extreme poverty¹ and hunger.

Box 1 Millennium Development Goals and Targets Relevant to This Paper

1. Eradicate extreme poverty and hunger

Relevant target: Halve the proportion of people whose income is less than \$1 per day by 2015.

2. Achieve universal primary education

Relevant target: Ensure that by 2015 children everywhere, boys and girls alike, will be able to complete a full course of primary schooling.

3. Promote gender equality and empower women

4. Reduce child mortality

Relevant target: Reduce by two-thirds the mortality rate for children under 5 years of age.

5. Improve maternal health

6. Combat HIV/AIDS, malaria, and other diseases

Relevant target: By 2015, halt and begin to reverse the incidence of malaria and other major diseases.

7. Ensure environmental sustainability

Relevant target: Give everyone sustainable access to safe drinking water and sanitation.

8. Develop a global partnership for development

The official definition of poverty in Ethiopia is much less stringent than the MDG definition. In Ethiopia, the poverty line is US\$ 0.36 per adult-equivalent per day and extreme

¹ Extreme poverty is defined as an income of less than US\$ 1 per person per day (United Nations 2003).

poverty is \$0.27 per person per day. Under these definitions, almost one-half of Ethiopians were poor in 2000 and about 25 percent were extremely poor (MOFED 2002a). As of 2006, the prospects of achieving the target for MDG 1 looked very ambitious, but Ethiopia's situation is by no means unique in Africa. Of 49 African countries considered in an IMF dataset, only the gross national income per capita of Burundi was lower than that of Ethiopia in 2005; four countries (Burundi, Malawi, Liberia, and Guinea-Bissau) are within \$50 per capita per year of Ethiopia; seven countries are within \$100 per capita; and 10 countries are within \$150 (IMF 2007). In almost all of these countries, the poor people are concentrated in rural areas. The 44 percent of Ethiopians who are poor is about the same for sub-Saharan Africa as a whole (Chen and Ravallion 2004). Shedding light on a typical, rural region of Ethiopia, therefore, can also benefit many other low-income countries.

The United Nations developed targets for achieving the MDGs by 2015 (United Nations 2003), but individual countries have established their own targets in so-called poverty reduction strategy papers linked to the MDG process. In Ethiopia, this document was called the Sustainable Development and Poverty Reduction Program (SDPRP), but it was replaced in October 2005 by the Plan for Accelerated and Sustained Development to End Poverty (PASDEP). The PASDEP identifies select targets through 2010: its specification of targets is in contrast to SDPRP, which specified relatively few quantitative goals. Selected PASDEP targets are presented in table 1 below.

Ethiopia has advanced toward the MDG targets, but this can be difficult to see because the MDGs are international and the reported data are national averages,² which mask country-specific details and are limited in scope. If we want to improve our understanding of how poor people live, what challenges they face, and what coping mechanisms they use in very low-income countries, such as Ethiopia, we need to look behind the targets and examine the issues at household or even individual levels. This paper, therefore, utilizes a unique household-panel data set, collected in three parts (2000, 2002, and 2005), from one of Ethiopia's eight non-urban regions³ to analyze Ethiopia's progress.

² See, for example, the papers available at <http://ddp-ext.worldbank.org/ext/GMIS/gdmis.do?siteId=2&menuId=LNAV01HOME6#cstudy>

³ There are also three purely urban regions, which include the capital, Addis Ababa.

We emphasize that this paper does not identify the factors contributing to poverty, but carefully looks at the nature of poverty in a typical rural region, with reference to the literature and MDGs. Because it does not identify causality or even correlation, the paper cuts a wider swath and digs deeper into the data than otherwise possible and relies on non-parametric tools to paint a picture of life in rural Ethiopia.

The paper has four sections in addition to the introduction. The next section selectively reviews the extensive literature on the incidence and consequences of poverty worldwide. Section 2 describes collection of the panel data, section 3 presents the data results and how they relate to the MDGs, and section 4 draws general conclusions from the analysis.

Table 1 Select PASDEP Targets

Target/Indicator	2005 Level	PASDEP target (2009–2010)
Primary school completion rate	40%	85%
Primary school enrollment	79%	100%
Population with access to clean water (within 0.5 km)	42%	84.5%
Ratio of girls to boys (in primary school)	0.84	0.97
Infant mortality rate (per 100,000 births)	97/1000	45/1000
Maternal mortality rate (per 100,000 births)	871/100,000	600/100,000
Contraceptive prevalence rate	23%	45%
Primary health coverage (within 10 km)	64%	100%
DPT 3* vaccination rate	61%	90%
Use of latrines	20%	80%
Average time to all-weather road (walking hours)	5.0	3.2
Road density (km/1,000 sq. km)	33.2	54.1
Local governments (<i>kebeles</i> ** with telephone)	3,000	15,000

* Diphtheria, pertussis, tetanus

** Kebeles—neighborhoods or communities—are small administration units similar to wards.

Source: MOFED 2005b

1. Literature on Outcomes and Contributors to Poverty in Low-Income Countries

In examining the MDGs for reduction of poverty, education, child mortality and health, and water supply and sanitation, we limited the literature review to the relationship between income and MDG benchmark targets. We specifically looked at accumulation of assets and management of risk, which are critical determinants of future income.

Vulnerability to shocks is a key element addressed by MDG 1 and characteristic of rural life in developing countries. Ownership of assets, such as land and livestock, helps reduce vulnerability of households and allows them to exploit income generating opportunities. Several researchers have observed asset disinvestment in response to shocks (e.g., Christiaensen 2006), but Christiaensen and Boisvert (2000) also found that female-headed households are less likely to be at risk during droughts due to higher social capital. Indeed, a diverse literature provides evidence that poor people in developing countries use social networks and connections as insurance to manage risk. (e.g., Fafchamps and Gubert 2006; Dercon and Krishna 2000; Chetty and Looney 2006; Grootaert and Narayan 2004; Fafchamps and Lund 2003). This phenomenon is not limited to developing countries. For example, Dehejia et al. (2006) found that U.S. religious organizations provide alternative but vital insurance.⁴

Education, the focus of MDG 2, was probably the most interesting aspect of this paper, given the interaction between income, child labor, and education in rural areas of developing countries. We found two schools of thought in the literature. The first showed an insignificant relationship between child labor, education, and income in a variety of low- and middle-income countries, e.g., Brazil, Turkey, Ghana, and Thailand. However, it also highlighted important linkages with other factors: parental education, gender of children, land size, distance from school, residence in mountains, and household size, etc. (Cochrane 1990; Ray 2000; Ahmed 1999; Dayioglu and Assad 1994; Lloyd and Gage-Brandon 1994; De Graff et al. 1993).

Zafiris (1998), Bhalotra and Heady (2001), Sedlacek et al. (2005), and Bhalotra (2001), on the other hand, contended that child labor and low levels of education were the main outcome of low income and poverty. Grootaert and Kanbur's (1994) evidence from Brazil confirmed a strong relationship between income and child labor and income and education, as did ILO

⁴ Specifically, Dehejia et al. examined whether "religious participation provide[d] a particular good: implicit insurance of consumption (through mutual aid from other members) or of happiness (as a result of the consumption insurance or directly through doctrinal solace)" with positive results.

(1992), which identified low income as well as parental education to be key factors determining levels of child labor and education.

MDGs 4 and 6 focus on child mortality and health. Casterline et al. (1989) found that child mortality was primarily the result of low income in Egypt. In rural India (Jain 2004), Bangladesh (Hussain et al. 1999), and Taiwan and Thailand (Zimmer et al. 2000), socioeconomic status was also a key factor determining child mortality and health. Contrary to this, Pitt et al. (1990) noted a net negative relationship between income and health in Bangladesh because higher incomes were correlated with more child labor. This basic relationship was also found by Bhalotra and Heady (2003; 2001)

MDG 7 focuses on environmental sustainability, including safe water and sanitation. Evidence on the linkages between household income and provision of clean water and sanitation was fairly limited. Eyob and Harris (2004) and Minot et al. (2006) found that access to sewage and sanitation facilities was negatively related to poverty in Eritrea and Vietnam, respectively. Dasgupta et al. (2002) found similar results, but emphasized that the negative relationship with access to clean water was much stronger.

2. Description of Data and Study Sites

The data come from three household survey rounds conducted in the Ethiopian highlands: April–June 2000 (1518 households), March–April 2002 (1522 households), and March–May 2005 (1752 households). Questions on household characteristics, health, social capital, land use, production and consumption, tree planting, livestock ownership, income sources, credit, water, energy sources, and cooking were asked in one or more rounds.

To implement the survey, one supervisor for each village monitored 10 agents who were employed for two months to interview 100 households each. On average, each agent took 1.6 days to interview a household. Once a questionnaire was completed, it was verified by the field supervisor and the agent revisited the household when unrealistic responses were detected. After the field visits, all questionnaires were also verified by a different set of supervisors before the data were actually finalized.

The sample comes from six *weredas*⁵ in the South Wollo and East Gojjam zones of the regional state of Amhara, with households within each village selected at random. In 2005, two additional weredas were included to investigate the impacts of a pilot land-certification program. Typical of Ethiopia, this area has very limited irrigation, and agricultural production depends on timely rainfall. The major crops grown include teff⁶ (27–34 percent of households), wheat (9–15 percent), barley (6–7 percent), maize (9–10 percent), beans (5–7 percent), and sorghum (5–12 percent). Most households are primarily subsistence farmers who complement their own production with outside income. These farmers have small plots with limited access to roads and capital markets. Average time to the nearest road and town/market is 32 minutes and 70 minutes, respectively.

Rural Amhara is representative of the non-urban regions of the country. According to the Government of Ethiopia Household Income Consumption and Expenditure Survey (conducted in 2000, it sampled 17,332 households in Ethiopia, including 1740 in rural Amhara), real per capita expenditure in Amhara is close to the rural national mean, as is the 2614-calorie average adult intake. In rural Amhara, 42.9 percent of households are poor. Average income there is less than US\$ 0.36 per adult per day—compared to 65.8 percent for the country as a whole—and 20 percent are extremely poor versus 23 percent nationally. Up to 71 percent of household income in Amhara is spent on food, which is close to the national average of 67 percent. (MOFED 2002a).

3. Results

This section presents descriptive statistics from the three survey rounds, beginning with a discussion of key household and demographic issues. These results are followed by income by source, debt and credit, assets, access to water and sanitation, and health and vaccinations. The section concludes with a discussion of social insurance against shocks.

⁵ A *wereda* (or *woreda*) is an administrative district (of local government) in Ethiopia, similar to a county. Weredas, which are made up of *kebeles*, or neighborhood associations, are typically collected together (usually contiguous weredas) into zones.

⁶ Teff is a cereal crop grown as an alternative to wheat. It is ground into a flour, fermented, and commonly made into *injera* (a sour-dough flatbread), porridge, and alcoholic beverages. Teff straw (after threshing) is used to feed livestock and to reinforce the mud or plaster used in buildings (Stallknecht 1997).

3.1 Household Makeup and Education

As is true in many low-income countries, household membership in Ethiopia is a declining function of age due to high birth rates and low life expectancies. The total fertility rate is 5.9 children per woman, which ranks it among the highest in the world (UNDP 2006). Nationwide, life expectancy at birth is a mere 42.5 years, and about 17 of every 100 children die before the age of five (World Bank 2006). Table 2 presents average household size broken down by age for the three surveys.⁷ During the five-year time frame of the surveys, average household size increased from 5.2 to 6.4 persons (about 23 percent). It is tempting to speculate that the high birth rate explains this increase, but it turns out that children contributed the fewest additional members to households, and that actually the percentage of children in a household fell from 43 percent in 2000 to 38 percent in 2005. It seems that not only did the birthrate decline in the sample area but more young adults returned to their homes. As discussed later, land is allocated administratively and claims are linked to household size. The motivation of increased access to land could partly explain why younger adults may have returned to their villages during the study period.

Table 2 Average and Change in Household Size and Age Distribution

Year	Household size		Age 0–15		Age 16–35		Age 36–65		Age 65 +	
	Sample average	Δ prev. period	Sample average	Δ prev. period	Sample average	Δ prev. period	Sample average	Δ prev. period	Sample average	Δ prev. period
2000	5.17	–	2.45	–	1.54	–	0.98	–	0.20	–
2002	5.61	0.46	2.46	0.002	1.80	0.26	1.09	0.11	0.24	0.04
2005	6.35	0.71	2.53	0.06	2.27	0.46	1.16	0.07	0.27	0.10

MDG 2 focuses on universal primary education, and the government of Ethiopia set its own targets, including a fifth-grade completion rate of 34 percent and total literacy of 37.9 percent by 2004–2005 (MOFED 2002b). On average, 37.9 percent of the population can read and write (MOFED 2005a), which is lower than all but five countries worldwide (UNDP 2006). In our sample, 44.5 percent of household members were literate, with a median educational

⁷ Two villages were added to the sample in 2005, so when comparisons across time were made, these additional study sites were excluded.

attainment of four years. Completion of 10th grade put a person in the 95th percentile of the distribution.

Ethiopia's educational initiatives, however, which by all accounts have been substantial since 2000, were targeted at the young and, therefore, age is important when looking at change in education statistics. The government spent 18 percent of the national budget on education in 2005 (MOFED 2005b)⁸ and the initiatives show substantial progress (table 3). In 2000, only 60 percent of 13-year-olds and just over half of 11-year-olds could read and write; by 2005, over 80 percent of 13-year-olds and 78 percent of 11-year-olds had these skills. In 2000, completion of grade 5 would have put a 15-year-old in the 85th percentile of the distribution, but in 2005, 41 percent had at least completed fifth grade. Our evidence, therefore, suggested that although literacy is extremely low by world standards, Ethiopian children born after 1990 (compared with the 1980s) were much more likely to be fully literate. The evidence also showed the Ethiopian government to be on track to achieve MDG 2 targets.

Table 3 Educational Attainment by Age, as of 2005

Age	Literacy		School years attended			School years completed			n*
	Read only	Read/write	Mean	Median	75 th percentile	Mean	Median	75 th percentile	
7 years	3.8%	22.6%	1.4	1.0	2.0	1.3	1.0	1.0	319
9 years	5.2%	62.3%	3.9	2.0	2.0	1.8	2.0	2.0	308
11 years	2.9%	77.7%	2.9	3.0	4.0	2.8	3.0	4.0	314
13 years	1.3%	81.1%	4.3	4.0	5.0	4.1	4.0	5.0	307
15 years	2.1%	78.0%	5.2	5.0	7.0	5.0	5.0	7.0	341
17 years	3.1%	77.4%	6.0	6.1	8.0	5.9	6.0	8.0	288
19 years	1.8%	70.0%	6.9	7.0	9.0	6.7	7.0	9.0	220
21 years	0.90%	58.6%	6.7	7.0	9.0	6.4	7.0	9.0	222
23 years	3.4%	49.3%	6.6	7.0	9.0	6.5	7.0	9.0	266

* Observations noted were for literacy. There were fewer observations for school attendance or completion.

⁸ Total educational expenditure in 2005–2006 was \$744 million of the total budget of \$4.1 billion.

3.2 *Income*

This section examines levels and changes in total household income from 2000 to 2005. Respondents were queried about agricultural output and products primarily produced for sale (such as honey, trees, and animal products), as well as farm and non-farm wage labor and remittances. To value crops that were produced and consumed by households, output by crop was multiplied by local market prices. Total crop income was therefore the sum of all crops and household income was the sum of crop and non-crop income sources.

Inflation was low initially (2000–2002), but by 2005, prices had increased over 50 percent. It was important to examine these monetary variables in both nominal and real terms. Because virtually all households in the sample were subsistence farmers whose income and consumption were dominated by food, the most relevant price index for deflating incomes was the food consumer price index (CPI). We used the food CPI for the state of Amhara from the Central Statistics Agency of Ethiopia for December 2000 (100.00), July 2002 (100.80), and May 2005 (151.10), with December 2000 as the base period.

Table 4 shows household income in nominal terms during the three periods. (Income was converted to US dollars, using the official exchange rate with the Ethiopian birr, ETB.)⁹ Mean nominal annual household income was US\$ 253 in 2000, but a serious drought in 2001–2002 caused average household income to fall by one-third to \$170. By 2005 mean income had rebounded to \$354.

Table 5 presents household incomes adjusted for inflation. In real terms, household incomes in 2005 were about 7 percent lower than in 2000, at both median and mean. This entire decline was attributable to the approximately 33-percent drop in real income in 2000–2002, because in 2002–2005, real income rose by 39 percent. These findings speak to the huge variance in income that households must absorb and their dependence on the whims of weather. Medians were lower than means in all years, indicating skewed distributions.

⁹ See www.exchangerate.com. Relevant exchange rates were July 2000, ETB 8.25/US\$ 1; and July 2002 and June 2005, ETB 8.51/US\$ 1. These were official exchange rates, fixed by the government, so changes in exchange rates did not provide a sufficient adjustment for changes in the overall price level.

Table 4 Mean and Median Nominal Household Income by Source

Income source	2000		2002		2005	
	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>
Crops	\$178.77	\$119.50	\$96.40	\$78.89	\$305.19	\$223.29
Animal sales	\$36.77	\$8.97	\$31.95	\$0.00	\$40.59	\$0.00
Animal products	\$3.66	\$0.00	\$6.35	\$3.06	\$8.09	\$3.53
Honey	\$0.84	\$0.00	\$0.59	\$0.00	\$0.77	\$0.00
Tree products	\$5.41	\$0.00	\$7.37	\$0.00	\$8.21	\$0.00
Farm wages	\$4.03	\$0.00	\$1.04	\$0.00	\$1.20	\$0.00
Non-farm wages	\$21.36	\$0.00	\$18.65	\$0.00	\$24.00	\$0.00
Other	\$2.10	\$0.00	\$7.93	\$0.00	\$6.90	\$0.00
Total income	\$252.94	\$201.20	\$170.28	\$138.65	\$354.37	\$267.68
n	1515		1507		1752	

Table 5 Mean and Median Real Household Incomes by Source (2000 base year)

Income Source	2000		2002		2005	
	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>
Crops	\$178.77	\$119.50	\$95.63	\$78.26	\$201.98	\$147.77
Animal sales	\$36.77	\$8.97	\$31.70	\$0.00	\$26.86	\$0.00
Animal products	\$3.66	\$0.00	\$6.30	\$3.03	\$5.36	\$2.33
Honey	\$0.84	\$0.00	\$0.59	\$0.00	\$0.51	\$0.00
Tree products	\$5.41	\$0.00	\$7.31	\$0.00	\$5.43	\$0.00
Farm wages	\$4.03	\$0.00	\$1.03	\$0.00	\$0.80	\$0.00
Non-farm wages	\$21.36	\$0.00	\$18.50	\$0.00	\$15.88	\$0.00
Other	\$2.10	\$0.00	\$7.94	\$0.00	\$4.57	\$0.00
Total household income	\$252.94	\$201.20	\$168.93	\$137.55	\$234.53	\$177.15
n	1515		1507		1752	

Income in the sample area was not very diversified—it was primarily agricultural income, particularly for those in the bottom half of each income source distribution. In 2005, for example, crop income made up 85 percent of household income on average, and 65–68 percent in 2000 and 2002. The 2005 median income, however, was much more concentrated, with 95 percent of the median income coming from crop production (although in 2000 and 2002 these values were lower at 68 percent and 73 percent, respectively). At the mean, sales of tree products added another 2.5 percent in 2005, and non-farm wage labor contributed 6.3 percent, although these values were somewhat higher in 2002. In 2005, sales of animals generated 19 percent of total income on average, and in 2000 and 2002, this figure was about 15 percent. Off-farm wage labor also appears to have played some role in buffering households against shocks. In all three years, approximately one-third of households had some family member working for wages outside the agricultural sector, which generated on average about 9.0 percent of total household income. About 60 percent of households' labor was on other farms, usually under labor exchange agreements.

Table 6 Nominal and Real Total Per Capita Incomes by Year (2000 base year)

	2000		2002		2005	
	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>
Nominal	\$52.51	\$41.39	\$31.65	\$25.33	\$61.04	\$46.68
Real	\$52.51	\$41.39	\$31.40	\$25.13	\$40.40	\$30.89

Per capita incomes are perhaps most relevant for welfare analysis because they include the resources available, on average, for each person in each household, adjust for changing household size (mentioned above), and are in line with MDG 1. In table 6, per capita income is shockingly low. In nominal terms, depending on whether the mean or median is quoted, income was US\$ 41–\$53 per capita in 2000, and then dropped by about 40 percent in 2002 to the astounding levels of \$25–\$30 per capita per year. By 2005, however, per capita income exceeded 2000 levels in nominal terms at \$47–\$61 per capita, though this was still less than 20 percent of the \$1 per day, which defines extreme poverty in the MDG. In real terms, average per capita income in 2005 was actually lower than in 2000.

These low values clearly required cross-checking, but our estimates were in line with other household level income analyses for rural Amhara. MOFED (2002a) reported that average income per poor adult (i.e., the average adult) was US\$ 97 in 2000. Adjusting this value for total

family size (which in our sample included an average of 2.5 children per household) yielded a per capita income level of \$51, which is very close to the result for 2000 in table 6. Thus, we felt confident that our estimates, while astounding, were reasonably accurate.

What caveats could we try to make these results less shocking? The first possibility was to adjust the dollar values for PPP to account for differences in prices of non-tradable goods across countries. To get an idea of the effect of a PPP adjustment, we multiplied per capita incomes by 6.25, which is the 2005 national PPP adjustment factor (World Bank 2006), which yielded an average income of US\$ 1.05 per day. The average income per person in 2000 was marginally less than \$1 (\$0.90) per person per day, but the median person only had \$0.71. In 2002, when incomes dropped precipitously, the PPP adjustment did not help at all, since per capita incomes were only around \$0.50 per day. Adjusting for PPP, therefore, still put most people below the extreme poverty cutoff.

Table 7 Percent of Households in Extreme Poverty Using Nominal Income (per capita)

Year	PPP-adjusted income per capita		Unadjusted income per capita	
	<i>MDG cutoff (\$1.00/day)</i>	<i>Government cutoff (\$0.27/day)</i>	<i>MDG cutoff (\$1.00/day)</i>	<i>Government cutoff (\$0.27/day)</i>
2000	67.67%	12.23%	100.00%	88.24%
2002	90.18%	27.94%	100.00%	98.47%
2005	62.65%	8.79%	99.60%	85.44%

In table 7, unless we used the Ethiopian government's definition of extreme poverty *and* adjusted incomes for PPP, most of the households in the sample would be extremely poor in all years, regardless of the definition used. Given this data, achieving target 1 of MDG 1 plus halving the incidence of poverty as defined by the government appear to be serious challenges.

It is, of course, possible that income was omitted or under-reported. In surveys that estimated household income, household expenditure was often considered a better measure of household welfare because respondents had few incentives to under-report (Deaton 1997). In Amhara and in much of the low-income world, however, households produced mainly for their own consumption and earned little cash (Jacoby, 1993; Singh et al. 1986). In such contexts, expenditure provided a very poor proxy for income and welfare.

The issue of under-reporting, of course, remained a possibility. However, any under-reporting was remarkably consistent across survey rounds, and income changes were in line with

economic trends. Furthermore, the survey took steps to reduce under-reporting. For example, agricultural output, which made up more than two-thirds of household income, was reported by plot rather than in aggregate and reporting on various types of cash incomes was spread throughout the questionnaire. In sum, while under-reporting was likely, it was probably minor—and there also appeared no alternative to analyzing income.

3.3 Credit

With low and variable income, consumption smoothing is likely to be an important issue. Table 8 presents the percentage of households in the surveys that gave and received credit, total debt of households, and days worked to pay off debts (2002 only). In 2000, the average household debt was US\$ 12, and in 2002 was \$17.40 before declining to \$8.34 in 2005. In all three years, the median debt was zero. For the 36 percent of households who had some debt in 2002, mean debt was \$42.62—about one-quarter of the \$170 average annual household income. In 2005, about 10 percent of households had debt, with a mean of \$98. During the two years prior to 2002, 47 percent of households took out loans worth ETB 50 (\$5.88) or more, which was below the value for 2000, when more than half of all households took loans. Few households gave loans, however, suggesting that credit came from an external source.

Table 8 Credit Given and Received, Total Debt, and Days Worked to Pay Off Debts

Year	Credit ≤ ETB 50 (US\$ 5.88) given or received over 2 years		Total debt (US\$)		Days worked to pay debts	
	<i>Received</i>	<i>Given</i>	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>
2000	55.3%	3.3%	\$11.54	\$0.00	Not collected	
2002	46.9%	3.9%	\$17.40	\$0.00	17.4	0.00
2005	18.3%*	7.8%	\$8.34	\$0.00	Not collected	

* In 2005, the survey asked about credit taken in the *past 1 year*, rather than the past 2 years.

One way for households to settle debts is through work. In 2002, virtually all households who had debt used this method of settlement. Although the median was zero, on average, households worked 17.4 days to pay debts. Among the 592 households who worked off their debts, the mean was 44 days. This suggested that debt peonage could be an important issue.

3.4 Assets

To understand whether future income streams differed substantially from the past, we examined household assets. As is true around the world, a household's most important asset is its land. In the study area of Amhara, mean landholding over all three survey periods was almost exactly 1 hectare, and 50 percent of households had more than 0.85 hectares. The distribution was fairly narrow, with a standard deviation of 0.71 hectares, and 75 percent of households farming fewer than 1.3 hectares. On average, households had 5 plots, but 25 percent had 7 or more. What makes Ethiopia different from most other developing countries is that usufruct defines the right to land: all land belongs to the state and is allocated by local governments called *kebeles*, or neighborhood associations (see footnote 5). Land cannot be permanently sold and is rarely mortgaged. This means there are quite strict limits associated with using land to smooth consumption and leverage investments.

But even usufruct could be at risk due to kebele redistributions. Of 1522 respondents to the survey in 2002, 93 had experienced one or more land changes since 1997: 38 percent gained land and the remainder lost land. The average land gain was 0.26 hectares and the average loss 0.51 hectares. For those whose holding were reduced, 55 percent were redistributions or gifts within families, which were the most important causes of loss. Approximately 20 percent of land reductions were involuntary, such as redistributions by kebeles, evictions, and land reform measures.

While in practice involuntary reallocations are fairly limited, the system itself creates enormous insecurity. Respondents were asked about expected landholding changes in later survey periods, 2003–2007 and 2006–2010, where responses split almost evenly between those expecting increases (38 percent), decreases (28 percent), and no change. Among the more than 400 respondents who expected decreases in 2002, only 25 percent expected to lose land for voluntary reasons, and 70 percent expected changes from land redistributions by kebeles. In 2005, this was about 80 percent, and most (76 percent) thought the gains would come from government mechanisms. (However, in the past five years, only 20 percent of predicted land reallocations have been imposed by the government.)

Use rights over land in the study area can therefore be characterized as highly uncertain. Moreover, because land is public, in times of distress it cannot function as a true asset, with no use as rental, sales, and mortgage, for example.

In contrast to land, property rights regarding animals are individual and therefore represent important stores of wealth. Table 9 presents average and median animal holdings for

the major species during the three survey rounds.¹⁰ While animal holdings were stable between 2000 and 2002, average holdings declined across virtually all categories from 2002 to 2005. Except for 2005, where 50 percent of households had no bulls, in 2002 most households (70 percent) had at least one bull. In all three periods among households owning bulls, the median was two bulls—the number needed for plowing.

Table 10 presents average values for animal holdings in total and by species. In 2000 the average animal value was US\$ 178, with a median of \$118. In 2002 total value at the mean was \$194, with a median of \$158; in 2005 average value was \$168, with a median of zero. At real values, however, the average in 2005 was only \$111, which is 62 percent of the average in 2000. In real terms, therefore, the value of animals declined very sharply after 2002. Across the three survey rounds, bulls typically made up about 50 percent of total animal value.

Table 9 Animal Holdings by Type and Year

Animal	2000		2002		2005	
	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>
Bulls	2.2	1.0	2.3	1.0	0.7	0.0
Young bulls	0.3	0.0	0.3	0.0	0.2	0.0
Cows	1.2	0.0	1.0	1.0	0.4	0.0
Heifers	0.6	0.0	0.6	0.0	0.2	0.0
Calves	0.5	0.0	0.7	0.0	0.3	0.0
Sheep	1.0	0.0	1.2	0.0	0.8	0.0
Goats	0.2	0.0	0.3	0.0	0.3	0.0
Horses	0.1	0.0	0.1	0.0	0.04	0.0
Mules	0.02	0.0	0.02	0.0	0.01	0.0
Donkeys	0.4	0.0	0.4	0.0	0.2	0.0
Chickens	1.6	0.0	2.2	1.0	0.8	0.0
Camels	0.009	0.0	0.001	0.0	0.002	0.0

¹⁰ As with other analyses here where comparability across time was important, the two additional villages included in 2005 were omitted.

Table 10 Nominal Animal Value by Animal Type and Year

Animal	2000		2002		2005	
	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>
Bulls	\$86.11	\$60.61	\$87.76	\$70.51	\$80.14	\$0.00
Young bulls	\$11.41	\$0.00	\$13.36	\$0.00	\$11.75	\$0.00
Cows	\$40.07	\$0.00	\$43.17	\$23.50	\$32.43	\$0.00
Heifers	\$13.21	\$0.00	\$13.85	\$0.00	\$11.16	\$0.00
Calves	\$7.15	\$0.00	\$9.30	\$0.00	\$6.11	\$0.00
Sheep	\$8.35	\$0.00	\$12.48	\$0.00	\$14.57	\$0.00
Goats	\$1.93	\$0.00	\$2.72	\$0.00	\$3.17	\$0.00
Horses	\$1.73	\$0.00	\$3.42	\$0.00	\$2.35	\$0.00
Mules	\$0.97	\$0.00	\$1.22	\$0.00	\$0.71	\$0.00
Donkeys	\$5.11	\$0.00	\$5.10	\$0.00	\$4.23	\$0.00
Chickens	\$1.68	\$0.00	\$1.48	\$0.24	\$0.86	\$0.00
Camels	\$0.85	\$0.00	\$0.17	\$0.00	\$0.36	\$0.00
Total animal value	\$178.39	\$117.70	\$194.05	\$153.29	\$167.50	\$0.00

Analyzing the cause of this precipitous decline is beyond the scope of this paper. Table 11, however, shows that the sell-off occurred in an environment of modestly rising, average real equilibrium prices. Because the quantity supplied rose, it must be that demand rose faster. Farmers may have been responding to market conditions.

Table 11 Average Real Prices of Animals: 2000, 2002, and 2005

Year	Bulls	Young bulls	Cows	Heifers	Calves	Sheep	Goats
2000	\$75.64	\$43.03	\$54.79	\$36.97	\$14.42	\$9.94	\$8.36
2002	\$71.81	\$44.53	\$54.91	\$36.95	\$15.97	\$11.54	\$8.39
2005	\$84.61	\$48.92	\$59.26	\$39.12	\$16.25	\$13.14	\$8.87

Many respondents reported livestock sales in each year of the survey. Table 12 presents the primary reasons respondents said they sold animals, other than mature bulls, for which there were significant sales in 2002. There was a split between production and consumption motivations, but consumption predominated, making up 55–62 percent of responses. Purchase of food was by far the most important motivation, ranging from 26.4 percent of responses for

selling young bulls to 35.7 percent for cows. Other important reasons for selling animals were to buy other animals (5–2 percent), loan repayment (6–12 percent), and purchase of tools (7–26 percent). Selling chickens was most common for buying tools.

Table 12 Reasons for Selling Other Important Animals (other than Mature Bulls) during the Year Prior to the 2002 Survey

	Sheep		Young Bulls		Cows		Chickens	
	<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>
<i>Production</i>								
Buy tools	43	19.9%	7	10.3%	8	7.0%	29	26.9%
Construction	5	2.3%	7	10.3%	10	8.7%	1	0.9%
Buy agricultural inputs	11	5.1%	1	1.5%	6	5.2%	2	1.9%
Buy animals	15	6.9%	8	11.8%	14	12.2%	5	4.6%
Other investment	0	0.0%	0	0.0%	2	1.7%	0	0.0%
Land rent	8	3.7%	2	2.9%	0	0.0%	2	1.9%
Education	9	4.2%	3	4.4%	1	0.9%	3	2.8%
Labor cost	1	0.5%	2	2.9%	2	1.7%	0	0.0%
<i>Subtotal</i>	<i>92</i>	<i>42.6%</i>	<i>30</i>	<i>44.1%</i>	<i>43</i>	<i>37.4%</i>	<i>42</i>	<i>38.9%</i>
<i>Consumption</i>								
Medical	3	1.4%	5	7.4%	6	5.2%	3	2.8%
Help relatives	4	1.9%	0	0.0%	1	0.9%	3	2.8%
Buy food	57	26.4%	20	29.4%	41	35.7%	31	28.7%
Loan repayment	18	8.3%	4	5.9%	14	12.2%	2	1.9%
Tax payment	18	8.3%	6	8.8%	1	0.9%	7	6.5%
Ceremonial expense	0	0.0%	2	2.9%	2	1.7%	0	0.0%
Clothes	10	4.6%	0	0.0%	0	0.0%	0	0.0%
Other goods	10	4.6%	1	1.5%	3	2.6%	17	15.7%
Misc. other	4	1.9%	0	0.0%	4	3.5%	3	2.8%
<i>Subtotal</i>	<i>124</i>	<i>57.4%</i>	<i>38</i>	<i>55.9%</i>	<i>72</i>	<i>62.6%</i>	<i>66</i>	<i>61.1%</i>
<i>Total</i>	<i>216</i>	<i>100%</i>	<i>68</i>	<i>100%</i>	<i>115</i>	<i>100%</i>	<i>108</i>	<i>100%</i>

Mature bulls are particularly important animal capital in Ethiopia because they are used for plowing. Given that virtually all of its agriculture is rain dependent, the timing of plowing can be critical (McCann 1987). Bulls are sometimes rented out, earning valuable income for households. In table 13, sales of mature bulls in 2002 were mainly motivated by production considerations (54.4 percent), with purchase of other animals being the most important (31.9 percent) followed by acquisition of tools (9.1 percent).

Food purchases made up a significant but minor share (17.1 percent), as did loan payments (11.1 percent) and payment of medical expenses (8.4 percent). Roughly the same rankings existed for selling mature bulls in 2005, although the tilt toward production was more pronounced: two-thirds of households reported that they were motivated to sell bulls by reinvestment or other production considerations. Forty-two percent, for example, sold in order to purchase other animals, and 13.8 percent bought tools.

The 2005 section of table 13 is a caution against concluding that bulls were always sold just for reinvestment because in 2000 more than 60 percent of bulls were sold for consumption, particularly to buy food (47.2 percent). The 2000 figure may reflect the effects of the drought in 2000–2001 or may be related to conscription of men for the war with Eritrea (1998–2003).

The second most important reason for households to sell bulls (23.5 percent) was to buy other animals. (Other motivations were less important.) Looking deeper, one-third more bulls were sold in 2000 than in 2002 or 2005, although the same number of bulls was sold to buy other animals as in 2002. What made 2000 different seemed to be more sales to cover food deficits.

Other than human capital, animals, and land (which only comes with user rights), the other major asset is trees grown as a crop on farms. Households have more complete property rights over trees than the land itself, but expropriation can and does occur. The most important tree is the eucalyptus (grown by 1100 households participating in the survey), which was brought to Ethiopia in the late 1800s by Emperor Menelik II. The tree spread rapidly and now is the most important source for firewood and construction.

Table 13 Reasons for Selling Mature Bulls during the Previous Year

	2000		2002		2005	
	<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>
<i>Production</i>						
Buy tools	22	5.4%	27	9.1%	45	13.8%
Construction	13	3.2%	22	7.4%	22	6.7%
Buy agricultural inputs	19	4.7%	7	2.3%	4	1.2%
Buy animals	95	23.5%	95	31.9%	137	41.9%
Other investment	1	0.2%	3	1.0%	2	0.6%
Land rent	6	1.5%	3	1.0%	2	0.6%
Education	0	0.0%	1	0.3%	6	1.8%
Labor cost	0	0.0%	4	1.3%	3	0.9%
<i>Subtotal</i>	<i>156</i>	<i>38.5%</i>	<i>162</i>	<i>54.4%</i>	<i>221</i>	<i>67.6%</i>
<i>Consumption</i>						
Medical	20	4.9%	25	8.4%	13	4.0%
Help relatives	6	1.5%	3	1.0%	4	1.2%
Buy food	191	47.2%	51	17.1%	44	13.5%
Loan repayment	20	4.9%	33	11.1%	17	5.2%
Tax payment	6	1.5%	4	1.3%	6	1.8%
Ceremonial expense	2	0.5%	4	1.3%	2	0.6%
Clothes	0	0.0%	1	0.3%	0	0.0%
Other goods	1	0.2%	6	2.0%	7	2.1%
Misc. other	3	0.7%	9	3.0%	13	4.0%
<i>Subtotal</i>	<i>249</i>	<i>61.5%</i>	<i>136</i>	<i>45.6%</i>	<i>106</i>	<i>32.4%</i>
<i>Total</i>	<i>405</i>	<i>100.0%</i>	<i>298</i>	<i>100.0%</i>	<i>327</i>	<i>100.0%</i>

Table 14 presents average and median stocks of trees planted by households, divided into eucalyptus and all other trees. In each of the survey years, households had an average of more than 100 eucalyptus trees on their farms, with medians of 15 to 35, although some plantations had thousands of trees. The average age of the eucalyptus trees was 10 years, but over half were younger than 8 years. There were much fewer numbers of other trees, and over 50 percent of households had no trees. At the mean and median (as with animals), there was a substantial decline in the stock of trees—particularly eucalyptus—between 2002 and 2005, appearing to be related to increasing prices. Each mature eucalyptus tree was valued at roughly US\$ 1.84 in 2002, and by 2005 the average was \$3.76. Adjusted for inflation, the price rose by 40 percent,

suggesting that responsiveness to market conditions might have driven declines in stocks. (One may expect to see a decline in average age and increase in future stocks.) On average, households earned about \$30 per year from sales of eucalyptus wood and leaves, which was about 10 percent of household income.

Table 14 Number of Trees Planted by Households

Year	Eucalyptus			Other trees		
	Mean	Median	<i>n</i>	Mean	Median	<i>n</i>
2000	145	35	1514	55	0	1518
2002	144	30	1522	60	0	1521
2005*	120	15	1484	47	0	1486

* In the interest of comparability, the two kebeles added in 2005 were omitted. Four households in 2000 and three in 2005 which claimed to have more than 10,000 eucalyptus trees are treated as outliers.

Table 15 Value of Trees Planted by Households

Year	Eucalyptus				Other trees			
	Full sample		Growers only		Full sample		Growers only	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
2000	\$215.88	\$18.18	\$315.15	\$58.18	\$44.38	\$0.00	\$121.09	\$17.33
2002	\$219.02	\$19.39	\$299.06	\$81.67	\$37.42	\$0.00	\$136.90	\$21.15
2005	\$329.61	\$9.41	\$610.69	\$136.31	\$93.74	\$0.00	\$326.20	\$37.60

How important were trees to household asset portfolios? On average, they were extremely important and in 2000 and 2005 were more important than animals. Table 15 presents medium stock values of eucalyptus and non-eucalyptus trees for the full sample and growers only.¹¹ For the full sample in all years, the mean tree value was US\$ 200–\$300, with most value coming from eucalyptus plantations. These were easily comparable to the average animal value

¹¹ Both low and high estimates were also made. Low estimates were typically 30–40% lower than medium estimates, but high estimates were only marginally higher. Details are available from the first author.

of \$200 in 2002 and greatly exceeded the 2005 value. Particularly in an environment of rising real prices, trees appear to be a critical element of the household wealth portfolio.

The distribution of tree holdings is much more skewed than for animals, however, with the bottom 25 percent of the distribution having no trees and the top 25 percent having tree values in excess of US\$ 175 in 2002. As prices rose, the disparity in average eucalyptus value between the growers-only and the full sample increased. Although in 2000 growers had an average eucalyptus value one-third higher than the overall sample, in 2005 they had twice the average of the sample as a whole. Because land is distributed by the kebele in a relatively uniform fashion, it appeared that households either appropriated public lands or devoted substantial portions of their “own” land to tree planting. Given the mortality risk associated with animals and crops, the long history of eucalyptus in Ethiopia, lack of true land ownership, and the thinness of most markets in Amhara, investing in a fast-growing tree, such as eucalyptus, appears to make sense. Strengthening land tenure would probably promote cultivation of other species.

Although other forms of assets (e.g., human capital, good will, and cash-on-hand) were not examined, it is clear that household assets to smooth consumption were extremely limited. There is little reason to believe future income streams will differ substantially from the past. Our best estimate was that the average household, in 2005, possessed about US\$ 645 in disposable assets, with perhaps \$425 from farmed trees, \$170 in animals, and perhaps \$50 in household effects. Possibly, there was also some cash-on-hand and mortgagable land within thin, localized lending markets.

3.5 Access to Clean Water and Sanitation

This section examines MDG 10, which focuses on access to potable water and sanitation. Table 16 presents water sources by year and by season, showing that almost all households collected water primarily from one source—rivers and streams (60–65 percent)—followed by water supply systems. (Sources with no centralized treatment have the potential to spread disease.) Use of other sources, including wells, was insignificant.

Table 16 Percentage of Water Collected from Various Sources in Summer and Winter

Source	2000		2002		2005	
	<i>Summer</i>	<i>Winter</i>	<i>Summer</i>	<i>Winter</i>	<i>Summer</i>	<i>Winter</i>
Rivers and streams	65.02%	66.00%	62.85%	58.96%	57.94%	59.24%
Community water supply	26.45%	25.84%	31.07%	36.89%	37.91%	36.72%
Hand-powered well	3.29%	3.20%	2.53%	0.19%	0.67%	0.86%
Improved well	1.33%	1.04%	3.00%	3.19%		
Lake	1.96%	1.92%	0.08%	0.00%	1.41%	1.46%
Other	1.96%	2.00%	0.47%	0.47%	2.08%	1.72%
n*	1278	1250	1265	1060	1203	1163

* 16–29% of household heads did not fully respond to this set of questions.

Depending on the year, 26–37 percent of households got water from water supply systems which, while not necessarily disease-free, probably came from more protected sources than rivers and streams. According to MDG figures for 2000–2005, the percentage of people getting water from rivers and streams declined because more water was available from community water systems. (The percentage of households getting water from community water supply systems rather than direct surface water sources increased by 46 percent during this period, which represented an increase in coverage of 17.4 percent.)

The households in table 16 mirrored this decreased use of rivers and stream for water and the increase in use of community water supply. It implies that the Ethiopian government is on track to meet MDG 10, which seeks to reduce by half the number of people without safe drinking water and basic sanitation. The SDPRP target was to increase the provision of clean water to 31.4 percent of the rural population by 2005: if community water systems in Amhara met this safety criterion, then the government met its goal.

Water collection is a significant use of labor and time. On average, households—typically women—made 45–50 trips per month to collect water (i.e., 1–2 trips, or about an hour per day). Per table 17, the average time to get water from water supply systems was about the same as from rivers or streams. (Although the travel time to get piped water was 40 percent less than for rivers and streams, the filling took longer, which ate up time gains.) Given the modest trend toward increased use of piped water, households seemed to be shifting to water from community systems because of higher quality.

Table 17 Mean Water Collection Round-Trip Travel and Filling Time per Trip by Source and Year (in minutes)

Source	2000		2002	
	Summer	Winter	Summer	Winter
River	41.6	35.4	39.2	41.7
Stream	37.5	35.9	38.8	38.9
Community systems	33.3	33.5	39.1	40.2

Note: Due to data incomparability, we did not include 2005 data, but we do not expect unit costs to vary temporally.

MDG 10 also includes sanitation improvement and the Ethiopian government has set a goal of 80 percent usage of latrines by 2010.¹² As shown in table 18, most people used no sanitation facilities. Children were less likely than adults to use toilets, although more than 70 percent admitted to using informal facilities (and 60 percent of adults). This indicated an important area for improvement if the PASDEP target is to be reached.

Table 18 Type of Sanitation Facilities Used by Household Members, 2005

Type of facility	Household head	Adults in household	Children in household
Private flush toilet	0.29%	0.29%	0.24%
Common flush toilet	0.34%	0.34%	0.06%
Private pit latrine	34.25%	34.0%	21.30%
Common pit latrine	6.62%	6.70%	4.43%
Other	0.14%	1.20%	2.45%
No sanitation facility	57.65%	57.44%	71.50%
n	1752	1748	1671

Note: The percentages for household head and adults are striking but interesting. It indicates that in areas where there are relatively better sanitation facilities, they are mainly used by heads of the household. Other members are using open fields.

¹² Only in 2005 were survey respondents asked about their sanitation facilities, so we were not able to report on progress toward the MDG as with water provision.

3.6 Health and Vaccinations

In 2002 and 2005, respondents were asked about their health and vaccination status (MDGs 4 and 6). The SDPRP set a target for “access to health service” of 65 percent by 2005 (MOFED 2005a). At the time of the 2002 and 2005 surveys, 27 percent of household heads reported an ongoing serious illness or disability, 19 percent of them were currently ill, and 27 percent had been ill during the 2 months prior; of *all* household members, 27–32 percent of households had at least one person with a serious illness. Among those who experienced illness, more than 40 percent said the most recent bout lasted longer than 10 days, and 25 percent (in 2002) and 14 percent (in 2005) said the illness lasted more than 19 days. One reason illnesses lasted so long was they went untreated. In 2002, only one-third of household heads treated their most recent illness: 63 percent reported the reason for non-treatment was cost (34 percent) or facilities were not reasonably available (29 percent). There clearly were important problems concerning access to health services.

Table 19 Vaccination Rates in 2002 and 2005

	2002				2005			
	<i>All household members</i>		<i>Children under 5 years</i>		<i>All household members</i>		<i>Children under 5 years</i>	
	<i>Frequency</i>	<i>n</i>	<i>Frequency</i>	<i>n</i>	<i>Frequency</i>	<i>n</i>	<i>Frequency</i>	<i>n</i>
Measles	24.94%	4720	44.76%	735	31.67%	7847	49.35%	693
Polio	27.60%	4797	52.05%	782	35.42%	7962	56.41%	725
Tetanus	22.48%	4701	32.84%	682	30.05%	7844	43.52%	694
Tuberculosis (BCG*)	13.58%	5863	32.31%	687	25.00%	7773	40.03%	687

* BCG—bacilli Calmette-Guérin (strain of *Mycobacterium bovis* used in vaccine)

Infectious diseases—such as polio, measles, and tuberculosis—that have been virtually eliminated in other parts of the world are still prevalent in many parts of Ethiopia. Vaccination is critical to reducing the spread of these diseases; and under MDG 4 (reducing child mortality), the number of one-year-old children immunized against measles is an indicator of success. The government of Ethiopia set a goal to have 55 percent of children under 5 years of age immunized against DPT by 2004, and 90 percent by 2010 (MOFED 2005b). No other immunization targets exist, although the 2005 SDPRP progress report mentioned progress on immunizing children under 5 years for measles and tuberculosis.

As of 2005, most household members had not received vaccinations for measles, polio, tetanus, or tuberculosis. In other words, in the sample of more than 7000 individuals, only 35 percent had been vaccinated. Tuberculosis had the lowest vaccination rate (25 percent), but the tetanus rate was only 30 percent. Among the 3000-plus children under 16 years of age, the immunization rate was substantially higher than for the overall sample, with 64 percent vaccinated for polio and 53 percent for measles. In addition, 47 percent had had a tetanus shot and 43 percent received tuberculosis vaccinations.

The details behind table 19 showed that young children were vaccinated at an increasing rate, although improvements were less for all children. Over half of young children had gotten a polio vaccination and about half were immunized against measles. Rates for tetanus and tuberculosis were lower, but improvement from 2002 was significant, with a full one-third more children vaccinated in just three years. The SDPRP progress report noted that nationwide immunization rates in 2003–2004 for measles were 57 percent; for tuberculosis, 55 percent; and 60.8 percent for DPT3. In table 19 (year 2002), only 45 percent of children in Amhara had their measles vaccination, and only for polio had more than half of the children under five years been vaccinated (52 percent). Thirty-two percent of young children had received the BCG vaccination against tuberculosis and only 40 percent of respondents overall reported immunization against tetanus. The 2005 immunization rates in Amhara also were not up to the levels reported nationally.¹³

With vaccine rationing a possible barrier, we examined the reasons young children were not vaccinated. For children under five years old, 40 percent (2002) and 34 percent (2005) of household respondents said that facilities were too far away. Fifteen percent in both years, however, reported that only young children and pregnant women were eligible for vaccinations, and 20 percent were unaware that vaccinations were needed. Seventeen percent (2002) and 10 percent (2005) said their children were too young to be vaccinated (which was incorrect because immunizations are administered to young children). That many respondents did not know vaccinations were needed, thought children were too young, or believed they were ineligible for vaccination suggested that, in addition to increasing access, there is a huge need to educate people and provide more information in order to increase vaccination rates.

¹³ Vaccination rates for children under 2 years of age (corresponding to the MDG 4 indicator) were a bit lower, including for measles, where there was a 44 percent vaccination rate.

3.7 Social Capital and Group Coping Mechanisms

The previous discussion painted a picture of an environment of low-level, mainly agricultural, income where assets—including human health—are limited and at risk in an economy with no insurance markets. As discussed in section 2, extensive literature suggests that rural communities use social capital as insurance for adverse shocks when markets are incomplete. This section looks at the social safety net in the study area (Amhara).

Table 20 Assistance Given to and Received from Neighbors, 2002

Type of assistance	Assistance to neighbors		Assistance from neighbors	
	<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>
None	396	26.5%	507	34.2%
Providing information	104	7.0%	64	4.3%
Labor				
Domestic work	365	24.5%	247	16.7%
Agricultural work	573	38.4%	643	43.4%
Labor sharing	12	0.8%	6	0.4%
House construction	26	1.7%	4	0.3%
Assist in ceremonial preparations	3	0.2%	0	0.0%
<i>Subtotal</i>	<i>979</i>	<i>65.6%</i>	<i>900</i>	<i>60.8%</i>
Medical				
Nursing	1	0.1%	2	0.1%
Traditional / treatment	3	0.2%	0	0.0%
Co-operate in any sickness or death	1	0.1%	2	0.1%
<i>Subtotal</i>	<i>5</i>	<i>0.3%</i>	<i>4</i>	<i>0.3%</i>
Material/Financial				
Financial aid	6	0.4%	3	0.2%
Food aid	1	0.1%	2	0.1%
Credit (cash or in-kind)	1	0.1%	1	0.1%
<i>Subtotal</i>	<i>8</i>	<i>0.5%</i>	<i>6</i>	<i>0.4%</i>
Total	1492	100.0%	1481	100.0%

Most respondents had assisted and had been assisted by neighbors during the six months prior to the 2002 survey. Table 20 presents the most important assistance received from, and provided to, neighbors.¹⁴ Although we did not know if households gave and received the same assistance, in aggregate there was an amazing symmetry between assistance received and given, with 60–65 percent of households sharing labor as the most important area of cooperation. Agricultural labor was most important (40 percent participation), followed by domestic work. Other forms of cooperation, however, were rarely used, with less than one-half of 1 percent giving or receiving material or medical help. Between one-quarter and one-third of respondents neither gave nor received assistance during the six months before the survey.

Table 21 Sources of Assistance for Serious Financial or Health Problems, 2002

	Health problem requiring help		Need to borrow ETB 50	
	<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>
No one	68	4.62%	229	15.45%
Relatives	512	34.81%	500	33.74%
Friends	171	11.62%	178	12.01%
Neighbors	662	45.00%	315	21.26%
Money lenders			145	9.78%
Microfinance institutions			81	5.47%
Other	58	3.94%	34	2.29%
Total	1,471	100.0%	1,482	100.0%

To assess where households tended to seek help in the event of major income or health shocks, respondents were asked who they would turn to if they required physical assistance if ill or needed to borrow ETB 50 (\$5.87). Table 21 presents the results. In 2002, for either problem, over one-third would rely most heavily on close relatives. Neighbors were also critical sources of support and, indeed, were most important in the event of illness (45 percent). More than 20 percent would also borrow money from neighbors. In 2002, a small number said they would borrow from money lenders (9.8 percent) or microcredit institutions (5.5 percent). The 15

¹⁴ Questions on social capital were not included in the 2000 survey, and in 2005 the survey did not include assistance. Virtually all households reported only one mode of assistance.

percent of respondents relying on commercial institutions is roughly the same as the percent who would ask no one for help. This suggests that small loans are available, but not popular.

Tables 20 and 21 are very consistent. In the event that a health problem required assistance (i.e., labor), households counted on their families and neighbors and few handled it alone. Financial problems were treated very differently, however, with a substantial minority asking no one for help and a slightly larger minority asking neighbors for monetary assistance. The social safety net around health problems, therefore, seemed fairly strong, but in the event of financial problems about 30 percent had no support or had to seek market solutions.

4. Conclusion

This paper attempted to look deeply at some key development issues facing households in a representative rural region—Amhara—of Ethiopia. This was done in the context of the MDGs, which provide an umbrella for efforts to increase incomes and improve the quality of life of poor people. The data in the study was gathered in 2000–2005, which is the first third of the MDG period. We found that Ethiopia made progress toward meeting some vital MDG goals. There were major improvements in vaccinating children against deadly infectious diseases (specifically polio, measles, tuberculosis, and tetanus). Progress was also made in furthering education for both boys and girls. Although educational attainment and literacy are still very low by international standards and detailed information on quality of education was not available, more than 80 percent of 13-year-olds could read and write in 2005, in sharp contrast to 2000 when only 60 percent had that capability. A child born today is clearly much more likely to be literate and vaccinated during his or her lifetime than 10 years ago. While improvements in sanitation have a long way to go, there was notable improvement in the number of people using and having access to a safe water supply. Formal provision of water increased substantially during 2000–2005, and households are choosing the safer, community source, not because it saves time, but because it is more beneficial. These major achievements should pay substantial dividends in Ethiopia's future.

Household incomes in Amhara and in Ethiopia, however, were shockingly low and subject to huge variance, largely dependent on weather. Average annual per capita income was only US\$ 50–\$60, just a fraction off the cutoff for extreme poverty as defined by the international community. It was so low as to be outside the realm of normal discussions and popular comprehension. Not only were incomes low, but households were also buffeted by shocks that caused incomes to rise and fall by one-third in a year, and there was little social support when financial disaster hit.

Incomes showed no improvement in the first five years of the MDGs, which points to the difficulty of even approaching real success with MDG 1—halving extreme poverty by 2015. A bright spot, perhaps, was that households appeared to be responsive to real price increases and seem to have benefited from developing markets and increases in eucalyptus and animal prices. This is something on which to build. Assets can help smooth consumption when incomes vary, but the households in Amhara had only animals and farmed trees to use as stores of wealth. These stocks were extremely low, and land (normally the main asset of most rural households), which is owned by the government in Ethiopia, could not be used as an asset. A particular surprise of this research was the importance of eucalyptus trees to household asset portfolios. In 2005, more than 50 percent of assets were eucalyptus trees.

Solidifying property rights for land would be a major step toward helping each household smooth its consumption and allowing it to respond optimally to market conditions. At present, most households' asset stocks are so low that when incomes fall they have few to no options. Furthermore, when incomes rise, investment possibilities are quite restricted. Liberalizing property rights for land would allow markets to develop that could dramatically expand households' options, especially in the face of income drops.

As if state ownership of land did not sufficiently hamstring households, tenuous usufruct rights are creating more uncertainty over whether households have rights to use land from one period to the next—may distort behavior in important ways. For example, it has likely spurred the development of eucalyptus markets simply because eucalyptus grows quickly and can be harvested before rights change. This development may have occurred to the detriment of other tree species that could be more beneficial to the fertility of the land but yield returns over a relatively longer period..

Increasing security over use rights—and ideally creating true ownership with all that it implies—can help eliminate such distortions. Finally, giving communities more control over common lands—i.e., creating common property—would reduce land degradation caused by open access. It would also create incentives for communities to invest in common land, perhaps creating other avenues for wealth generation. Based on this analysis, we can say with confidence that public policies in rural Ethiopia actively need to support wealth creation.

References

- Ahmed, I. 1999. "Getting Rid of Child Labor," *Economic and Political Weekly* (Bombay) 34, July 3.
- Akhtar, H, S.M. Keramat Ali, G. Kvåle. 1999. "Determinants of Mortality among Children in the Urban Slums of Dhaka, Bangladesh," *Tropical Medicine & International Health* 4(11): 758–64.
- Bhalotra S. 2001. "Is Child Work Necessary?" Social Protection Discussion Paper Series, no. 0121. Washington, DC: World Bank, Human Development Network.
- Bhalotra, S., and C. Heady. 2001. "Child Farm Labor: The Wealth Paradox," Social Protection Discussion Papers Series, no. 125. Washington, DC: World Bank, Human Development Network.
- . 2003. "Child Labor: The Wealth Paradox," *World Bank Economic Review* 17(2): 197–227.
- Casterline, John B., Elizabeth C. Cooksey, Abdel Fattah E. Ismail. 1989. "Household Income and Child Survival in Egypt," *Demography* 26(1): 15 –35.
- Chen, S., and M. Ravallion. 2004. "How Have the World's Poorest Fared since the 1980s?" World Bank Policy Research Working Paper, no. 3341. Washington, D.C: World Bank.
- Chetty, R., and A. Looney. 2006. "Consumption Smoothing and the Welfare Consequences of Social Insurance in Developing Economies," *Journal of Public Economics* 90: 2351–56.
- Christiaensen, L.J., V. Hoffmann, A. Sarris. 2006. "Coffee Price Risk in Perspective: Household Vulnerability among Rural Coffee Growing Smallholders in Rural Tanzania." Paper presented at the Center for the Study of African Economies Conference, "Reducing Poverty and Inequality: How Can Africa Be Included? St. Catherine's College, Oxford, U.K., March 19–21, 2006. <http://www.csae.ox.ac.uk/conferences/2006-EOI-RPI/papers/csae/Christiaensen.pdf>. Accessed December 4, 2007.
- Christiaensen, L.J., and N. R. Boisvert. 2000. "On Measuring Household Food Vulnerability: Case Evidence From Northern Mali." Paper presented at the Center for the Study of African Economies Conference, "Opportunities in Africa," St. Catherine's College, Oxford, U.K., April 9-10, 2000. <http://www.csae.ox.ac.uk/conferences/2000-OiA/pdfpapers/christiaensen.PDF>. Accessed December 4, 2007.

- Cochrane, S.H. 1990. "Education, Income, and Desired Fertility in Egypt: A Revised Perspective," *Economic Development and Cultural Change* 38: 313–39.
- Dasgupta, S., U. Deichmann, C. Meisner, and D. Wheeler. 2002. "The Poverty/Environment Nexus: Findings for Lao PDR," *Environment Strategy Notes*, no. 5. Washington, DC: World Bank.
- Dayioglu, M., and R. Assad. 2006. "Determinants of Child Labor in Urban Turkey," *Journal of Development Studies* 42: 939–56
- De Graff, D., R. Billsborrow, and A. Merrin. 1993. "The Implications of High Fertility for Children's Time Use in the Philippines. In *Fertility, Family Size, and Structure*, edited by C. Lloyd. New York: Population Council, 297–329.
- Deaton, A. 1997. *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy*. Baltimore, MD, USA: Johns Hopkins University Press for the World Bank.
- Dehejia R., T. DeLeire, and F.P.E. Luttmer. 2006. "Insuring Consumption and Happiness through Religious Organizations," *Journal of Public Economics* 91: 259–79.
<http://www.nber.org/~luttmer/religiousinsurance.pdf>.
- Dercon, S., and P. Krishnan. 2000. "In Sickness and in Health: Risk Sharing within Households in Rural Ethiopia," *Journal of Political Economy* 108: 688–727.
- Eyob, F., and M. Harris. 2004. "Determinants of Poverty in Eritrea: A Household Level Analysis," *Econometric Society Paper*, no. 364, *Econometric Society Australasian Meetings*. <http://econpapers.repec.org/paper/ecmausm04/364.htm>. Accessed December 4, 2007.
- Fafchamps, M., and F. Gubert. 2006. "The Formation of Risk Sharing Networks," *Journal of Development Economics* 83(2): 326–50.
- Fafchamps, M., and S. Lund. 2003. "Risk-Sharing Networks in Rural Philippines," *Journal of Development Economics* 71: 261–87.
- Grootaert, C., and D. Narayan. 2004. "Local Institutions, Poverty, and Household Welfare in Bolivia," *World Development* 32: 1179–98.
- Grootaert, C., and R. Kanbur. 1994. *Child Labor: A Review*. Washington, DC: The World Bank.
- International Labor Organization (ILO). 1992. *World Labor Report 1992*. Geneva: ILO.

- International Monetary Fund (IMF). 2006. "World Economic Outlook," <http://www.imf.org/external/pubs/ft/weo/2006/02/data/index.aspx>. Accessed May 24, 2008.
- Jacoby, H. 1993. "Shadow Wages and Peasant Family Labor Supply: An Econometric Application to the Peruvian Sierra," *Review of Economic Studies*, 60: 901–23.
- Jain, A.K. 2004. "Determinants of Regional Variations in Infant Mortality in Rural India," *Journal of Population Studies* (39)3: 407–424.
- Lloyd, C. B., and A. Gage-Brandon. 1994. "High Fertility and Children's Schooling in Ghana: Sex Differences in Parental Contributions and Educational Outcomes," *Population Studies* 48: 293–306.
- McCann, J. C. 1987. "The Impact of Drought in Ethiopia: Oxen, Households, and Some Implications for Rehabilitation." In *Drought and Hunger in Africa*, edited by M. Glantz. Cambridge: Cambridge University Press, 245–67.
- Ministry of Finance and Economic Development of Ethiopia (MOFED). 2005a. "Ethiopia: Sustainable Development and Poverty Reduction Program (SDRP): Annual Progress Report (2003/2004)." Addis Ababa, Ethiopia: MOFED, Development Planning and Research Department.
- . 2005b. *Ethiopia: Building on Progress—A Plan for Accelerated and Sustained Development to End Poverty (PASDEP)*. Addis Ababa, Ethiopia: MOFED.
- . 2004. *Millennium Development Goals Report: Challenges and Prospects for Ethiopia*. Addis Ababa, Ethiopia: MOFED.
- . 2002a. *Development and Poverty Profile of Ethiopia*. Addis Ababa, Ethiopia: MOFED, Welfare Monitoring Unit.
- . 2002b. *Ethiopia: Sustainable Development and Poverty Reduction Program*. Addis Ababa, Ethiopia: MOFED.
- Minot, N., B. Baulch, and M. Epprecht. 2006. "Poverty and Inequality in Vietnam: Spatial Patterns and Geographic Determinants." Research Report 148. Washington, DC: International Food Policy Research Institute.
- Pitt, M., M.R. Rosenzweig, M.N. Hassan. 1990. "Productivity, Health, and Inequality in Intra-household Distribution of Food in Low Income Countries," *The American Economic Review* 80(5): 1139–56.

- Ray, R. 2000. "The Determinants of Child Labor and Child Schooling in Ghana." Photocopy, School of Economics, University of Tasmania, Australia.
- Sedlacek, G. (2005) "Child Labor, Schooling and Poverty in Latin America." Social Protection Discussion Paper Series, no. 0511. Washington, DC: World Bank, Human Development Network.
- Singh, I., L. Squire, and J. Strauss. 1986. *Agricultural Household Models: Extensions, Applications, and Policy*. London: Johns Hopkins University Press.
- Stallknecht, Gilbert F. 1997. "New Crop FactSHEET: Teff." Online source. NewCROP (New Crops Resource Online Program), Center for New Crops and Plant Products, Purdue University, West Lafayette, IN.
<http://www.hort.purdue.edu/newcrop/cropfactsheets/teff.html>
- United Nations. 2003. *Indicators for Monitoring the Millennium Development Goals*. New York: United Nations. http://devdata.worldbank.org/gmis/mdg/UNDG%20document_final.pdf. Accessed December 4, 2007.
- United Nations Development Programme (UNDP). 2006. "Human Development Report 2006—Beyond Scarcity: Power, Poverty and the Global Water Crisis." New York: UNDP. <http://hdr.undp.org/en/reports/global/hdr2006>. Accessed December 4, 2007.
- World Bank. 2005. *World Development Indicators 2005*. Washington, DC: World Bank. <http://devdata.worldbank.org/wdi2005/Cover.htm>. Accessed December 4, 2007
- Zaffris, T. 1998. "Child Labor and School Enrollment in Thailand in the 1990s." Social Protection Discussion Paper, no. 9818. Washington, DC: World Bank, Human Development Network.
- Zimmer, Z., J. Natividad, H.S. Lin, and N. Chayovan. 2000. "A Cross National Examination of the Determinants of Self-Assessed Health," *Journal of Health and Social Behavior* 41 (4): 465–81.