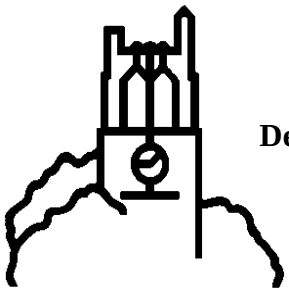
MSU International Development Paper

Targeting of Food Aid in Rural Ethiopia: Chronic Need or Inertia?

by

T.S. Jayne, John Strauss, Takashi Yamano, and Daniel Molla

MSU International Development Paper No. 23 2000



Department of Agricultural Economics
Department of Economics
MICHIGAN STATE UNIVERSITY
East Lansing, Michigan 48824

MSU Agricultural Economics Web Site: http://www.aec.msu.edu/agecon/
MSU Food Security II Web Site: http://www.aec.msu.edu/agecon/fs2/index.htm

MSU INTERNATIONAL DEVELOPMENT PAPERS

Carl Liedholm and Michael T. Weber

Editors

The MSU International Development Paper series is designed to further the comparative analysis of international development activities in Africa, Latin America, Asia, and the Near East. The papers report research findings on historical, as well as contemporary, international development problems. The series includes papers on a wide range of topics, such as alternative rural development strategies; nonfarm employment and small scale industry; housing and construction; farming and marketing systems; food and nutrition policy analysis; economics of rice production in West Africa; technological change, employment, and income distribution; computer techniques for farm and marketing surveys; farming systems and food security research.

The papers are aimed at teachers, researchers, policy makers, donor agencies, and international development practitioners. Selected papers will be translated into French, Spanish, or other languages.

Individuals and institutions in Third World countries may receive single copies of papers published since 1993 free of charge. Requests for copies and for information on available papers may be sent to:

MSU Bulletin Office
10-B Agriculture Hall
Michigan State University
East Lansing, Michigan 48824-1039
U.S.A.

Information concerning how to purchase MSU International Development Papers is included in the back of this publication and requests should be sent to:

MSU Bulletin Office
10-B Agriculture Hall
Michigan State University
East Lansing, Michigan 48824-1039
U.S.A.

TARGETING OF FOOD AID IN RURAL ETHIOPIA: CHRONIC NEED OR INERTIA?

by

T.S. Jayne, John Strauss, Takashi Yamano, and Daniel Molla

March 2000

This paper is published by the Department of Agricultural Economics and the Department of Economics, Michigan State University (MSU). Funding for this research was provided by the Food Security II Cooperative Agreement (PCE-A-00-97-00044-00) between Michigan State University and the United States Agency for International Development, through the Africa Bureau's Office of Sustainable Development, and Agriculture, Natural Resources and Rural Enterprise Division (USAID/AFR/SD/ANRE).

Jayne is a Visiting Associate Professor, Department of Agricultural Economics, Michigan State University; Strauss is a Professor, Department of Economics, MSU; Yamano is a Graduate Student, MSU; and Molla is a Food Security Advisor, Canadian International Development Agency.

ISSN 0731-3438

Published by the Department of Agricultural Economics and the Department of Economics, Michigan State University, East Lansing, Michigan 48824-1039, U.S.A.

ACKNOWLEDGMENTS

The authors gratefully acknowledge funding for this study from the Food Security II Cooperative Agreement between AID/Global Bureau, Office of Agriculture and Food Security, and the Department of Agricultural Economics at Michigan State University. Support was also provided by the Food Security and Productivity Unit of the Productive Sectors Growth and Environment Division, Office of Sustainable Development, Africa Bureau, USAID (AFR/SD/PSGE/FSP). Support for the collection and initial analysis of data is acknowledged from USAID/Ethiopia.

The study has benefitted from previous discussions with members of the Disaster Prevention and Preparedness Commission/Government of Ethiopia; the Food for Peace Office of USAID/Ethiopia; and Dejene Aredo, Alemu Asfaw, Arne Bigsten, Margaret Brown, Dan Clay, Gebremeskel Dessalegn, Aklu Girgre, Laurence Haddad, John Hoddinottt, Tim Lavelle, Jean-Charles LeVallee, Simon Maxwell, Agnes Quisembing, Ali Said, James Shaffer, Paul Strasberg, Duncan Thomas, Jennifer Ward-Batts, and Michael Weber. The authors take full responsibility for the findings and implications of the study.

EXECUTIVE SUMMARY

Background: Governments and donor agencies have been grappling for decades with how to design and implement food aid programs in developing countries. Despite the enormity of cross-country food aid transfers, which were running as high as 15 million tons annually during the early 1990s, very little is known regarding how well food aid is targeted to intended beneficiaries by local governments and NGOs. The lack of rigorous monitoring assessments has impeded the ability to learn from past experience and to develop improved systems for allocating food aid in the future.

Ethiopia is one of the poorest countries in the world and has suffered two major famines in the past 25 years, in 1973 and 1984/5. It has also received almost 10 million metric tons of cereal aid from 1984 to 1998, an average of almost 10% of national cereal production over this period. Concerns have recently arisen in Ethiopia over the extent to which food aid reaches the poor and whether the logistical apparatus of food aid distribution is able to flexibly adjust to yearly changes in the geographical incidence of vulnerability.

Objectives and Methods: This paper identifies the factors driving the allocations of food aid in Ethiopia. We determine both how food aid is allocated across rural regions, reflecting the targeting criteria of the federal government, as well as how aid is allocated within regions, reflecting the decisions of local authorities and non-governmental organizations (NGOs). Devising a measure of "need" is difficult and controversial and there is no consensus on how to do so. It is agreed by most analysts that income is an imperfect measure of need, yet it is arguably the best single indicator of need in the absence of more detailed anthropometric information. Econometric analysis is used to examine the degree to which food aid is targeted according to pre-aid per capita household income, as well as to other factors. The paper also identifies factors associated with low incomes at regional- and household-levels, in order to be helpful to donors, NGOs and governments in their efforts to improve the targeting of food aid.

Data are drawn from the Food Security Survey (FSS), fielded on a subset of the 1995/96 Annual Agricultural Sample Survey by the Ethiopian Central Statistical Authority. The data covers 4,112 households in 348 weredas (i.e., local administrative units of which there are about 450 in rural Ethiopia). To examine the validity of the data, we calculated the amount of food aid received at the regional level from the FSS sample households and compared these results with actual food aid distribution records of the Disaster Prevention and Preparedness Commission (DPPC). The results showed striking similarities, and provide a robust external test of validity of the FSS and CSA data sets (Clay, Molla, and Debebe 1998).

Food Aid in Ethiopia: Food aid in Ethiopia has historically taken two major forms: free distribution (FD), which is generally categorized as "emergency" distribution, and food for work (FFW), which attracts labor to help build assets such as roads, terraces, and dams in the process of channeling food to needy areas.

FD and FFW allocations are made in two stages: From federal authorities to weredas; and from wereda authorities to local Peasant Associations which distribute the food to beneficiaries. A

critical element of this two-stage process is that while the amount of food to be allocated to each wereda is determined at Federal level (using input from local levels), the actual beneficiaries are designated at the local community (PA) level.

FFW is often referred to as "development food aid." Quite often, completion of planned activities takes precedence over targeting the neediest households for participation. Because most FFW programs are planned in advance for multi-year periods, and involve allocations that are largely fixed regardless of current crop assessments, one might expect that FFW should exhibit less income-based targeting than free distribution programs.

Seven Major Findings

- **The first finding upholds the need for targeting even in very poor countries.** While the argument is often heard that targeting in poor countries is not necessary or cost-effective because the majority of rural households live in absolute poverty by current world standards, our findings show very large relative disparities in incomes and assets across rural households in Ethiopia. The poorest 25% of households in rural Ethiopia had less than 190 birr per capita, while the highest 25% had more than 595 birr per capita. At the extremes of the income distribution, the poorest 10% had less than 104 birr per capita, while the highest 10% had over 834 birr per capita. Households at the low end of the income distribution are much more likely to be food insecure and require food aid.

  These findings from Ethiopia are not unique – almost all survey data from Sub-Saharan Africa show a high degree of relative variation in incomes and assets across regions and across households within regions. These findings imply that targeting of food aid to the poorest of the poor remains an important objective in food aid programs.

- **The second conclusion sheds light on the effectiveness of alternative targeting strategies.** There is considerable debate in Ethiopia on whether scarce targeting resources should be used to (a) identify the most needy areas and put less emphasis on identifying needy households within targeted areas, or (b) allocate targeting resources equally to identify the most needy households within areas as well as the most needy areas. The merits of both strategies depend largely on whether there is greater variability in needs across geographic areas or within areas. To examine this issue in Ethiopia, we ranked all weredas in the national sample (n=348) according to their mean per capita income and plotted these values against the percentage of households in each wereda falling into the bottom per capita income quartile ranked nationally.

  Figure 9 (page 65 in the main report) shows a negative but highly variable relationship. For example, at the 25th mean income percentile (vertical dotted line), as many as 60% or as few as 20% of the households belonged to the poorest national income quartile. Because of wide

  within-wereda variation in per capita income, the poorest 25% of the weredas in 1995/96 (i.e. those to the left of the vertical dotted line) were found to contain only 54% of the nation's

poorest households (those falling into the bottom per capita income quartile, ranked nationally). The other 46% of households in the bottom national income quartile were scattered throughout the other 75% of the weredas. These findings indicate that a large share of the poorest people in the country are not located in the poorest weredas in the country, and that a targeting strategy that focuses only on relatively poor weredas would miss a large percentage of needy people. These findings point to the importance of targeting both across regions and within them, although the relative costs involved are not addressed here.

However, identifying and including the poorest weredas for food aid distribution is clearly an important element of a well-targeted food aid program. Each of the 348 weredas in our national sample was plotted in Figure 9 as an "x" if food aid was received within that wereda, and as an "o" if no food was distributed. Out of the 127 weredas receiving food aid, only 47 were contained in the poorest mean wereda income quartile (to the left of the vertical dotted line). Of course, even if income were the sole criterion used to determine which weredas should receive food aid, we would expect to see less than 100% targeting of poor weredas due to incomplete information on wereda incomes at the time that food aid allocations need to be made. This raises the question of whether there are observable indicators that can be used to improve the identification of poor and vulnerable regions, as well as low-income households within regions.

- **A third conclusion is that, at the national level, food aid was targeted only to some extent according to income.** Poorer households and poorer weredas had higher probabilities of receiving food aid than households or weredas with higher per capita incomes. But this varied considerably across regions. Overall, the probability that a particular wereda (local administrative unit) would receive free food varies from 30.4% for the 25th percentile of wereda mean log per capita income, to 24.1% for the 75th income percentile, to 21.1% for the 90th income percentile. Assets, such as size of landholding and livestock ownership, were not related to food aid allocations. Long-term rainfall, in most of the estimated models, was correlated with food aid allocations, even though wereda-level incomes were not significantly related to long-term rainfall.

- **Fourth, the fact that only 30% of the poorest weredas received food aid indicates that, at least in this particular year (1995/96) and using income as the criteria of need, there were very large targeting errors of exclusion.** Over the national sample, the probability of receiving food aid was 35% or below, other factors held constant, even for the poorest weredas in the country. These findings suggest that the amount of food aid distributed in 1995/96 was inadequate to meet the needs of households under the 25th per capita income percentile. The finding of large targeting errors of exclusion is consistent with the findings of Clay, Molla, and Debebe (1999).

- **Fifth, free distribution of food aid was generally more effectively targeted according to household income than food for work.** However, there were wide variations in the extent of targeting across regions. Free food was most effectively targeted to the poor in Amhara Region, and least effectively targeted in the South. Food for work was targeted to the poor most effectively in Tigray, but was almost totally unrelated to household per capita incomes

in Amhara and the South. There are difficulties in accommodating the dual objectives of food for work, which include development objectives as well as hunger alleviation. At policy levels, donors and government regard both objectives as important, but at the field level there is often less emphasis on the need to promote these objectives simultaneously.

While emergency food aid is programmed annually and is designed to respond to changes in the spatial incidence of vulnerability from one year to the next, development food aid (i.e., FFW) by contrast is essentially programmed on a multi-year basis in selected areas designated for development projects. Such development-oriented food aid is typically programmed up to five years in advance, which means that there is less flexibility to relocate FFW operations in response to short-term changes in vulnerability. Targeting of FFW food was also likely to have been impeded by the practice of offering wages to participants that typically exceeded prevailing agricultural labor wages. Other studies have examined the potential to improve food aid targeting through careful selection of cereals for work rations whose consumption tends to be inversely related to incomes.

- **Sixth, there were significant differences in the amounts of per capita food aid allocated regionally, which were not related to observable household and wereda level characteristics.** Weredas in Tigray Region were more likely to receive both free food and food for work than households in other regions even after controlling for income levels, assets, long-term rainfall and short-term rainfall shocks, and other household and wereda characteristics. These findings are highly consistent with earlier findings of Clay, Molla, and Debebe (1999).

- **Lastly, the single most important factor associated with who received food aid in our survey year was who received food aid in the past.** This was true at both the wereda-level and household-level. We also found that the current spatial allocation of food aid is highly correlated with the regions of greatest need during the 1984/85 famine in Ethiopia. On its face, it is unclear whether historical use should be interpreted as indicating that inertia is driving current allocations, or whether unobserved, time-invariant factors related to chronic needs are important. In an attempt to differentiate, albeit imperfectly, we find that the poorest areas of the country in 1995/96 were generally not the ones hardest hit by the famine. And after controlling for historical needs during the 1980s, it is the recent 1990s pattern of food aid allocation that is most important in determining receipt in the 1995/6 survey year; i.e., the 1980s pattern of vulnerability has little explanatory power over and above the more recent pattern of allocation in the 1990s in influencing current food aid allocations.

From these results, and the fact that current weather shocks have only a small impact on allocations, we conclude that there is a degree of inertia in the allocation of food aid geographically over time. This inertia may arise from high fixed program costs, rigidities in the governmental process of determining food aid allocations to local administrative units, political

income transfer objectives, or possibly other reasons. This spatial inertia, whatever the exact cause(s), is a factor that has so far been ignored in both the theoretical targeting and the policy-related food aid literature.

Implications for Food Aid Programming, Policy and Future Research: What can be done to improve targeting effectiveness in the future? Although government policy papers clearly state that food aid should be targeted to only the neediest households, they do not indicate specifically how to identify the needy. Econometric analysis in the report reveals that for purposes of identifying weredas with low incomes (both per capita and total household income), there was a small set of variables that consistently were associated with need.

- weredas in the Southern Region;
- weredas lacking tarmac or all-weather roads;
- weredas in which a large portion of cropped area was damaged due to drought, pests, or disease;
- weredas with relatively small average land holdings; and
- weredas with a large percentage of female-headed households with no adult male in the family.

Food aid programs could do more to utilize such indicators for targeting vulnerable weredas. Within weredas, households with relatively low incomes and animal assets were associated with:

- small landholding size;
- the percentage of household cropped area affected by disease and drought;
- female-headed households with no adult male in the family; and
- the percentage of family members that are young children.

By targeting food aid according to these indicators, local authorities could have improved the share of food aid going to the poorest households within weredas, at least in this particular survey year. Further analysis is necessary to gauge how robust these indicators are across years with different weather and harvest conditions.

In recent years in Ethiopia, government policy statements indicate a priority on targeting the poorest weredas in the country and then distributing food aid widely within these weredas. However, this study indicates that such an approach may miss a large percentage of the poorest households. As discussed earlier, many poor people that are not located in the poorest areas of the country, and that a strategy focusing only on targeting poor areas would miss a large percentage of needy people.

There is still a great deal that is unknown about the actual implementation of food aid programs in the field. We observe that targeting effectiveness varies, sometimes greatly, between regions. But there is little available information on how implementation of food aid programs differed across these areas (e.g., how authorities identified the vulnerable, the targeting criteria used, how supply channels were organized).

This kind of descriptive information could prove useful to match up with findings such as those presented in this paper to better understand what kind of operations lead to relatively effective targeting and vice versa. Closer collaboration between researchers and implementors of food aid

programs in the field could help to produce more effective targeting and monitoring systems. This would shed considerable light on the enduring “black box” stage of food aid programs -- the criteria and forces driving food aid allocation at the local level.

CONTENTS

ACKNOWLEDGMENTS iii

EXECUTIVE SUMMARY v

LIST OF TABLES xiii

LIST OF FIGURES xiv

LIST OF ABBREVIATIONS AND ACRONYMS xv

1. INTRODUCTION 1

1.1. Objectives 1
1.2. Background 2
1.3. Chronic Needs Hypothesis vs. Inertia Hypothesis 5
1.4. Previous Empirical Studies of Food Aid Targeting 6
1.5. Organization of Paper 7

2. FOOD AID IN ETHIOPIA 8

2.1. Free Distribution 9
2.2. Food for Work 10
2.3. Flexibility Versus Inertia in Spatial Allocation of Food Aid 12

3. FOOD AID TARGETING: CONCEPTUAL ISSUES 13

4. DATA SOURCES AND SAMPLES 16

5. EMPIRICAL MODELS AND VARIABLE CONSTRUCTION 19

5.1. Empirical Models 19
5.2. Covariates 20
5.3. Organizational Presentation of Findings 25

6. RESULTS: NATIONAL LEVEL 27

6.1. Regional and Community Allocations 27
6.1.1. Probability of Receiving Food Aid 27
6.1.2. Values of Food Aid Received by Weredas 32
6.2. Household Allocations Within Weredas 34
6.2.1. Probability of Receiving Food Aid 34
6.2.2. Values of Food Aid Received By Households 37
6.3. Robustness Checks 39

7. RESULTS: REGIONAL LEVEL 40

7.1. Targeting of Free Food 43
7.2. Targeting of Food for Work 46

8. PROGRAM EXIT AND CHRONIC PARTICIPATION 52

8.1. Program Exit Probabilities 52
8.2. Chronic Aid Recipients 54

9. DOES PAST RECEIPT OF FOOD AID REFLECT CHRONIC NEEDS OR INERTIA? . . 59

10. POTENTIAL STRATEGIES FOR IDENTIFYING LOW-INCOME WEREDAS AND HOUSEHOLDS FOR FOOD AID TARGETING 64

10.1. Wereda-level Targeting 64
10.2. Household-level Targeting 68
10.3. Alternative Indicators of Need 70

11. CONCLUSIONS 71

APPENDIX 75

REFERENCES 81

TABLES

Table — Page

1. Food Aid Distribution in Ethiopia, 1995/96 4
2. Determinants of Food Aid Allocation: Wereda-Level Results (Probit) 28
3. Determinants of the Value of Food Aid Distributed to Weredas that Received Aid (Truncated OLS) 33
4. Determinants of Food Aid Allocation: Household Level (Probit) 35
5. Determinants of the Value of Food Aid Received Among Households Who Received (Truncated OLS) 38
6. Determinants of Free Distribution by Region: Household Level Results (Probit) 44
7. Predicted Probabilities of Receiving Free Distribution and Predicted Per capita Value Received, For Households in Weredas Where Free Food Was Distributed 45
8. Determinants of the Value of Free Distribution Received by Recipients, by Region: Household Level (Truncated OLS) 47
9. Determinants of Food for Work by Region: Household Level Results (Probit) 49
10. Determinants of the Value of Cereal Received by FFW Participants by Region: Household Level (Truncated OLS) 50
11. Predicted Probabilities of Participation in Food for Work and Predicted Per capita Value Received, for Households in Weredas Where Food for Work Programs Were Operating 51
12. Determinants of Exit from Food Aid: Wereda-Level Results (Probit) 53
13. Determinants of Exit From Food Aid: Household Level (Probit) 55
14. Determinants of Chronic Food Aid: Wereda-Level Results (Probit) 56
15. Determinants of Chronic Food Aid: Household-Level Results (Probit) 57
16. Determinants of Food Aid Allocation with 1980s Post-Famine Variable: Wereda Level Results (Probit) 61
17. Determinants of Mean Wereda Income (OLS) 66
18. Determinants of Household Income (OLS) 69

FIGURES

Figure — Page

1. Household Food Aid Allocation by Ln Per capita Pre-Aid Income 3
2. Annual Grain Production and Food Aid in Ethiopia, 1974-1997 8
3. Food Aid Targeting under Ideal and Less than Ideal Conditions 14
4. Food Aid Distribution Estimates by Region, FSS and DPPC, June 1995-May 1996 18
5. Free Distribution (FD) and Food for Work (FFW) by Ln Per capita Income 21
6. Wereda Food Aid Allocation by Rainfall 23
7. Free Distribution and Food for Work Distribution by Region 41
8. Value of Food Aid Received Among Households Who Received by Region 42
9. Poor Households Relative to Mean Wereda Per Capita Income 65
10. Relationship Between Per capita Income and Land Owned, National Level 68

ACRONYMS

AD	Administrative District
ASS	Agricultural Sample Survey
CSA	Central Statistical Authority
DPPC	Disaster Prevention and Preparedness Commission
EAs	Enumeration Areas
EGS	Employment Generation Schemes
FD	Value of Free Distribution
FDRE	Federal Democratic Republic of Ethiopia
FFW	Food for Work
FSS	Food Security Survey
GIS	Global Information System
IFPRI	International Food Policy Research Institute
LOWESS	Locally Weighted Smoothed Scatter Plots
NOG	Non-governmental Organizations
OLS	Ordinary Least Squares
PAs	Peasant Associations
PL	Poverty Line
RRC	Relief and Rehabilitation Commission
SNNPR	Southern National, Nationalities, and People's Region
USAID	United States Agency for International Development
WFP	World Food Program

1. INTRODUCTION

Governments and donor agencies have been grappling for decades with how to design and implement food aid programs in developing countries. A major recurrent issue of food aid programs, as with other transfer programs, is how to target aid to intended beneficiaries. In Africa, concerns over increased hunger and declining availability of food aid from donor countries have spawned renewed interest and debate over how food aid programs can be designed to ensure that food reaches those who need it the most (Sharp 1997; Clay, Molla, and Debebe 1999; Barrett 1998; Maxwell, Belshaw, and Lirenso 1994; Basu 1982).

The lion's share of past literature on food aid has concerned itself with the disincentives issue – the effect of food aid distribution on local food prices, production incentives, and labor allocation. These issues are arguably still unresolved. Yet despite the enormity of cross-country food aid transfers, which were running as high as 15 million tons annually during the early 1990s, very little empirical work has shed light on the issue of targeting, even though interest in poverty alleviation and targeting of anti-poverty programs has greatly heightened during the 1990s.[1] Furthermore, as the availability of world food aid declines, as it has in the 1990s,[2] the importance of effective targeting is likely to increase.

1.1. Objectives

This paper quantifies the factors underlying the allocations of food aid, both across and within rural regions, by the Ethiopian government, together with local and international non-governmental organizations (NGOs). The paper examines the degree to which food aid is targeted according to pre-aid per capita household income, as well as to other factors. The paper also attempts to disentangle two competing explanations for the observed continuity of food aid allocations to particular areas and households: that the recipient areas are chronically needy; or that needs shift geographically from one year to the next, but that fixed costs in setting up operations and in the process of identifying needs lead to inertia in the location of food aid programs over time. Data are drawn from two linked rural household surveys in 1995/96, to which we merge information on local rainfall and historical assessments of food aid needs. We focus on "reduced form" specifications in which as little structure is put on the decision rules as possible, because so little is known about these decision rules and their implementation at the village level.

---

[1]See van de Walle (1998), and Clay, Pillai, and Benson (1998) for recent reviews.

[2]By the late 1990s food aid quantities have dropped almost in half, to 7 million tons per year, in part because of changes in General Agreement on Tariff and Trade regulations and domestic policies that have reduced agricultural subsidies in some major donor countries, which has in turn reduced surplus production. This and other aggregate food aid statistics come from the World Food Program's (WFP) website at http://www.wfp.org.

1.2. Background

Ethiopia is one of the poorest countries in the world and has suffered two major famines in the past twenty-five years, in 1973 and 1984/5. It has also received enormous amounts of food aid over the past several decades, almost 10 million metric tons from 1984 to 1998, an average of almost 10% of national cereal production over this period. In bad production years food aid has been as high as one-fifth of domestic production. In the late 1980s, Ethiopia was receiving roughly 25% of all food aid deliveries to Africa, and as late as 1996 was still receiving 20%.[3] The national and international responses to famine and vulnerability in Ethiopia since the mid-1980s have arguably been a success story of humanitarian assistance. However, recent concerns have arisen in Ethiopia about both targeting effectiveness and potential long-run impacts (e.g., Commission of the European Communities 1993; Sharp 1997; Clay, Molla, and Debebe 1999; USAID 1998; Joint Danish Ethiopia Development Programme 1999). The Ethiopian Government's concern with these issues is reflected in its National Policy on Disaster Prevention and Management (Transitional Government of Ethiopia 1993).

Given the large amount of food aid coming into Ethiopia, it is important to know whether and how it is being targeted. Devising a measure of "need" is difficult and controversial, and there is no consensus on how to do so. It is agreed by many analysts that income is a very imperfect measure of need, nevertheless, it is readily available from many household surveys and is arguably the best single indicator of need in the absence of detailed anthropometric information. Figure 1 shows the bivariate relationship between food aid receipt and the log of household per capita income. Both the percent of the value of total food aid of total rural household income (including aid), and the probability that households receive some form of food aid are negatively related to the log of per capita pre-aid income.[4] The share of food aid in total income ranges from 2% to 8%, while the probability of receiving aid varies from near 30% (for low levels of income) to roughly 10% (for households at the high end of the income distribution). Over 70% of households at the very bottom end of the income distribution received no food aid. Moreover, the value of food aid received per capita is roughly constant across per capita pre-aid income levels. Since the 1995 cropping year was a good one, it is perhaps surprising that households in the high end of the income distribution have a non-trivial chance of receiving some form of food aid.

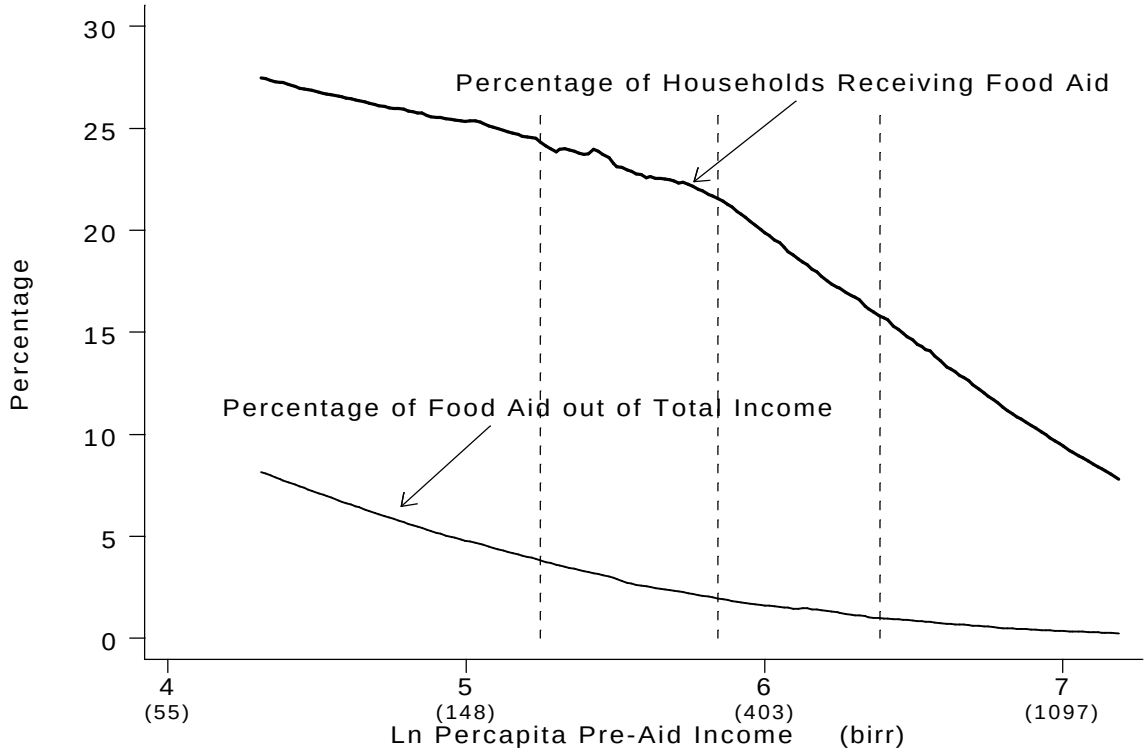
In countries such as Ethiopia, where the majority of the rural population live in absolute poverty by current world standards, the argument is often made that targeting of food aid is not necessary because almost all households are needy. Dercon and Krishnan (1998) estimated that the average poverty line in rural Ethiopia for 1995 was approximately 600 birr per capita (a log income of 6.4), which, as can be seen from Figure 1, exceeds the per capita income of about 75% of the rural households in Ethiopia.

---

[3]During the 1990s, Sub-Saharan Africa has been receiving as much as one-third of all food aid delivered in the world (WFP, website statistics).

[4]Figure 1 and the other figures in this paper are created using locally weighted smoothed scatter plots (LOWESS), (Cleveland 1979) with window length set at .6 or .7 of the neighboring observations.

Figure 1. Household Food Aid Allocation by Ln Per capita Pre-Aid Income



Note: Dotted lines are drawn at the 25th, 50th, and 75th percentiles of ln per capita pre-aid income, corresponding to 190, 345, and 595 birr.

However, Figure 1 also shows that there is considerable variation in rural household income, being 190 birr per capita at the 25th percentile, and rising three-fold to 595 birr per capita at the 75th percentile. Per capita incomes at the 10th and 90th percentiles were 104 birr and 834 birr, respectively. Despite the fact that most households are poor in absolute terms, there is clearly substantial variability in the extent of relative vulnerability across rural households, as measured by per capita income. This would imply that targeting of food aid to the poorest of the poor remains an important objective in food aid programs.

In addition to targeting by income, there has been important targeting by region. Table 1 indicates that the Tigray Region and the North Wello area of Amhara Region received relatively large amounts of food aid in 1995/96 – almost five times the national per capita average – yet do not have abnormally low household incomes or an abnormally large fraction of its people in the

Table 1. Food Aid Distribution in Ethiopia, 1995/96

Killil[A]	Domain	Number of sampled		Mean per capita income	Percent of sampled households in the bottom national income quartile[B]	Percent of households considered vulnerable in 1984/85[C]	Percent of sampled households who received			Value of Free Distribution (FD) + Food for Work (FFW) distributed per capita[D]
		Weredas	Households				FD or FFW	Free distri-bution	Food for Work	
				(a)	(b)	(c)	(d)	(e)	(f)	(g)
	.	number	number	– birr –	– percent –	– percent –	—	percent	—	birr/capita
Tigray	all	31	162	546.7	15	60	55	35	36	41
Amhara	N. and S. Gonder	17	154	421.5	18	11	21	19	10	16
	E. and W. Gojam, Agewawi	31	234	562.3	17	2	2	0	2	1
	N. Wello, Wag Hamra	13	178	356.0	23	93	69	61	16	43
	S. Wello, Oromiya, N. Shewa	31	194	458.5	19	46	35	24	11	11
Oromiya	E. and W. Wollega	32	219	451.0	29	0	6	3	4	1
	Illubabor, Jimma	29	223	672.7	11	0	4	4	0	0
	N. and W. Shewa	30	198	674.8	6	1	9	3	7	1
	E. Shewa, Arsi, Bale, Borena	30	183	704.1	16	8	13	7	9	2
	E. and W. Hararge	18	135	371.2	33	16	16	1	14	5
Southern (SNNPR/ SEPA)	Yem, Kefficho, Maji, Shekicho	15	180	449.3	24	0	2	2	0	0
	N.&S.Omo, Derashe, Konso	20	179	212.4	66	9	26	16	17	8
	Hadiya, Gurage, Kembata	16	175	328.9	39	4	22	13	12	5
	Sidama, Gedeo, Burji, Amaro	14	125	488.3	26	1	6	4	2	1
Others	Somali	5	71	307.3	34	46	10	10	1	2
	Beni-Shangul	4	66	291.6	35	0	3	3	2	1
	Gambela	5	55	318.0	51	0	51	33	18	21
	Harari	1	43	671.5	21	18	14	7	7	3
	Addis Ababa	5	53	1227.8	15	0	0	0	0	0
	Dire Dawa	1	40	239.5	50	7	75	8	75	38
Total		348	2,867	487.7	25	17	20	13	10	9

Note: A) Killil (Region) is the largest regional unit in Ethiopia. These are disaagregated into "domains," an amalgam of zones, which constitute the next highest administrative unit. Weredas are relatively small administrative units. There are approximately 460 rural weredas in Ethiopia. B) Income quartile is calculated nationally. C) As determined by the Government Disaster Prevention and Preparedness Commission (and its government precursors). D) Total value of free distribution and food for work divided by area population.

poorest national income quartile. In fact, many of the areas of Ethiopia containing the greatest proportion of households in the bottom national income quartile (e.g., parts of the Southern and Oromiya Killils, and the combined "other" Killils) received relatively little food aid in1995/96. Nutritional studies indicate that Tigray has somewhat higher levels of child stunting than the national average (World Bank 1999), so that using only income to target may result in missing many needy persons.[5]

1.3. Chronic Needs Hypothesis vs. Inertia Hypothesis

We start with the observation that the current spatial allocation of food aid in Ethiopia is highly correlated with the spatial pattern of vulnerability as determined by the Government during the 1984/5 famine (columns c and d of Table 1). There are several possible explanations for this observation. First, the spatial incidence of poverty and food insecurity in 1995/6 may still be very correlated with that of 1984/5, which would justify a high degree of spatial continuity in food aid operations year after year. We refer to this as the "chronic needs" hypothesis. A second possible explanation, however, is that there may be "inertia" in program operations or allocation procedures, leading to rigidities in the spatial pattern of food aid distribution in spite of potentially significant changes in the spatial incidence of vulnerability and poverty from one year to the next. This inertia hypothesis was first identified by Clay, Molla, and Debebe (1999).

There are several explanations for the possibility of spatial inertia in food aid distribution. First, fixed costs in program operation may arise in the development of supply channels, linkages to local communities, and field-level infrastructure for identifying vulnerable groups and delivering food to them. In such cases, governmental or NGOs may rationally prefer not to move their operations, if for example they are interested in minimizing their costs of distributing a given volume of food aid to recipients. Also, government and donors may prefer to distribute food through well-performing NGOs that operate only in certain areas. Moreover, the use of food aid for development purposes often entails the programming of food aid to particular areas on a multi-year basis, which creates rigidities in the spatial allocation of aid, especially food for work.

A second possible class of inertia explanations involve political economy issues at both the central and regional government levels. For example, the central government may have income transfer objectives which it seeks to promote through food aid allocations. Also, the procedure for identifying food aid needs may be susceptible to a degree of lobbying by local communities. Communities that have received food aid in the past may learn how to influence subsequent central government food aid decisions more effectively by better utilizing private information, for example, leading to continuity in historical allocation patterns.

---

[5]Child stunting is usually defined to be having height that is less than 2 standard deviations below some reference mark that is adjusted for age and gender. Stunting is widely considered to be a very good marker for cumulative health (Falkner and Tanner 1986). While child stunting is often related to household incomes or assets, the relationship is not always strong and many other underlying factors also affect height (see Strauss and Thomas 1995, for a review).

A high degree of "inertia," i.e., inflexibility in the location and amount of food aid distributed from one year to the next, affect how much targeting is optimal. If, for example, fixed costs is the reason for inertia, then presumably the degree of optimal targeting would be lower if needs change frequently.[6] The theoretical literature on optimal targeting rules (Besley and Kanbur 1988, 1993; Besley and Coate 1992, 1995; Besley, Coate, and Guinnane 1993; Besley 1997) explores how optimal targeting rules would vary according to the information authorities have regarding household or individual needs. Papers to date have considered issues of moral hazard.[7] These models are mostly static and, therefore, do not consider the implications of having high fixed costs of program establishment. Nor does this point seem to have been raised to date in the small empirical literature.[8]

A better understanding of how the spatial incidence of vulnerability changes over time – or whether it is recurrently concentrated in the same areas year after year – may help inform governments and donors about how much emphasis should be put in the design of food aid programs on flexibility in adjusting the location of operation. If the information indicates that needs are fairly stable over space, then fixed costs of distribution would be less of a problem. On the other hand, if needs do change over time, flexibility in operation may be warranted greater emphasis in the design of food aid programs.

1.4. Previous Empirical Studies of Food Aid Targeting

Very few studies have tried to infer targeting rules from micro data for safety net or other social programs in developing countries. Recent studies have quantified how subsidies such as for health facilities, school attendance, or food are distributed across income groups (see, for example, the papers in van de Walle and Nead 1995; or Pinstrup-Andersen 1988). Yet most of these studies just show cross-tabulations against income deciles and do not consider other potential factors statistically. Nor, in general, do they examine how safety net programs are targeted across geographical areas (see Datt and Ravallion, 1993, for an exception). Recently, there has been a burgeoning interest in empirical political economy, in measuring how underlying demographic and other factors affect government expenditure and tax behavior, for instance Besley and Case (1995), but few of these examine a specific social safety net program, and certainly not food aid in a developing country.

---

[6]Jalan and Ravallion (1998) make the same point regarding targeting poverty alleviation programs when there is a large transitory component to income, as they find in China. They do not consider the possibility of high fixed set-up costs, however.

[7]For instance if one is close to a means cutoff then it may be in one's interest to misinform, or to act, so as to make one eligible. The targeting literature has considered ways to induce self-selection to avoid such behavior, including, for instance, imposing work or other unpleasant requirements, such as mandating that recipients live in a poorhouse, as done in 19th century England.

[8]See Clay, Molla, and Debebe (1999) for an exception.

With respect to food aid, very little multivariate household-level analysis related to targeting has been conducted. Few papers have examined how unconditional food transfers, so-called "relief aid," are allocated, in part because household data on the receipt of such food transfers is usually unavailable.[9] In the case of food for work there have been studies that have examined determinants of household participation in such programs (e.g., Ravallion, Datt, and Chaudhuri 1993; Datt and Ravallion 1994, 1995; Kumar et al. 1993), as we also do, but none of the prior studies has analyzed why such programs are distributed across areas in the way in which they are. Furthermore, because of the nature of the data that we use, we are able to examine conditions underlying not only current (i.e., survey year) receipt of food aid, but also chronic use over the past five years. We are furthermore able to analyze the attributes of households who formerly received food aid but have stopped receiving aid or participating in food for work during the survey year. Finally, we are able to begin to measure the importance of past allocation patterns in explaining current period allocations as well as the influence of past assessed needs.

1.5. Organization of Paper

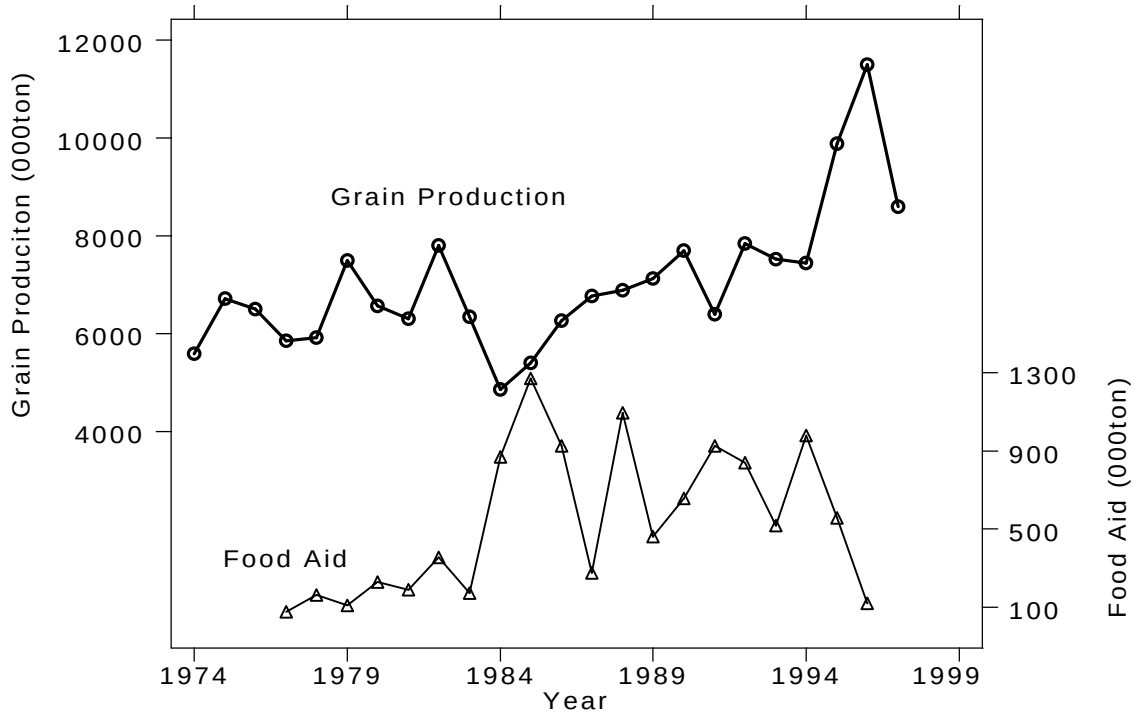
The paper is organized as follows: Section 2 describes institutional aspects of food aid programs in Ethiopia that are especially germane to understanding our specifications and results. Section 3 draws on the theoretical literature to show the reader what our results would look like if food aid were perfectly targeted under certain strong assumptions. Section 4 presents the data sources and sample characteristics for the analysis. Section 5 explains the models and variable construction. Section 6 presents and interprets the main results of the models at national level. Section 7 examines differences in targeting effectiveness across the four regions of Ethiopia where sampling procedures in our survey were adequate to be considered representative – Oromiya, Amhara, Tigray, and the South (SNNPR). Section 8 examines the determinants of chronic recipients of food aid and the characteristics of households recently exiting from program participation. Section 9 assesses the degree to which the very strong continuity of food aid operations in particular areas reflects chronic needs versus inertia. Section 10 synthesizes the study's conclusions and policy implications.

[9]Reardon, Matlon, and Delgado (1988) discuss regional targeting of food aid in Burkina Faso in the early 1980s. However, their sample has only 3 regions so they are not able to analyze the factors that underlie the allocations across regions.

2. FOOD AID IN ETHIOPIA

Figure 2 plots national production of cereals and of food aid (with different scales).[10] Notice that there is not a close medium-run or even short-run correspondence between the two series. While there is a negative relationship in some years between production and aid, in 1986/7 for instance, in other years, 1987/8, there is not. In 1987/8, three years after the 1984/5 famine was over, food aid remained extremely high, at nearly 1,000,000 tons, despite national cereals production having recovered substantially.[11] In the medium-run, cereals production has trended upwards over the 1985-96 period, but food aid did not trend downward until after 1994.[12]

Figure 2. Annual Grain Production and Food Aid in Ethiopia, 1974-1997



[10]The major food aid commodities distributed in Ethiopia are cereals (93%). Wheat in particular constitutes the largest share and accounts for about 80% of the total volume of food aid supplied between 1992-1995. Sorghum and maize account for about 8% and 3% respectively, while oils and fats make up another 3% of the total.

[11]There were regional droughts in 1987/88, which may explain the large amount of food aid in that year (von Braun, Teklu, and Webb 1998), but the level was not related to the national level of production.

[12]A trend regression of cereal food aid from 1984/5 through 1993/4 results in a coefficient of .017 with a standard error of .054. Clearly there is no trend over this period.

The apparent lack of correlation between production and food aid over this period is at least partially due to the increased emphasis in the late 1980s on expanding the use of food aid from famine relief to "rehabilitation", the use of food as a wage pool to recruit labor to build perceived useful local infrastructure (Webb, von Braun, and Yohannes 1992). By the early 1990s, such efforts to “link relief to development” became popularized and integrated into the food aid programs of both donors and the government.

In 1974 the Ethiopian government established the Relief and Rehabilitation Commission (RRC) to monitor the incidence of food insecurity across the country and coordinate food aid activities, including those of international NGOs. In 1985, 48 international NGOs were operating relief projects in the country. In the mid-1990s, 50 were active (Webb and von Braun 1994). Local church and other organizations have also been quite active historically (Webb, von Braun, and Yohannes 1992). Historically, NGOs handled nearly 80% of relief food distribution in the country, with the balance undertaken by government. Since the early 1990s, however, this has increasingly been taken over by the federal Disaster Prevention and Preparedness Commission (DPPC, which in 1993 was organized from the old Relief and Rehabilitation Commission). Currently, NGOs are allowed to handle and distribute only “development” food aid, which is used as wage payment in labor-intensive area development projects.

Food aid in Ethiopia has historically taken two major forms: free distribution (FD), which falls under the category “emergency” distribution, and food for work (FFW).[13] Most FFW activities are categorized as “development” food aid programs since they focus on developing assets such as roads, terraces, and dams. However, some food for work programs in Ethiopia are defined as emergency programs (e.g., Employment Generation Scheme) that is designed to target the neediest able-bodied people. We briefly describe the policy objectives and implementation of these two food aid types.

2.1. Free Distribution

FD programs in Ethiopia distribute cereals and cooking oil directly to households.[14] Allocations are made in two stages: From federal authorities to weredas (i.e., local administrative units roughly akin to a county); and from wereda authorities to local Peasant Associations (PAs) which distribute the food to beneficiaries. The administrative mechanisms used at each level are distinct (Sharp 1997). In the first stage, the wereda administration determines the number of

[13]A third form, cash for work, has been used only sparingly in Ethiopia and is not addressed here. Also, so-called “program” food aid, which is food that is sold on local markets (not directly given to households) for local currency which is then used for general budget support, has not been much used in Ethiopia with the exception of U.S. Title III food aid since 1995 which has been used for emergency relief.

[14]During the 1984/5 famine camps were set up at which food aid was distributed. Now food aid goes directly to permanent villages.

households "in need" within each wereda.[15] These assessments are forwarded to, and revised by, the Zonal and Regional Administrations, and ultimately the federal-level DPPC. The DPPC then revises (generally downward) the number of households determined to be in need and the amount of food aid required for each wereda based on historical patterns, the potential supply of food aid to be pledged by donors, and the DPPC's own field-level food insecurity assessments. At this stage an appeal is launched by the Federal Government for food aid, specifying the amount of food and number of households in need after aggregating across all weredas. However, almost always, the amount of food aid pledged by donors falls short of the requirements as expressed in the appeal, which leads to further downward revision of allocations to weredas.

The second stage begins after the federal DPPC has finalized allocations to each wereda. Wereda DPPCs then assign allocations to individual PAs (there are typically about 30 PAs within a wereda). Then the PA leadership prepares a list of beneficiary households against the assigned allocation. According to the Government's National Policy for Disaster Prevention and Management (Transitional Government of Ethiopia 1993), local-level responsibility for selecting food aid beneficiaries lies with the wereda administration, but implementation is actually carried out by elders and community representatives at the PA level. Neither the DPPC nor NGOs have control over the selection of beneficiaries at the PA level. The critical element of this plan is, that while the amount of food to be allocated to each wereda is determined at Federal level (using input from local levels), the actual beneficiaries are designated at the local community (PA) level. Of course, PA leaders are urged to use a set of selection criteria to determine which households are eligible, including livestock ownership, grain production, assets, income, being unable to work because of illness, having no family support network, and household size (Sharp 1997).[16] We will explore below the extent to which this is true empirically.

2.2. Food for Work

Ethiopia's official food aid policy states that no able-bodied person should receive food aid without working on a community development project in return. This is complemented by targeted free food aid for those who cannot work. The official goal, as described above, is to expand work-based food aid to the point where it accounts for 80% of all distributions (World Food Programme 1995). However, household-level data show that, of the total kilocalories of

[15]The exact criteria used to determine "needs" could not be clearly established through liaison with DPPC, and interviews with local officials indicated that the process is to some degree vulnerable to different interpretations of neediness by local officials across weredas.

[16]There is little attempt to self-target food aid, i.e., provide foods that are eaten primarily by the poor, as was the case, for instance, in Mozambique in the early 1990s when food aid consisted largely of yellow maize, a staple of the poor (Tschirley, Donovan, and Weber 1996). In Ethiopia, food aid is predominantly (80%) wheat, which is considered a normal good in both rural and urban areas (Kebede, Jayne, and Tadesse 1996).

food aid received nationally over a full twelve-month period in 1995/96, only 35% involved work in exchange for the food (Clay, Molla, and Debebe 1999).[17]

FFW takes the form of public works programs in historically food deficit or degraded areas. This type of food aid is often referred to as "development food aid." Quite often, completion of planned activities takes precedence over targeting the most food insecure households in the allocation of FFW programs. Most FFW activities are planned and resource allocations are committed a year or more in advance – regardless of current crop assessment conditions.[18] Some examples of regular food for work are: U.S. Title II food aid distributed through NGOs in historically drought prone areas; WFP's Project 2488 which is executed through the Ministry of Agriculture and aims mainly at rehabilitation of degraded areas; and Canada's multi-year food for work program implemented by NGOs in historically food deficit areas. Because most FFW programs are planned far in advance and for multi-year periods, one might expect that FFW should exhibit less income-based targeting than free distribution programs, at least with regard to which weredas get targeted.

Rules determining participation in FFW programs have varied widely (Sharp 1997). In some cases self-targeting has been used, by which households decide whether to send members to work at the offered food wage. Typically a given project pays a constant daily food wage, not differentiating by the human capital of workers (Disaster Prevention and Preparedness Commission 1997). In the past, offered wages have typically been higher than local market wages (Webb, von Braun, and Yohannes 1992; Sharp 1997), which should result in much less income targeting than in a low wage regime. Ration amounts are based on daily nutritional requirements of a cereal-based diet for an average family of six persons. Also, on some food for work projects, beneficiaries are paid an additional amount of food aid as an allowance for transport when the project area is at a significant distance from where they live (Relief Society of Tigray projects, for example). Providing in-kind wages higher than local wage rates for manual labor is often justified by the contention that poverty is endemic in many rural areas, so that targeting is implicitly not needed, plus a concern that a "livable" wage be paid (Disaster Prevention and Preparedness Commission 1997). However, programs in other areas have targeted FFW opportunities more narrowly to specific types of households. In these schemes, a local community group chooses households who will be eligible for participation based on some underlying criteria, which may be easily measured or not. In some cases there is *de jure*

[17]There are several reasons why the work in exchange for food is apparently underutilized. First, food aid is sometimes available for distribution to locations considered "in need" without a work project having been identified. Second, anecdotal reports indicate that in situations where the technical input for food for work projects is unavailable, the food aid may be distributed to households with the condition that work will be expected at some point in the future. Lastly, the work requirement for receiving food is sometimes waived if the community is considered weak or stressed as a result of transitory food insecurity.

[18]An exception is "Employment Generation Schemes" (EGS) mechanisms for distributing emergency relief that require participation in public works and tend to expand or contract based on needs and availability of relief resources.

rationing of either spaces (restricting the number of eligible participants per household) or time allowed per person. Other factors that are claimed to be used to target households are poverty, livestock and other asset ownership, crop production, and size of landholding (Sharp 1997).

2.3. Flexibility Versus Inertia in Spatial Allocation of Food Aid

Emergency or relief food aid is programmed annually, and is designed to respond to changes in the spatial incidence of vulnerability from one year to the next. Both Canada and the U.S. make pledges of their emergency food either through WFP or directly to DPPC. By contrast, all development food aid (i.e., FFW) essentially is programmed on a multi-year basis in selected areas designated for development projects. Such development-oriented food aid is typically programmed with a five-year time frame, in which the amount of food targeted for recipient weredas is based on the amount of work-days needed to accomplish the task. Ostensibly, there are heightened efforts to use food aid to simultaneously meet both relief and development objectives (e.g., the EGS program, in which FFW activities are explicitly targeted to areas and households in need). The nature of the activities of the sponsoring NGO influences how flexible they are in moving from one area to the next according to need. For example, Lutheran World Federation specializes in using FFW for soil and water conservation investments, which means that they are able to relocate their operations more easily and within a shorter time span than most other NGOs that tend to be involved in "integrated area development" activities in specific weredas that span several years. In general, however, we hypothesize that there is considerably less flexibility in targeting vulnerable weredas and households through FFW operations than FD programs, i.e., a greater degree of inertia despite changes in the spatial incidence of vulnerability.

3. FOOD AID TARGETING: CONCEPTUAL ISSUES

Food aid targeting is defined as "restricting the coverage of an intervention to those who are perceived to be most at risk" (Jaspars and Young 1995). "Most at risk" can be defined in various ways and may have numerous dimensions (e.g., nutrient intakes, purchasing power, assets, anthropometric or other health indicators). Ethiopian Government statements on food aid indicate that it is intended to redress both poverty and malnutrition (Federal Democratic Republic of Ethiopia 1996). Most analysts agree that household income is highly indicative of poverty, although it represents only one component of many (e.g., World Bank 1990). Household income is much less strongly related to nutritional intakes, though among the poor the relationship is stronger (Strauss and Thomas 1995); while nutritional status (heights and weights) tend to be related to income as well, again the relationship is not as tight as might be thought (Strauss and Thomas 1995).

For the sake of tractability and based on the empirical data available from Ethiopia, we focus on income-based measures of need, acknowledging that this emphasizes the poverty alleviation objective of food aid. We also determine the relationship between food aid and numerous other household and community influences.

One may be tempted to argue that since poverty and food insecurity are pervasive in Ethiopia, there is no need for targeting. However, as shown previously, there are wide variations in per capita incomes across weredas and across households within weredas, even though most rural households in Ethiopia would be considered poor by world standards. Also, the availability of food aid has always been short of perceived need, strengthening the argument for targeting the most needy households. Nevertheless, targeting is not without cost. There is a tradeoff between precision in targeting and its associated costs, particularly when governments have incomplete information regarding who is truly in need (Besley and Coate 1992; Van de Walle 1998). Also, to elicit political support for food aid to the poor, it may be necessary to have leakages to the non-poor (Besley 1997). Nevertheless, targeting, and perhaps significant targeting, is likely to be part of a socially optimal distribution system.

What would the household-level graphs such as Figure 1 look like if targeting programs were complete? Conversely, what would Figure 1 look like if targeting programs were completely untargeted (either randomly targeted or if available food aid was distributed equally to all households)? While no program can be expected to target the poor perfectly, it is useful to describe the shape of such a graph as a benchmark against which to assess the empirical results presented below.

Figure 3a plots households' pre-aid income levels (on the horizontal axis) against their adjusted incomes after counting the value of food aid received (on the vertical axis), following Besley and Kanbur (1993). Households whose pre-aid income is below the poverty-line threshold (PL) receive aid such that their after-aid income is brought up exactly to the poverty line. For example, a household whose pre-aid income level is at point *x* would receive food aid worth *z* in

order to bring that household's income up to the poverty line income. The shaded area represents the value of food aid transferred to households below the poverty line. Households whose pre-aid income is greater than the poverty line receive no food aid.

Figure 3. Food Aid Targeting under Ideal and Less than Ideal Conditions

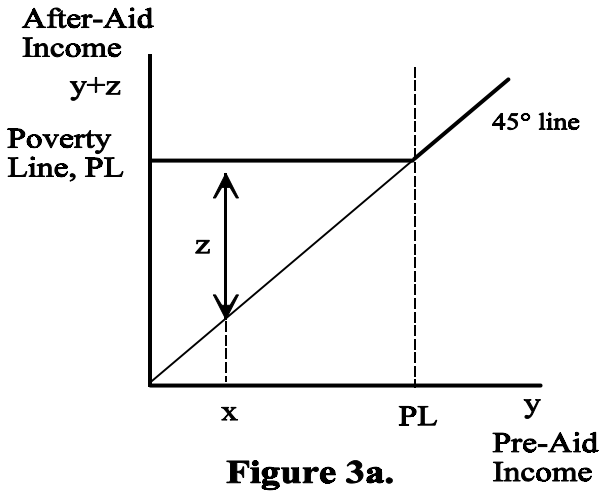


Figure 3a.

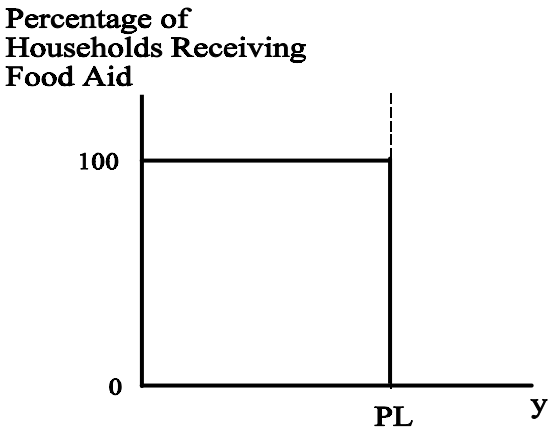


Figure 3b.

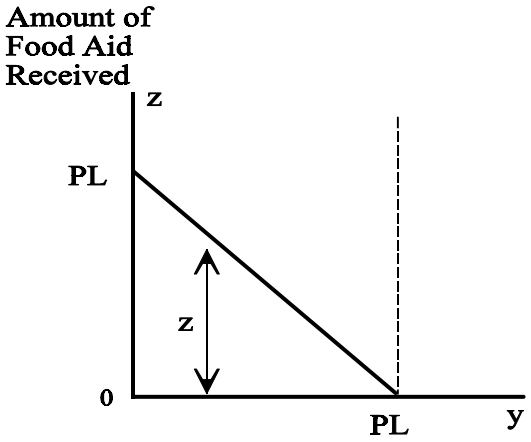


Figure 3c.

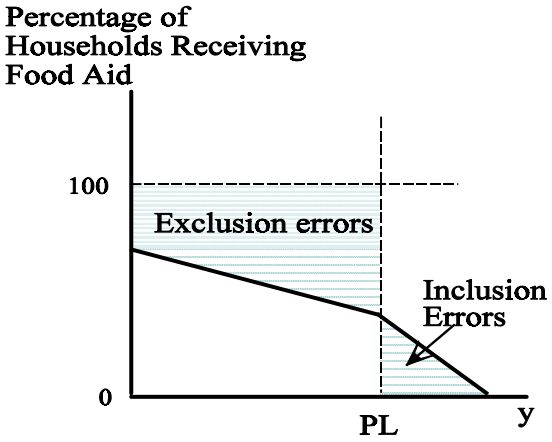


Figure 3d.

We might expect to see results similar to that displayed in Figure 3a only under the highly unrealistic conditions that:

- food aid authorities have perfect information on who are the vulnerable and the extent of their vulnerability;
- there are no fixed costs in the organization and implementation of food aid programs;
- government's only objective in food aid programs is to minimize the number of vulnerable households; and
- food aid resources are sufficient to meet the needs of all households below the threshold poverty line.

This "ideal" situation in Figure 3a would produce results shown in Figure 3b (which shows the bivariate relationship between income and the probability of receiving food aid) and Figure 3c (which shows the bivariate relationship between income and the amount of food aid received). Under the ideal targeting assumptions stated above, the probability of receiving food aid would be 100% for all households below the PL and zero for households above it. The relationship between household income and amount of food aid received under ideal conditions would confirm to Figure 3c, in which the value of food transferred was just sufficient to restore the recipient's adjusted income to the poverty line. Households with pre-aid income greater than PL would receive nothing.

There is little expectation that food aid targeting, in practice, should conform to the patterns reflected in Figures 3a-c. Collecting information both at region level and household level is costly. And to the extent that there is fixed costs in the operation of food aid programs, the correlation between the household vulnerability and receipt of aid should decline, certainly at national level and most likely within weredas as well. And there may be other objectives in food aid transfers in addition to minimizing poverty.

Now consider Figure 3d, which is similar to Figure 3b but shows an "incomplete" degree of income targeting. The probability of receiving aid is still negatively related to income, but not all households below the poverty line receive aid, a case commonly referred to as a **targeting error of exclusion** (see Jaspars and Young 1995). Moreover, some households above the poverty line do receive food aid, representing **targeting errors of inclusion**. In later sections, we examine the relative magnitude of these two types of targeting errors.

4. DATA SOURCES AND SAMPLES

The data come from the 1995/96 Annual Agricultural Sample Survey (ASS), fielded by the Ethiopian Central Statistical Authority (CSA), and the Food Security Survey (FSS), fielded on a subset of ASS households in 1996 by the CSA and the Grain Market Research Project. In addition, monthly rainfall data are taken from 40 rainfall stations distributed throughout Ethiopia and matched to the locations of the household samples. The 1995/96 Agricultural Sample Survey uses the same frame of enumeration areas (EAs) as used to conduct the 1994 Population Census. Some 612 rural EAs are sampled out of roughly 60,000, with probability proportional to population size.[19] In each of the EAs, 25 households are randomly selected, for a total of 15,374 households. Out of these, 7 are randomly sampled to be in the FSS, some 4,112 households total.[20] The FSS collected detailed information regarding amounts of food aid received by each household, plus other information. Of the households in both the FSS and ASS, we drop 86 because they are in one region, Afar, for which rainfall data was unavailable (Afar households are mostly pastoral households) and another 8 because of gross outliers in income.[21] Further, out of the roughly 25 ASS households per EA, 15 are selected for the collection of more detailed field-crop information, including actual measurement of fields and cutting and weighing of crops from the Meher (main) season.[22] Since the income variable that we use is constructed from field cutting data, for reasons detailed below, our analysis sample is constrained to the field cutting sample. Of the 3,823 cropping households in the Food Security sample, 3,244 have field cutting data for their Meher crops. A further 377 households were dropped due to missing crop cut information on at least some of their fields. The final sample contained 2,867 households in 348 weredas. There are roughly 460 rural weredas in Ethiopia.

Receipt of food aid is measured for each household in the FSS. For the past year the respondent is asked whether at least one member of the household participated in the food aid program. If yes, the type of program as reported by the household is recorded, separating free distribution from food for work, and by type of commodity received.[23] If aid was received, for each month

---

[19]Some 8 EAs were dropped because of security and accessibility inadequacies. In Ethiopia, each EA normally contains from 100-200 households.

[20]Actually, out of the FSS households, 126 are **not** in the ASS sample, for reasons that are not documented. They are more likely to be female headed, with half the land owned and a much greater likelihood of receiving food aid compared to the 3,823 households in both FSS and ASS.

[21]We dropped households with gross incomes per capita less than 3 birr or greater than 20,000.

[22]The cuttings are taken from a randomly selected 16 meter^2 area within each chosen field. The yield estimate is blown up to a field production estimate using the actual field size measurement.

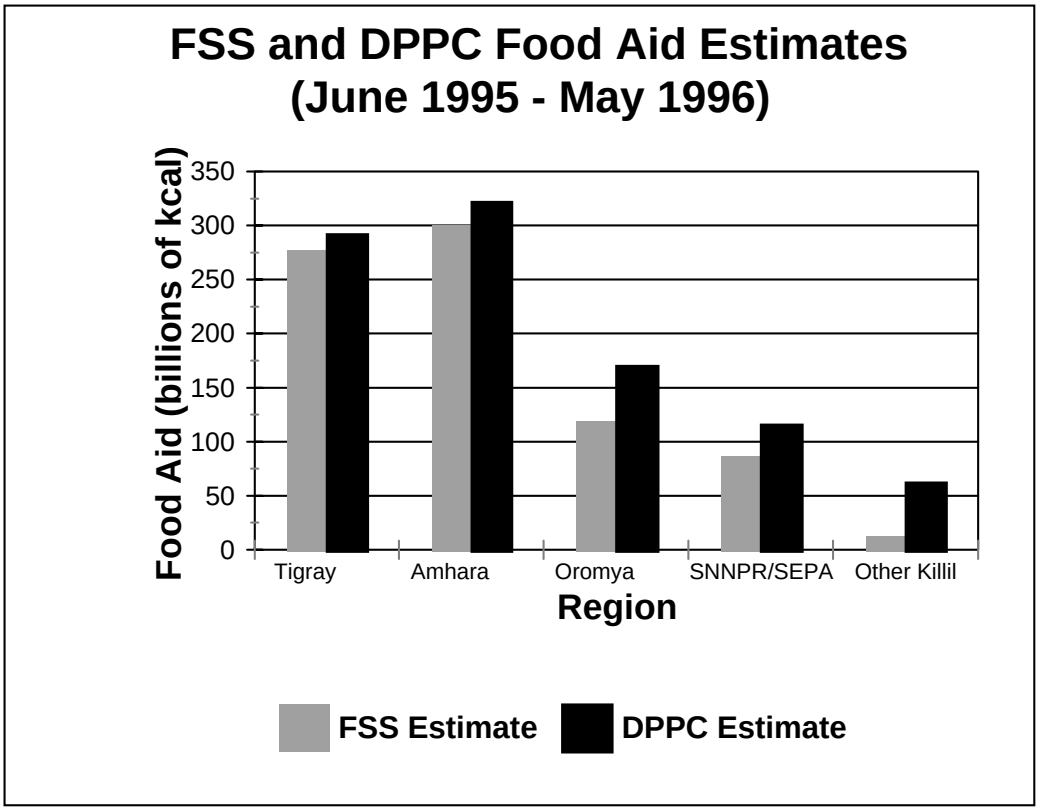
[23]Households tend to report more free food, relative to food for work, than is supposed to be the case according to government plans (Clay, Molla, and Debebe 1999). Anecdotal field reports indicate that food that was supposed to be distributed in return for work was, in many cases, actually distributed freely, with no work obligation imposed. Consequently it seems reasonable to use the household's assessment of whether they explicitly worked for the food received.

from June 1995 through May 1996 the quantities received were recorded. Thus, all the food aid variables are at the household level.

Free food was distributed in roughly 27.5% of weredas, and FFW programs operated in 21.5% of weredas over the recall period. However, only 13% of households report receiving free food and only 10% took food under an FFW arrangement. On average, about 40% of households receive FD or FFW in weredas that receive food aid. However, as shown in Table 1, both the proportion of households receiving aid, and the amounts received, vary substantially across zones. Over the entire sample, 20% of the households received either free food or food for work.

To test the validity of the survey data, we examine how our FSS household-level results compare with region-level food aid figures from the DPPC. After converting food aid receipts into kilocalories and then aggregating across months for the comparable 12 month period over which the DPPC data is reported, we find striking similarities across all major regions (Figure 4). Overall, our survey estimates amount to 82.6% of the DPPC's recorded deliveries. Since the DPPC estimates also include deliveries to urban areas and monetized food aid amounts, it is expected that they should be somewhat higher than the survey estimates, which do not capture urban and monetized food aid. This difference is especially evident in the "other killil" category, which includes Addis Ababa, Dire Dawa, and Harrar, all predominantly urban regions. However, in regions where food aid has historically been most important, the household-reported estimates of food aid receipt were highly consistent with DPPC estimates. In Tigray, for example, households reported receiving 278 million kcals of food aid compared with DPPC estimates of 290 million kcals (a 4% difference). Differences in Amhara Region were less than 8%. Overall, we conclude that the household-reports of food aid receipts in our CSA-enumerated survey is highly consistent with the more aggregated DPPC food aid delivery statistics.

Figure 4. Food Aid Distribution Estimates by Region, FSS and DPPC, June 1995-May 1996



5. EMPIRICAL MODELS AND VARIABLE CONSTRUCTION

5.1. Empirical Models

Evidence cited in Section 2 is consistent with a two-stage process in allocating food aid: first, aid is allocated across regions and weredas by the federal DPPC; and second, based on amounts to be allocated to each wereda, beneficiaries are selected by local village committees of some kind. Furthermore, in the case of FFW, households must decide whether or not to work in exchange for the food ration depending on their other labor opportunities. For FD, only stigma would prevent a household from accepting food, which seems unlikely in the context of areas in which food aid is endemic. These considerations suggest that estimation should be stratified by FD and for FFW, and that further, a two-stage estimation strategy be used in which first we explain allocations across local areas, corresponding to federal government decisions, and then within these local areas, corresponding to local leaders' decisions. The level of local area aggregation that we use is the wereda, a local political unit akin to a county with population sizes that vary from under 20,000 to 200,000 (for further detail, see Clay, Molla, and Debebe 1999; and Sharp 1997). Furthermore, since the graphs in Figure 3 suggest that the impacts of conditioning variables may differ between whether households or weredas get aid and how much they get, we use a hurdle model which distinguishes any receipt from how much. We use probits to model whether communities or households receive aid and ordinary least squares (OLS) to model how much conditional upon receiving.[24] Thus, for both FD and FFW, we use probits to analyze which weredas receive such food aid and truncated OLS regressions to examine the average amount per household. We do the same at the household level. However, when analyzing household allocations, only weredas having at least one sample household that received food aid of the type being considered (FD or FFW) are included in the regressions.

For each of the probit and truncated OLS regressions, we use a specification in which observable household and wereda variables are used together with dummy variables at a more aggregate region level, the killil. In addition, we also use a specification with household level covariates together with wereda dummy variables. In these probit regressions only weredas in which sample household distribution is incomplete (between 0% and 100%) get used.[25]

In the case of food for work, participation by a household requires that an FFW project is present in the community and the household must send an individual(s) to work. If there are no binding hours constraints, then a simple income maximization model can be considered in which a household will send one or more members to work for food, at an implicit wage of w, if the person's shadow wage, w^*, is less than w. Thus observables used as covariates should be ones

[24]We do not feel that we have plausible identifying information, so we do not attempt any selection corrections.

[25]Finally, we also run upper-censored tobits on the percentage of households within each wereda that receive food aid, including weredas in which all sample households are recipients. We do not report those results as they are quite similar to the household-level probits that use kill-zone, not wereda, dummy variables.

that help explain the potential market wage or the shadow wage. Unfortunately the survey did not record which household members worked for food aid, so that the analysis has to be done at the household, not individual, level.

5.2. Covariates

Since we have little ex-ante insight into the nature of allocation decisions, we use a variety of covariates at the community and household levels that are likely to be exogenous to these decisions and that may be known to government and NGO officials. We divide these into variables that attempt to measure household resources, household demographics, community accessibility, community long-run agroclimatic potential, and short-run weather shocks, in both the wereda-level and household-level models.

Household Resources: The household resource variables we use are whether the head of household has any schooling, the amount of land owned, and the log of household gross income per capita.[26] For the wereda analyses, wereda means are included for each of these covariates. Gross income is the sum of production value for food crops in the 1995 Meher growing season (harvest typically being from September through December) taken from crop cuttings;[27] plus self-reported production value in 1995 for non-food crops such as coffee (no field cuttings were taken for these crops); less cash costs for all crops combined (which is mostly fertilizer costs); plus 20% of the value of livestock as an approximation to livestock income; plus an estimate of off-farm cash income contributed by each household member over the past year prior to the survey. Free food receipts and FFW payments are not included in this measure, since we will be attempting to explain them. Unfortunately this income measure does not include any income from the Belg harvest.[28] This is likely to be important in only a few areas of Ethiopia. We test the robustness of the main results in Section 6.3 by re-running the models after excluding these areas.

The top two panel graphs of Figure 5 show how the probability of receiving food aid varies with the log of per capita income, while the bottom two panels show how per capita amounts received (conditional on positive receipt) vary with the log of per capita income.

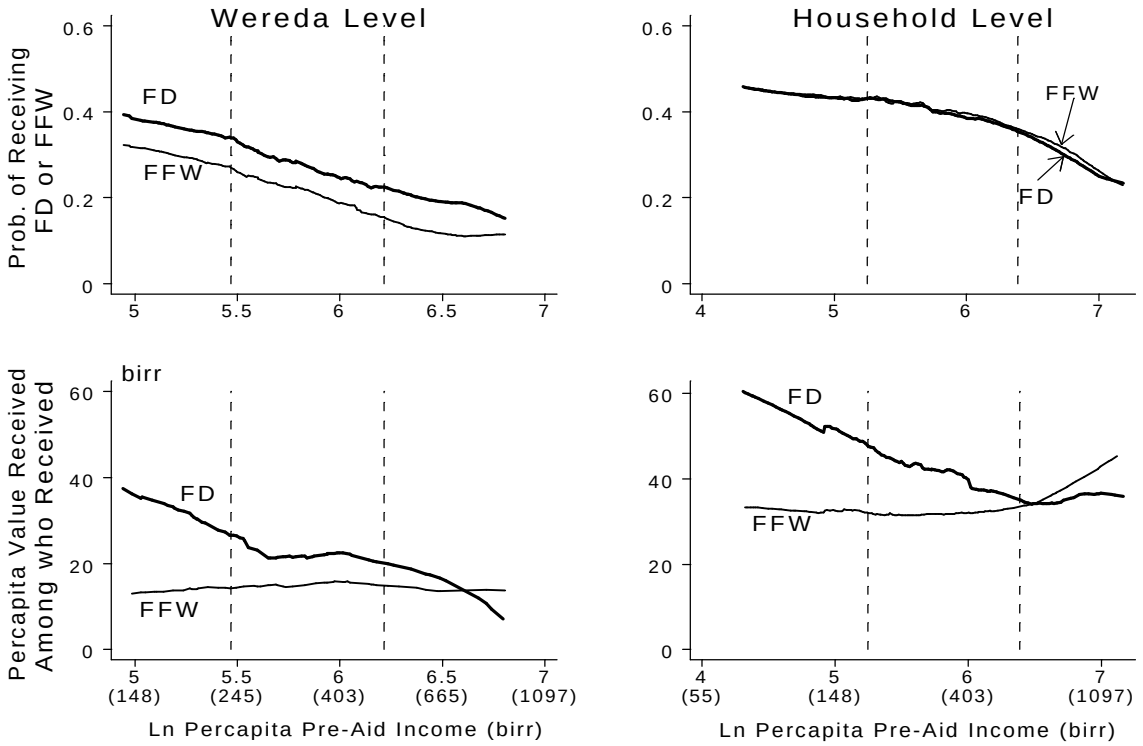
---

[26]Schooling information is only available for the household head in both the ASS and the FSS. Unfortunately no health outcome information is available in these two surveys.

[27]Self-reports are also available, however CSA considered the crop cut data to be more reliable. This is because self-reports of production are reported in many different local units, and to convert into a common unit such as kilograms, one has to use CSA gathered conversion factors of uncertain reliability.

[28]Belg is the second, short growing season found in areas with a bimodal monthly rainfall distribution. The Belg harvest contributes roughly 10% of total national cereal production. While both the ASS and FSS contains a forecast of Belg production, it is a forecast, taken 2-4 months before harvest. We do not consider this to be very reliable as a harvest estimate and so exclude it from our income calculation.

Figure 5. Free Distribution (FD) and Food for Work (FFW) by Ln Per capita Income



Note: Dotted lines are drawn at the 25th and 75th percentiles of ln per capita pre-aid income, corresponding to 284 and 623 birr for weredas, and 190 and 595 birr for households.

Top left panel includes all weredas sampled in Ethiopia. Bottom left panel includes only weredas in which food aid was received. Top right panel sample includes only households in weredas in which food aid was distributed. Bottom right panel includes all households that received free distribution and food for work, respectively.

The left-hand panels graph the relationships at the wereda-level and the right-hand panels for households. The household-level graphs are conditioned on living in weredas that have some sample households that receive aid (unlike Figure 1, which is unconditional). One can see that wereda participation rates are declining in mean log income for both FD and FFW, with the free distribution receipt probabilities being higher than those for food for work by just over 5%, across the distribution of mean incomes. Per capita amounts received are also inversely related to mean log per capita income for free distribution, but are constant for FFW. At the household-level, the FD and FFW participation curves are almost identical. They display a gentle negative slope until a log-per capita income of around 6, corresponding to just under the 60th percentile, but then participation drops off much more steeply for households with higher log per capita incomes. The amounts received per capita by households fall off with log per capita income for

free distribution, but not for food for work. Figure 5 strongly suggests that the probability of receiving food aid is linearly related to our log income measure at the wereda level. We use this fact to justify our linear specification used in the regressions. However, these bivariate figures indicate, especially for FFW at the household level, that non-linearities may be important. We explore these possibilities in the empirical work as well.

Household Demographics: We control for household size and the proportion under 9 years and over 55. We also allow for dummy variables if the self-reported head of household is a currently unmarried woman, or a married woman. We also allow for dummy variables if the head is Moslem or Protestant (the omitted category being Ethiopian Orthodox, the major religion in the country). These are included to account possible religion-based allocation patterns that are sometimes anecdotally reported in some areas.

Community Access and Agroclimatic Covariates: Community access should be related to the cost of providing food aid. Ethiopia has notoriously poor infrastructure. We have GIS (Global Information System) data at the wereda level as to whether certain types of roads are present, from paved roads to dirt paths. Consequently we use five dummy variables, road type 1 being the best conditioned road, followed by type 2, 3, and so forth. We also know wereda-level mean elevation (in meters), which will be related to agroclimatic conditions and possibly to accessibility. Elevation readings were taken using the Global Positioning System, a satellite-based system to take such readings.

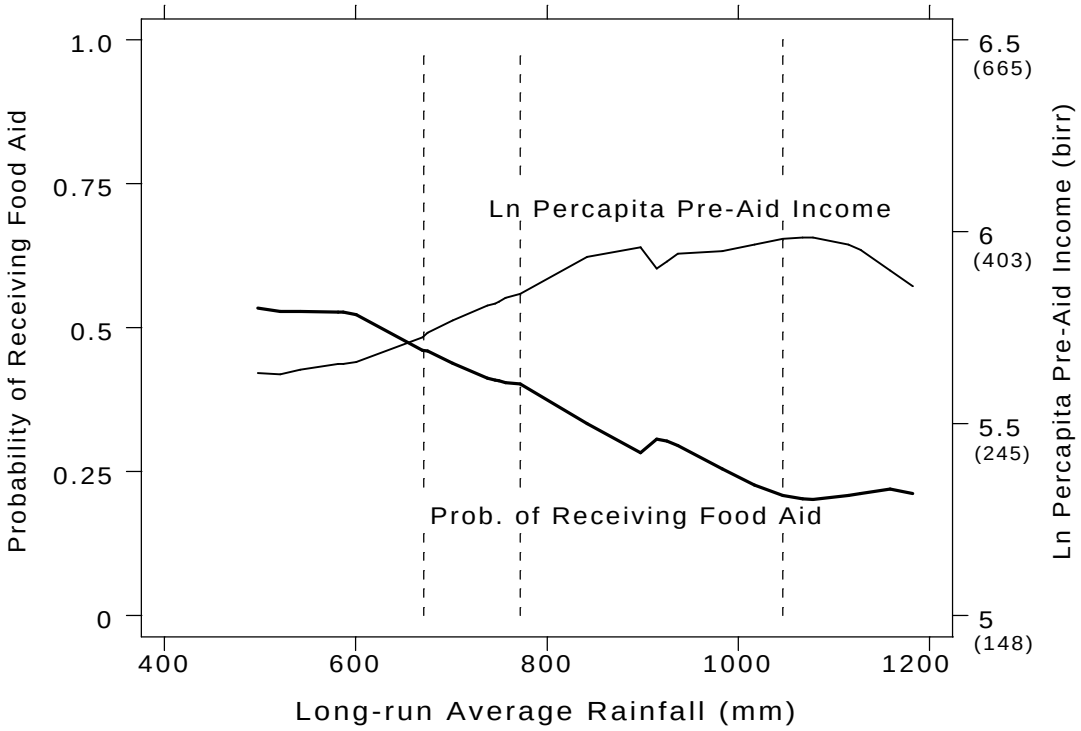
Rainfall is a critical factor related to cereals production in Ethiopia because farming is almost entirely rainfed. Drought-induced production shortfalls and consequent large cereals price spikes were major causes of the 1984/5 famine in Ethiopia (Webb, von Braun, and Yohannes 1992). We have available median Meher season planting rainfall (in millimeters) from 1988 through 1995.[29] These were derived by summing April through August rainfalls for these years from data collected by 40 rainfall stations of the Ethiopian National Meteorological Services Agency. Each sample zone (an area whose size is in between a wereda and a killil) was matched up to the closest rainfall station, provided there was at least one in the area [30] As shown in Figure 6, in rural Ethiopia long-run cropping season rainfall is related to wereda mean log per capita income levels. As can also be seen, wereda food aid deliveries are negatively related to long-run rainfall.

Weather and Other Shocks: We use two types of weather shock covariates. First we use our rainfall data and compute the differences between Meher rainfall in 1994 and 1995 and the longer run median. We use both 1994 and 1995 because our food aid receipt variables cover the period from June 1995 through May 1996. Crop income from 1994 would be relevant needs

[29]These years were chosen because earlier years had many missing observations for many stations.

[30]As mentioned, the Afar area was the one that did not have a rainfall station close by (and the nearest did not have 1995 data). We consequently dropped that area, which only contains 61 households. All weredas within a zone were assigned the same long-run median rainfall.

Figure 6. Wereda Food Aid Allocation by Rainfall



Note: Dotted lines are drawn at the 25th, 50th, and 75th percentiles of long-run average rainfall, corresponding to 671, 772, and 1047 mm.

criteria for food aid allocations up to at least the middle of 1995, while income from the 1995 crop year would be relevant in considering food aid allocations in late 1995 and 1996.

We also have available plot-level information from the Agricultural Sample Survey regarding whether a plot suffered damage from too little rain, too much rain, or from pests and diseases. We construct three variables that measure the percent of household or wereda field area so affected. These plot-level "shocks" are only available for the 1995 Meher season, so we can't infer changes from them. We can tell how a particular household fares relative to the wereda average in 1995, but some part of the "shock" may in fact be predictable. Controlling for the wider area rainfall shocks (that are deviations), one should interpret the plot variables as being roughly the impact of variation within zones, because only a small part of the variation in the

plot-level drought variable is related to the community long-run and deviation rainfalls.[31] Hence there is much independent variation of these plot-level shock variables.

Food Aid History: As emphasized in the introduction, one of the central concerns of this paper is the extent to which current allocations depend on past allocations, and if so, why. While the data are cross-sectional, we have two sources of information on past food aid allocations: one direct and one indirect. In the FSS questionnaire, respondents were asked whether they had received free food or food for work in the past and if so, in how many years out of the past five.[32] If the household is a recipient of food for free (food for work) in the 1995/6 year we subtract one from the stated number of years receiving during the past five to get a measure of the number of years of receiving food for free (food for work) during the four years prior to 95/96. We create a series of dummy variables if the household was a recipient during one, two, three or four of the prior four years and use these to represent recent historical patterns of food aid allocation in some of our specifications. At the wereda level we take the maximum number of years out of the prior four that some sample household received food aid and create a similar dummy variable, separately for free distribution and food for work.

We also take the group of households who received some food aid during the past five years but did not receive aid in 1995/6. These households, which we call "exiters" are the subject of analysis in Section 8. Of the 165 weredas that received free distribution sometime in the past five years, 78 did not receive any in 1995/96. This phase-out is mirrored among households: out of 782 that received free distribution during the past five years, 444 did not last year (food for work exhibits the same pattern). On the other hand very few weredas who had no experience with food aid in the past five years began receiving any in 1995/96. The data indicates that a larger number of weredas and households exited from food aid programs in 1995/96 than entered into food aid programs. This is consistent with the macro evidence presented in Figure 2 showing a general decline in the amount of food aid distributed nationally over the early 1990s. This raises a question as to whether households exiting from food aid are the better-off households, or households with positive rainfall shocks (or at least without negative ones). We analyze this question in Section 8.

Insights on near-historical distribution patterns can also be obtained by calculating which weredas and households have received food aid for three or more years out of the five years prior to the survey (including the 95/96 survey year). We refer to these households and weredas as "chronic recipients," and form binary dependent variables from them, which are analyzed in Section 8. Some 13.5% of weredas are chronic recipients of free food over the period 1991 to 1996 and 9% are chronic recipients of FFW. Among households in these chronic recipient weredas, 31.5% and 19.8% are chronic recipients of free food and food for work, respectively.

---

[31]A regression of percent of area affected by too little rainfall on the these other rainfall variables, plus elevation, road type dummies and killil dummies has an R^2 of only .25. The coefficients on long-run rainfall and on deviations in 1994 and 1995 are -.0108 (t=5.4), -.0079 (t=3.1), and -.0136 (t=5.8) respectively. Regressions of the percent of area affected by too much rainfall or by diseases or pests on these same covariates have much lower R^2s, .047 and .014 respectively.

[32]Unfortunately we do not know in which of the past five years food aid was received.

5.3. Organizational Presentation of Findings

Sections 6 through 9 present 15 regression model results. These models are specified to account for a number of different dimensions of food aid targeting: (1) federal vs. local food aid allocation decisions; (2) free food vs. food for work; (3) factors determining whether a household or wereda receives food aid vs. how much is received for those receiving; and (4) potential regional level differences in food aid. To help the reader keep track of the various results, we provide a brief road map here. As discussed in Section 2, food aid allocations in Ethiopia involve a two-step process. The first step reflects the decisions by the Federal authorities as to which weredas will receive food aid and how much: the second step reflects the decisions of local authorities in determining which households will receive aid (and how much), subject to the wereda-level allocation decisions of the federal authorities.

Table 2 in Section 6.1 presents wereda-level determinants of the probability of receiving both free food and food for work. The results are based on probit models that include all weredas sampled at the national level. These models reflect the allocation decisions of federal DPPC authorities in their allocation of food aid to weredas.

Table 3 in Section 6.1 presents truncated OLS models, separately for free food and food for work, of the amounts distributed among weredas in which that type of aid was distributed. Again, these models reflect the allocation decisions of federal authorities.

Table 4 in Section 6.2 presents household-level determinants of the probability of receiving free food and food for work. The results are based on probit models that include all weredas in which free food (in the FD model) or food for work (in the FFW model) was distributed.

Table 5 in Section 6.2 presents truncated OLS models of the amount of food aid distributed among households in Ethiopia that received aid, again separated by type of program.

Table 6 in Section 7.1 presents probit models of the probability of receiving free food at household level, based on separate regressions for each of the four regions in Ethiopia where adequate data observations were available: Tigray, Amhara, Oromiya and Southern Regions.

Table 8 shows how amounts of free food distributed to recipients varied by income and other household and locational characteristics. The observations include only households in weredas where free food was distributed. At this level of analysis, the amount of free food allocated to each wereda has been fixed by federal level authorities. Hence, these models measure the allocation criteria of wereda and PA authorities.

Table 9 in Section 7.2 presents probit models of the probability of receiving FFW at household level, based on separate regressions for the four regions. Table 10 examines how amounts of FFW received by participants varied by income and other household and locational characteristics. Again, the observations include only households in weredas where FFW programs were in operation. These models also measure the allocation criteria of wereda and PA

authorities. Tables 7 and 11 summarize the relationship between household per capita incomes and food aid allocations after controlling for other covariates.

Table 12 in Section 8.1 presents probit model results of wereda-level "exit" or discontinuation of food aid programs. The sample is composed of weredas that received free distribution or food for work over the previous four-year period (1991/92-1994/95) for which recall data was obtained.

Table 13 in Section 8.1 presents probit model results of household-level "exit" from food aid programs. The sample is comprised of households in weredas that received free distribution or food for work over the previous four-year period (1991/92-1994/95) for which recall data was obtained.

Table 14 in Section 8.2 presents probit models of the determinants of chronic food aid participation at the wereda level. The sample is comprised of all weredas sampled at national level.

Table 15 in Section 8.2 presents probit models of the determinants of chronic food aid participation at the household level. The sample is comprised of households in chronic food aid-receiving weredas.

Table 16 in Section 9 presents wereda-level probit models that assess the relationship between spatial vulnerability and food insecurity during the 1984/85 famine and current food aid allocation patterns. The probit models are similar to those displayed in Tables 2 and 14 but with the addition of a variable designed to measure spatial vulnerability during the 1984/85 famine. The sample contains all weredas sampled nationally.

Tables 17 and 18 examine the determinants of mean wereda and household income, both using OLS. The household-income models use both wereda-fixed effects and wereda-level characteristics such as rainfall, road infrastructure, cereal prices, and regional dummies. These models are designed to identify easily identifiable and measurable indicators both total household income and per capita income.

6. RESULTS: NATIONAL LEVEL

6.1. Regional and Community Allocations

6.1.1. Probability of Receiving Food Aid

We begin with a discussion of the characteristics of weredas that received the different types of food aid in 1995/6. Table 2 provides the basic results.[33] We start, in columns 1 and 4, by reporting the simple probits using only the killil region dummies. One can immediately see that Tigray Killil has a much higher probability of receiving aid than any other region, and significantly so, the differential being especially high for free distribution.

In columns 2 and 5 we add the observable resource, access and agroclimatic, and shock covariates. The log of per capita income is significantly inversely related to participation, both for free food and for food for work. Increasing wereda mean log per capita income from the 25th (5.5) to the 75th (6.2) percentile would decrease the probability of receiving free distribution from 30.4% to 24.1%.[34] For food for work the predicted reception probabilities decline from 24.7% to 16.5%. And yet the predicted probabilities of receiving free food or accepting food for work when mean log per capita income is 6.6 (the 90th percentile), are still substantially above zero, 21.1% and 13.0% respectively. Thus, although there is definite income targeting with respect to the weredas that receive food aid, there is only a moderate difference in the probability of being a recipient across fairly large differences in income. No targeting is apparent with respect to education of household heads or to mean land owned.

Of key importance is the finding that a high proportion of poor weredas were not allocated food aid. The probability of receiving free food was no more than 35% even for the very poorest weredas in the country, and is even less than that for FFW. This indicates that either the amount of total food aid available for distribution in 1995/96 was insufficient to meet the needs of all poor weredas, or a large share of available food aid was distributed to relatively non-poor weredas, or both. We return to this issue later.

A potential reason why predicted wereda participation probabilities do not decline more as mean log incomes increase is that there are still numerous households within the weredas with low incomes. To test this, we add to our basic specification the wereda variance of log per capita incomes, a widely used measure of income inequality. The only specification for which this

[33]We report the marginal probabilities, and asymptotic normal statistics. For dummy variables, the "marginal" probabilities are calculated from discrete changes in the dummy variable, holding other variables constant at their sample means.

[34]These probabilities are calculated as the mean over all sample points after changing the log of each wereda's mean log per capita income to the appropriate amount (i.e., 5.5 for the 25th percentile). We use the same method to calculate expected probabilities for other covariates.

Table 2. Determinants of Food Aid Allocation: Wereda-Level Results (Probit[A])

	Free Distribution (1 if at least one household in the Wereda received FD)			Food for Work (1 if at least one household in the Wereda received FFW)		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
ln (Per capita Income)		-0.102	-0.020		-0.116	-0.051
		(1.99)*	(0.37)		(2.85)**	(1.55)
Fraction of households with some		-0.083	0.035		0.133	0.156
education		(0.67)	(0.27)		(1.37)	(2.03)*
Mean household size		-0.001	0.042		0.002	0.021
		(0.04)	(1.30)		(0.08)	(1.08)
Mean% of children (0-9 yrs) in households		-0.006	-0.005		-0.008	-0.007
		(1.86)	(1.35)		(2.91)**	(2.91)**
Mean % of elder (over 55) in households		-0.005	-0.004		-0.007	-0.005
		(1.19)	(0.82)		(1.98)*	(1.91)
Fraction of female headed, not married		0.207	0.352		-0.054	-0.158
		(1.06)	(1.64)		(0.35)	(1.20)
Fraction of female headed, married		0.033	-0.003		0.457	0.334
		(0.12)	(0.01)		(2.13)*	(1.86)
Mean size of land owned		-0.017	-0.029		0.005	0.008
		(0.92)	(1.05)		(0.69)	(1.36)
Fraction of Muslim households		0.126	0.127		-0.071	-0.081
		(1.55)	(1.48)		(1.03)	(1.43)
Fraction of Protestant households		0.064	0.033		0.085	0.131
		(0.45)	(0.22)		(0.74)	(1.31)
Fraction of livestock households		-0.540	-0.545		-0.515	-0.480
		(1.42)	(1.24)		(1.20)	(1.35)
Mean % of plot area with shortage of rain		0.004	0.004		0.004	0.004
		(2.64)**	(2.72)**		(3.04)**	(3.78)**
Mean % of plot area with flood		0.003	0.005		0.005	0.005
		(1.33)	(2.02)*		(2.52)*	(3.15)**
Mean % of plot area with crop disease or		0.002	0.001		-0.000	-0.002
insect problems		(0.93)	(0.24)		(0.18)	(0.88)
Average rainfall 1988-95 (mm) *10e-2		-0.025	0.002		-0.026	-0.007
		(1.84)	(0.11)		(2.25)*	(0.69)
Rainfall shocks in 1994 (mm) *10e-2		0.012	0.027		0.009	0.011
		(0.69)	(1.43)		(0.69)	(0.99)
Rainfall shocks in 1995 (mm) *10e-2		-0.025	-0.028		-0.009	-0.009
		(1.68)	(1.76)		(0.74)	(0.99)
Elevation *10e-2		0.013	0.014		0.017	0.017
		(2.18)*	(2.15)*		(3.46)**	(4.12)**
History of Receiving Food Aid[B]						
4 years in last 4 years (0,1)			0.792			0.868
			(4.34)**			(4.25)**
3 years in last 4 years (0,1)			0.517			0.262
			(2.95)**			(2.33)*
2 years in last 4 years (0,1)			0.295			0.425
			(2.73)**			(3.53)**
1 year in last 4 years (0,1)			0.173			0.288
			(2.30)*			(4.22)**
Previous experience with the other type of			0.209			0.087
food aid (0,1)			(3.03)**			(2.11)*
Tigray[D]	0.494	0.502	0.126	0.299	0.380	0.339
	(4.51)**	(3.27)**	(0.82)	(3.02)**	(2.60)**	(2.28)*
Amhara	0.048	0.135	-0.074	-0.044	0.163	0.151
	(0.66)	(1.25)	(0.67)	(0.70)	(1.61)	(1.54)
Oromiya	-0.119	0.017	-0.041	-0.090	0.147	0.148
	(1.76)	(0.18)	(0.45)	(1.51)	(1.83)	(2.03)*
Other Killils	0.231	0.474	0.292	0.051	0.399	0.337
	(1.95)	(2.88)**	(1.66)	(0.51)	(2.40)*	(2.02)*
Wald tests: For History variables			24.7 **			32.6 **
			[0.00]			[0.00]
For Plot level shocks		8.10 *	9.86 *		13.5 **	20.5 **
		[0.04]	[0.02]		[0.00]	[0.00]
For Rainfall shocks		3.13	4.80		0.95	1.90
		[0.21]	[0.09]		[0.62]	[0.39]
For Road dummies[C]		6.69	7.46		5.09	7.31
		[0.24]	[0.19]		[0.41]	[0.20]
For Regional dummies		22.2 **	7.22		10.1 *	7.16
		[0.00]	[0.12]		[0.04]	[0.13]
Log likelihood	-181.5	-151.8	-123.6	-170.3	-135.1	-104.6
Observations	348	348	348	348	348	348

Note: * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are z-values. Numbers in brackets are p-values. A) Reported coefficients are changes in marginal probability. B) At least one household received FD (or FFW) for 4 years in last 4 years, and so on. C) Coefficients of road dummies are not reported. D) Omitted region is "South."

inequality variable has a z-score over 1 is in the base case for free distribution. The mean log income marginal probability rises to -.118 (z-statistic of 2.25) and the marginal probability for the variance of log per capita income is -.12 (z-statistic of 1.86). Now the predicted probability of wereda receipt of free distribution at the 90th percentile of mean log per capita income is 20.3%, almost the same as in the specification without variance of log per capita income. So, apparently it is the case that the income targeting is incomplete. It is interesting that increasing income inequality, holding mean log incomes constant, has the effect of lowering the wereda participation probability. This result implies that comparing two weredas with equal mean log incomes, the one with a higher proportion of households with low incomes was less likely to receive free distribution.

Median Meher season rainfall from 1988-95 is negatively (significant at the .10 level) related to the chance of weredas receiving food aid, even controlling for other observables. The mean of median Meher rainfall across weredas is 843mm, a fairly high amount. There is a great deal of dispersion, however, for instance the 25th percentile is 672mm and the 75th percentile, 1047mm. Changing median long-run rainfall from the 25th to the 75th percentile lowers the average probability of a wereda receiving free distribution by 7.9 percentage points, to 23.0%. For food for work average probabilities are lowered from 24.8% to 15.3%. So there is some targeting of food aid by long-run regional rainfall levels, more so in the case of food for work.[35]

The zone-level rainfall deviation variables (for 1994 and 1995) are not jointly significant in either the free food or food for work case, although rainfall shocks in 1995 has a negative marginal probability almost identical to that on long-run rainfall for free food, and it is significant at the 10% level.[36]

Of the plot-level shock variables, farmer reports of having too much rain is positively related to both free distribution and participation in FFW at the wereda level and reports of too much rain are positively related to receiving FFW, each significant at 5%. The disease and pest shock variables do not significantly affect food aid receipt. Moving from the 25th to the 75th percentiles of each of the plot drought and flood percent of area affected variables results in the probabilities of free distribution increasing from 24.5% to 27.1% for drought and from 26.5% to 27.5% for flood. Food for work probabilities increase from 18.0% to 20.5% and from 18.9% to 20.7% for droughts and floods. The fact that these changes in odds of wereda participation are not large, stems in part from the fact that the inter-quartile range is small, from 0% to 7.5% of

[35]Although Figure 6 suggests that wereda food for work receipt is a concave function of long-run median rainfall, quadratic terms, when tried, were only significant when history variables are added. They are not reported here.

[36]We experimented with quadratic terms in both rainfall shocks, thinking that larger shocks might elicit a larger response. In the case of free distribution that turned out to be the case for the 1995 shock, but the opposite held true for the 1994 shock. The marginal effects are 5.73e-5 (z-statistic of 0.28) and -6.07e-7 (z-statistic of 1.86) for 1995 and -3.5e-4 (z-statistic of 1.10) and 1.21e-6 (z-statistic of 1.71) for the 1994 shock. The joint chi-square statistic is 10.32, which is significant at the .05 level. For FFW, the rainfall shock variables remain not jointly significant at standard levels, a chi-square statistic of 5.65 with 4 degrees of freedom.

area for drought problems, and 0% to 4% for flooding. Of course, if the changes in percent of plot area affected are larger, so too will be increases in the probabilities of reception.

Specifications were tried that included interactions between long-term rainfall and the two rainfall shock variables and separately, between long-run rainfall and plot-level shocks. None of these proved jointly significant. In addition, we interacted mean wereda per capita income with each set of shock variables separately. Neither was close to significant in the case of rainfall shocks,[37] while plot-shock-income interactions were jointly significant at the .05 level for free distribution.[38] The major effect is that the negative influence of mean income on the probability of receiving aid is lessened when the wereda has more flooding.[39]

Among other covariates, elevation is positively (and significantly at the .05 level) related to receipt of food aid, but the road dummy variables tend not to be significant. The interpretation of the elevation variable is not straightforward, but may be related to the fact that highland areas tend to suffer from greater land degradation and population pressure compared to lowland areas. As a result, they tend to be more intensively targeted in food assistance programs.

The Tigray marginal probability is almost unchanged for free distribution when covariates are added, but actually increases for FFW. One can conclude that these observable covariates do not help explain why weredas in Tigray are so likely to receive food aid. As shown in Table 1, per capita incomes in Tigray during the survey year were actually 12% higher than the national average, and the proportion of households in Tigray that fell into the bottom national income quartile was only 15%.

Once we control for the wereda's recent history of receiving food aid, which we do in columns 3 and 6 of Table 2, the regional effects lose their explanatory power in the case of free distribution. The Tigray "marginal" probability falls from .5 to .12 and loses all statistical significance. In contrast, the Tigray effect on FFW hardly shrinks and remains significant. Marginal impacts of being in other regions also shrink towards zero for free food.

The history dummy variables have extremely large "marginal" effects that swamp all else. The single most important factor determining current year probability of receiving aid is how commonly it was received in the past. Interestingly, the "cross-program" effect (e.g., the change in marginal probability of receiving FFW resulting from receiving free food in the past) is

[37]Chi-square statistics testing the two interaction terms jointly are 2.05 and 0.97 for free distribution and food for work respectively.

[38]The chi-square statistic for those three interactions is 9.55.

[39]This also means that the impact of flooding on receiving aid is greater for higher income weredas.

positive and significant at the .01 level for both free food and food for work.[40] The pattern of allocation by government indicates that it does not view the two programs as substitutes.

The interpretation of these "own" and "cross" program effects is tricky because these history variables are effectively lagged endogenous variables. One can usefully think of the problem as one of separating the impacts of unobserved heterogeneity from history, or state dependence (see, for instance, Heckman 1981). Equation 1 is a prototype example in which the regression

$$Y_{i,t} = Y_{i,t-1}\alpha + X\beta + \mu_i + \epsilon_{i,t} \qquad [1]$$

includes a lagged dependent variable, $Y_{i,t-1}$ while the unobserved error term includes a part, μ_i, which is time-invariant, but differs by weredas or households and a part, ϵ, that is independent over time and across weredas.[41] The problem is that $Y_{i,t-1}$ is correlated with μ_i, though it is independent of $\epsilon_{i,t}$, so that OLS (or simple probit) estimates of α are inconsistent as estimates of the true history effects, so long as μ exists. Another way of looking at the problem is that our usual estimates of α can't distinguish between whether the impact of $Y_{i,t-1}$ represents a true history effect or the effect of the omitted unobserved heterogeneity term, μ_i. The error component μ_i can usefully be thought of as arising from time-invariant unobserved variables at the wereda (or household) level, such as may be related to long-run neediness. Real effects of $Y_{i,t-1}$, can be usefully thought of as representing inertia. From these probit results we unfortunately can't distinguish between the two, although later we will use what we consider to be a good proxy for μ_i in an attempt to do so.

Note that once we include the food aid history variables, other covariates that had significant impacts in our earlier specification become insignificant and have marginal effects that shrink towards zero, particularly for income and long-run median rainfall, in both the free distribution and food for work equations. An important exception occurs for the plot-level shocks in both FD and FFW probits, which maintain the magnitude of their marginal impacts and their significance levels. This finding is somewhat important because it implies that even controlling for past receipt of aid, plot-level water shocks will increase the chance of remaining an aid recipient. This implies that some flexibility exists, despite history. However, this apparent flexibility may arise entirely because the volume of food aid in Ethiopia has declined in recent years. Fixed costs should matter much less for phasing out programs than they would for starting programs in new weredas, however the magnitudes are small. For FFW, increasing the percent of fields damaged by too little rain from the 25th to the 75th percentiles would increase the probability of having aid from 18.0% to 20.5%; for too much rain, from 18.9% to 20.7%. For free distribution food the same changes in plot drought would change the probabilities from 24.7% to 27.0%, and

[40]We have tried disaggregating the food for work history dummy variable in the same way as we do the free distribution variables, when estimating the free distribution receipt probits (and visa versa), but it does not make much difference.

[41]When we analyze households with wereda fixed effects, the fixed effects will capture any wereda-level unobserved effect. However, there may be unobserved household-level effects that remain.

for changes in plot flooding, from 26.0% to 27.3%. Even so, these impacts are trivial compared even to having had food aid in one of the last five years.

6.1.2. Values of Food Aid Received by Weredas

In addition to exploring whether weredas received food aid, it is of interest to explore the determinants of how much food aid was received per household. The decision rules applied may be quite different than the ones used to determine whether a wereda should receive any aid. For example, if the fixed costs of moving aid programs across weredas are very high, one wouldn't expect programs to move rapidly as new information, such as on new rainfall shocks, became known. However, it is plausible that fixed costs related to changing throughput may be less, especially for reducing throughput. Consequently, it is possible that the impact of shocks, even conditional on past history, may be larger for the amount of aid per household than it is on the probability that weredas are dropped or added to the programs.

In this analysis, we exclude weredas that received no food aid because we want to concentrate on the decisions made regarding amounts, which as discussed in Section 2 seem to differ from those having to do with who gets any. Table 3 contains the truncated OLS results for free distribution and food for work respectively. The table is organized similarly to Table 2. The sample sizes are small, and hence nothing is estimated with precision. Indeed F-tests of all coefficients jointly passes at just under and just over the .10 level for free distribution and food for work respectively. Among the individual coefficients that are significant at the .10 level, mean wereda per capita income negatively affects the value of free distribution received per capita, while a higher proportion of elderly positively affects the value of free food received. Having more area affected by diseases also raises the amounts per capita that are received. In the case of mean income, a large change, from the 25^{th} to the 75^{th} percentile, would lower the mean per capita value received by approximately 15.4 birr, just over 60% of the 24.9 mean per capita value of free distribution received in the 96 weredas that receive FD. A shift, equivalent to the inter-quartile range in the percent of area affected by disease, would increase mean value of free food aid received by 13.5 birr, also a substantial amount. For food for work, increases in rainfall in 1995 above the 1988-1995 median actually raises the value of FFW coming in. Interestingly, for both types of food aid, the effect of getting some food aid of either type in the past has no relationship to how much comes in now.

Table 3. Determinants of the Value of Food Aid Distributed to Weredas that Received Aid (Truncated OLS)

	Free Distribution (Mean Per capita value received in Birr)			Food for Work (Mean Per capita value received in Birr)		
	(1)	(2)	(3)	(4)	(5)	(6)
ln (Per capita Income)		-20.62	-16.61		-6.057	-6.032
		(1.92)	(1.48)		(1.49)	(1.37)
Fraction of households with some education		-0.326	-1.757		16.92	17.57
		(0.01)	(0.07)		(1.73)	(1.72)
Mean household size		3.705	7.405		-1.700	0.368
		(0.54)	(0.99)		(0.55)	(0.11)
Mean % of children (0-9 yrs) in households		-0.110	-0.064		0.197	0.045
		(0.16)	(0.09)		(0.61)	(0.12)
Mean % of elder (over 55) in households		1.632	1.552		-0.063	0.044
		(2.05)*	(1.82)		(0.20)	(0.13)
Fraction of female headed, not married		19.04	21.02		22.92	16.14
		(0.59)	(0.58)		(1.19)	(0.80)
Fraction of female headed, married		-27.90	-12.40		-28.21	-31.77
		(0.46)	(0.19)		(1.11)	(1.15)
Mean size of land owned		2.639	3.635		-0.813	-0.504
		(0.30)	(0.41)		(1.19)	(0.70)
Fraction of Muslim households		-9.260	-8.978		-5.920	-6.019
		(0.53)	(0.50)		(0.83)	(0.76)
Fraction of Protestant households		-0.559	-2.682		-3.722	4.159
		(0.02)	(0.08)		(0.25)	(0.25)
Fraction of livestock households		-37.68	-13.92		-29.99	-38.05
		(0.40)	(0.14)		(0.55)	(0.68)
Mean % of plot area with shortage of rain		0.163	0.090		0.147	0.180
		(0.64)	(0.33)		(1.32)	(1.45)
Mean % of plot area with flood		-0.011	0.081		-0.010	0.053
		(0.03)	(0.19)		(0.06)	(0.27)
Mean % of plot area with crop disease or insect problems		1.175	1.043		0.046	0.157
		(2.03)*	(1.74)		(0.20)	(0.62)
Average rainfall 1988-95 (mm) *10e-2		1.170	1.474		1.988	1.381
		(0.34)	(0.42)		(1.53)	(0.89)
Rainfall shocks in 1994 (mm) *10e-2		-1.230	-0.498		-0.162	0.076
		(0.40)	(0.15)		(0.12)	(0.05)
Rainfall shocks in 1995 (mm) *10e-2		-2.323	-0.194		3.268	2.682
		(0.51)	(0.04)		(2.47)*	(1.87)
Elevation *10e-2		-0.229	-0.450		-0.265	-0.166
		(0.19)	(0.36)		(0.48)	(0.29)
History of Receiving Food Aid[A]						
4 years in last 4 years (0,1)			14.35			12.68
			(0.74)			(1.55)
3 years in last 4 years (0,1)			-2.347			4.935
			(0.11)			(0.54)
2 years in last 4 years (0,1)			-10.41			8.241
			(0.58)			(0.94)
1 year in last 4 years (0,1)			-15.08			9.048
			(0.86)			(1.37)
Previous experience with other type of food aid			9.275			-5.160
			(0.77)			(0.75)
Tigray[C]	30.88	7.948	-2.866	18.11	12.25	19.94
	(2.18)*	(0.35)	(0.12)	(3.34)**	(1.11)	(1.55)
Amhara	34.77	36.12	30.03	1.650	-7.389	0.048
	(2.53)*	(1.54)	(1.19)	(0.30)	(0.68)	(0.00)
Oromiya	-3.331	8.131	5.218	-1.966	1.073	3.304
	(0.23)	(0.39)	(0.25)	(0.38)	(0.11)	(0.32)
Other Killils	3.513	5.992	3.899	-2.854	-2.640	-0.072
	(0.20)	(0.23)	(0.15)	(0.39)	(0.19)	(0.00)
Constant	8.067	109.9	72.67	10.87	37.06	22.83
	(0.74)	(1.36)	(0.82)	(2.75)**	(1.25)	(0.62)
F tests: For History variables			0.83			0.76
			[0.51]			[0.56]
For Plot level shocks		1.82	1.15		0.63	0.91
		[0.15]	[0.34]		[0.60]	[0.44]
For Rainfall shocks		0.20	0.01		3.11	1.76
		[0.82]	[0.99]		[0.05]	[0.18]
For Road dummies[B]		1.10	0.81		1.06	0.47
		[0.37]	[0.55]		[0.40]	[0.79]
For Regional dummies		0.69	0.61		1.05	1.14
		[0.60]	[0.66]		[0.39]	[0.35]
R square	0.138	0.377	0.410	0.223	0.46	0.51
Observations	96	96	96	75	75	75

Note: * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are absolute t-values. Numbers in brackets are p-values. A) At least one household received FD (or FFW) for 4 years in last 4 years, and so on. B) Coefficients of road dummies are not reported. C) Omitted region is "South."

6.2. Household Allocations Within Weredas

We now turn to the allocation of food aid to households within weredas. We condition these samples on weredas that have some food aid of the same type available in the same year. This is done to identify the inferred criteria driving allocations to households, which, as discussed in Section 2, are made by local committees, not by the central government. Of the households in these weredas, only 40% received free distribution and 40% food for work. As before, we model receipt of food aid separately from the value received.

We report three specifications. One contains wereda-level covariates and killzone-level dummy variables. For these regressions there is variation in covariates both within and between weredas. Two additional specifications use wereda dummy variables (with and without **household**-level history variables), so that only within wereda variation exists. For the probits this means that only weredas in which household participation is incomplete are used in the estimation, hence, sample size is smaller than for the first two specifications. Of course, this is not true for the truncated OLS regressions.

As an additional set of regressions, we estimated upper-censored tobits at the wereda level,[42] for which the dependent variable is the proportion of households within the wereda that receive food aid of a particular type. The results are close enough to the conditional household probits that we do not report them here.

6.2.1. Probability of Receiving Food Aid

Table 4 contains the probit results for the probability of a household's receiving free food and food for work (within weredas where this type of aid was distributed). Higher household per capita income reduces the chance of receiving free distribution and accepting food for work. Households at the 25th percentile of national log per capita income have an average probability of 41.6% of receiving free food and 41.8% of participating in food for work. At the 75th income percentile these probabilities fall to 35.3% and 35.7%. For relatively high income households, at the 90th percentile, the probabilities are still 32.6% and 33.2%. Thus, the probability that a household at the 25th per capita income percentile would receive free food or food for work is only 9 percentage points different from a household at the 90th income percentile.

Again, we are confronted by the finding that the probability of receiving food aid is quite low even for very poor households (below the 25th per capita income percentile) in weredas where food aid is distributed. If we use Dercon and Krishnan's (1998) 1995 rural poverty line estimate of roughly 600 birr per capita as a rough indicator, the findings suggest that well under half of these households received any type of food aid – even for those households in weredas where

[42]These tobits include weredas in which 100% of households receive aid, 15 weredas for free distribution and 9 for food for work.

Table 4. Determinants of Food Aid Allocation: Household Level (Probit[A])

	Free Distribution (1 if the household received FD)			Food for Work (1 if the household participated FFW)		
	(1)	(2)	(3)	(4)	(5)	(6)
ln (Per capita Income)	-0.071	-0.092	-0.103	-0.061	-0.002	0.009
	(3.12)**	(3.73)**	(4.01)**	(2.36)*	(0.07)	(0.29)
Household head has some education (0,1)	-0.075	-0.130	-0.124	-0.025	-0.066	-0.078
	(1.73)	(2.88)**	(2.73)**	(0.53)	(1.24)	(1.47)
Household size	-0.003	-0.018	-0.019	-0.006	-0.005	-0.000
	(0.34)	(1.66)	(1.76)	(0.55)	(0.40)	(0.02)
Percentage of children	0.002	0.002	0.002	-0.000	-0.001	-0.000
(0-9 yrs)	(1.63)	(2.30)*	(2.38)*	(0.38)	(0.44)	(0.35)
Percentage of elder	0.001	0.001	0.001	-0.002	-0.003	-0.003
(older than 55 yrs)	(0.63)	(0.77)	(0.49)	(1.63)	(1.79)	(1.80)
Female headed household, not married	0.166	0.105	0.098	-0.031	-0.009	-0.004
(0,1)	(2.90)**	(1.69)	(1.57)	(0.49)	(0.13)	(0.06)
Female headed household, but head is	0.076	0.082	0.084	-0.102	-0.143	-0.146
married (0,1)	(0.92)	(0.95)	(0.96)	(1.17)	(1.62)	(1.65)
Land owned in ha	0.004	-0.001	-0.002	0.025	0.015	0.015
	(0.41)	(0.10)	(0.12)	(0.80)	(1.05)	(0.95)
Muslim household (0,1)	0.011	0.049	0.037	-0.081	-0.041	0.022
	(0.20)	(0.45)	(0.34)	(1.19)	(0.31)	(0.16)
Protestant household (0,1)	0.170	0.187	0.159	-0.113	-0.111	-0.109
	(2.39)*	(2.19)*	(1.83)	(1.49)	(1.20)	(1.30)
Livestock household (0,1)	-0.041	-0.088	-0.121	0.079	-0.061	0.028
	(0.27)	(0.54)	(0.79)	(0.44)	(0.34)	(0.15)
Percentage of area with shortage of rain	0.001	0.001	0.001	0.001	-0.002	-0.001
	(1.83)	(1.09)	(1.47)	(0.70)	(1.47)	(1.31)
Percentage of area with flood	0.000	0.001	0.001	0.000	0.000	0.000
	(0.13)	(0.98)	(0.92)	(0.31)	(0.02)	(0.08)
Percentage of areas with crop disease or	0.000	0.000	0.000	0.002	0.001	0.002
insect problems	(0.20)	(0.32)	(0.31)	(1.72)	(0.83)	(1.25)
Average Rainfall 1988-95 (mm)	-0.010			-0.012		
*10e-2	(0.82)			(0.76)		
Rainfall shocks in 1994 (mm)	-0.029			-0.012		
*10e-2	(2.68)**			(0.92)		
Rainfall shocks in 1995 (mm)	0.012			-0.021		
*10e-2	(0.62)			(1.43)		
Elevation *10e-2	0.001			0.009		
	(0.26)			(1.26)		
History of Receiving Food Aid						
4 years in last 4 years (0,1)			0.190			0.389
			(1.41)			(2.07)*
3 years in last 4 years (0,1)			-0.112			-0.052
			(1.13)			(0.36)
2 years in last 4 years (0,1)			-0.167			-0.027
			(2.76)**			(0.23)
1 years in last 4 years (0,1)			-0.157			-0.125
			(3.21)**			(2.21)*
Previous reception of other type of food			0.068			0.189
aid (0,1)			(1.36)			(3.48)**
Tigray	0.294			0.417		
	(3.22)**			(3.89)**		
Amhara	0.323			0.094		
	(4.24)**			(0.95)		
Oromiya	-0.043			0.079		
	(0.60)			(0.93)		
Somali	-0.218			-0.392		
	(2.10)*			(3.37)**		
Beni-Shangul	-0.292			-0.291		
	(2.49)*			(1.59)		
Southern (SNNPR/SEPA)	-Omitted-	- with Wereda dummies -		-Omitted-	- with Wereda dummies -	
Gambela	0.179			-0155		
	(1.18)			(0.93)		
Harari	-0.277			-0.346		
	(2.69)**			(3.33)**		
Dire Dawa	-0.326			0.348		
	(3.00)**			(2.16)*		
Wald tests: For History variables			19.4 **			10.4 **
			[0.00]			[0.00]
For Plot level shocks	3.37	2.04	2.91	3.10	3.77	4.39
	[0.34]	[0.56]	[0.41]	[0.38]	[0.29]	[0.22]
For Rainfall shock	8.12 *			2.62		
	[0.02]			[0.27]		
For Road dummies[B]	9.45			7.49		
	[0.09]			[0.19]		
For Regional/Wereda dummies	69.8 **	169.3 **	171.4**	64.6 **	138.2 **	137.8**
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Number of observations	938	838	838	714	681	681

Note: * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are z-values. Numbers in brackets are p-values.
A) Reported coefficients are changes in marginal probability. B) Coefficients of road dummies are not reported.

food aid was distributed.[43] These findings suggest that the amount of food aid distributed in 1995/96 was inadequate to meet the needs of all households under the poverty line or even under the 25th per capita income percentile.

When we look exclusively within weredas (columns 2, 3, 5, and 6) the negative income effect remains significant in the case of free food, even when history variables are added. There is a predicted difference of 8.1 percentage points when one moves from the 25th to the 75th percentile of log per capita income, although, again, even at the 90th percentile, the predicted participation rate is still 23.4%. In the case of FFW, wereda fixed effects shrink the income coefficient to near zero. The results generally indicate that income targeting does play an important, but incomplete role in allocating free food to households. In the case of FFW, households in weredas with lower incomes apparently are more likely to accept. However, since even high income households have a non-trivial chance of receiving food aid, aid is clearly targeted very incompletely by income.

Education of the household head also has a negative impact on households receiving free distribution, independent of income. Education of the household head has no independent effect on receiving FFW. Households with a higher proportion of children and households with currently unmarried female heads are more likely to obtain free food, as are Protestant households. Controlling for wereda fixed effects, household size is weakly negatively related to the probability of getting free food. Households with more elderly members are less likely to engage in food for work.

In terms of shock variables, plot-level drought shocks have a weak positive impact on receiving free food, but only when wereda-level differences are not being controlled. Positive rainfall shocks in 1994 are associated with lower odds of receiving free distribution food. For FFW, having a higher percent of cropped area affected by disease and pests raises the probability of participation, although when wereda fixed effects are being controlled the impact is estimated only imprecisely.

With wereda fixed effects included, we have a good test of whether free food aid is being used to insure against idiosyncratic plot-level shocks. The fact that we do not observe significant plot shock impacts on free distribution suggests that this form of aid is not being used for insurance purposes. On the other hand, these results are derived holding income constant. As discussed above, income does have a significant negative impact on the likelihood of households receiving free distribution within weredas. Furthermore, income has both permanent and transitory components, so it may be that transitory income movements are smoothed by free food allocations within villages.[44]

---

[43] Obviously zero households under the poverty line received food aid in the roughly 70% of weredas nationwide where food aid was not distributed.

[44]However, when income is omitted from the household probit with wereda fixed effects, still the plot-level shock variables are not close to being jointly significant; see Appendix Table 2.

Instead of insuring against negative weather or pest shocks, the results indicate that food aid is going to households that received it chronically, for all 4 years in the prior 4 years to 1995, possibly reflecting long-run need. This is true regardless of whether wereda-level fixed effects are included in the model. The effects of past household receipt seem to be stronger in the case of FFW. In the FFW regressions, the coefficients of other covariates, particularly income, shrink toward zero as the history variables are used. There is a positive cross-program effect of receiving free food on the probability of participating in food for work, though not the reverse. The key question, as it was in the wereda-level analysis, is whether history is important because these are the truly needy households, or whether there is inertia in changing allocations.

6.2.2. Values of Food Aid Received By Households

Table 5 contains the truncated OLS results for households living in weredas participating in food aid programs. Higher per capita incomes reduce the value of free food received per capita, conditional on getting some. Comparing households at the 25th and 75th percentiles, free food received per capita declines by 20.8 birr. The effect of income on the amount of free food received declines by 20% when history variables are added, and declines substantially, 45%, when wereda dummy variables replace wereda and higher level covariates. In the case of food for work, log of per capita income has no impact unless wereda dummy variables are added, in which case income has a small, but imprecisely estimated impact.

The coefficients on the history variables differ from the wereda results. Both the individual coefficients and the group are only significant in the case of FFW. With wereda dummies, the magnitude is only large if the household has been a chronic receiver of food aid (in three or four of the past four years), in which case FFW increases by between 24 and 37 birr per year.

The major result, for both free distribution and food for work value received is the very strong negative relationship with household size. Within weredas, adding one person (in the age proportions as currently exist) lowers the value of free distribution by 6.1 birr per capita. Remembering that the average value consumed is 18 birr, this is a substantial impact. For FFW, the magnitude of the effect is smaller, 4.2 birr less for every additional household member, but is still highly significant.[45]

The negative impact of household size on food aid within weredas is intriguing. The Sharp Report (1997) suggests that local authorities in some areas limited participation in FFW programs to only one member per household. To test this, we reran the food for work truncated regressions, defining the dependent variable as the total value of food for work received by the

[45]A quadratic term in household size is significant in the food for work truncated regressions. The shape of the relationship is negative and convex.

Table 5. Determinants of the Value of Food Aid Received Among Households Who Received (Truncated OLS)

	Free Distribution (The amount received in Birr)			Food for Work (The amount received in Birr)		
	(1)	(2)	(3)	(4)	(5)	(6)
ln (Per capita Income)	-18.35	-9.281	-7.618	-1.443	-4.076	-2.892
	(3.26)**	(1.58)	(1.28)	(0.56)	(1.34)	(0.95)
Household head has some education (0,1)	6.797	11.89	11.02	10.07	10.66	9.213
	(0.57)	(0.99)	(0.92)	(2.06)*	(1.95)	(1.69)
Household size	-6.120	-8.655	-8.809	-4.224	-4.802	-4.661
	(2.36)*	(3.47)**	(3.52)**	(3.96)**	(4.50)**	(4.43)**
Percentage of children	0.030	0.048	0.062	-0.030	-0.045	-0.020
(0-9 yrs)	(0.13)	(0.23)	(0.29)	(0.29)	(0.45)	(0.21)
Percentage of elder	0.640	0.048	-0.021	0.016	0.014	-0.006
(older than 55 yrs)	(2.64)**	(0.21)	(0.09)	(0.11)	(0.09)	(0.04)
Female headed household, not married	-1.420	3.105	-0.877	3.109	-11.90	-11.85
(0,1)	(0.11)	(0.24)	(0.07)	(0.45)	(1.53)	(1.55)
Female headed household, but head is	-10.92	1.327	2.478	0.767	0.093	-1.937
married (0,1)	(0.54)	(0.07)	(0.13)	(0.08)	(0.01)	(0.19)
Land owned in ha	-0.770	-0.686	0.278	-0.211	0.548	0.620
	(0.15)	(0.12)	(0.05)	(0.79)	(0.15)	(0.17)
Muslim household (0,1)	-1.467	-1.050	0.575	-4.475	11.17	9.107
	(0.10)	(0.05)	(0.03)	(0.62)	(0.69)	(0.57)
Protestant household (0,1)	-15.98	0.187	-3.387	11.24	16.86	7.586
	(0.80)	(0.01)	(0.15)	(1.32)	(1.70)	(0.74)
Livestock household (0,1)	-6.020	10.08	12.60	5.842	12.41	18.55
	(0.17)	(0.28)	(0.35)	(0.43)	(0.88)	(1.32)
Percentage of area with shortage of rain	-0.051	0.001	0.046	0.007	0.072	0.078
	(0.31)	(0.01)	(0.26)	(0.09)	(0.76)	(0.84)
Percentage of area with flood	0.118	0.486	0.495	-0.085	0.124	0.101
	(0.44)	(1.68)	(1.72)	(0.68)	(0.81)	(0.67)
Percentage of areas with crop disease or	0.180	0.041	0.044	-0.123	-0.040	-0.006
insect problems	(0.79)	(0.18)	(0.20)	(1.16)	(0.34)	(0.06)
Average Rainfall 1988-95 (mm) *10e-2	1.072			2.744		
	(0.27)			(1.94)		
Rainfall shocks in 1994 (mm) *10e-2	1.106			-0.273		
	(0.37)			(0.21)		
Rainfall shocks in 1995 (mm) *10e-2	-3.266			5.352		
	(0.62)			(3.78)**		
Elevation	-0.379			-1.208		
	(0.30)			(1.87)		
History of Receiving Food Aid						
4 in last 4 years (0,1)			57.59			24.03
			(2.52)*			(2.20)
3 years in last 4 years (0,1)			7.794			33.51
			(0.41)			(2.98)**
2 years in last 4 years (0,1)			2.034			4.500
			(0.15)			(0.45)
1 years in last 4 years (0,1)			10.91			-0.021
			(0.81)			(0.00)
Previous reception of other type of food			12.35			6.611
aid (0,1)			(1.18)			(1.30)
Tigray	19.21			4.430		
	(0.80)			(0.41)		
Amhara	42.45			-2.234		
	(1.86)			(0.22)		
Oromiya	15.24			0.436		
	(0.66)			(0.05)		
Soamlie	23.35			-3.010		
	(0.60)			(0.09)		
Beni-Shanguru	-22.60			3.349		
	(0.35)			(0.10)		
Southern (SNNPR/SEPA)	-Omitted-	- with Wereda dummies -		-Omitted-	- with Wereda dummies -	
Gambela	42.72			-10.34		
	(1.05)			(0.56)		
Harari	33.74			19.67		
	(0.66)			(0.95)		
Dire Dawa	72.02			9.472		
	(1.28)			(0.63)		
Constant	192.9	178.4	163.3	82.69	93.7	79.37
	(3.78)**	(2.73)**	(2.44)*	(3.60)**	(3.74)**	(3.03)**
F tests: For History variables			1.65			3.11*
			[0.16]			[0.02]
For Plot level shocks	0.30	0.95	1.01	0.59	0.58	0.43
	[0.82]	[0.42]	[0.39]	[0.62]	[0.63]	[0.73]
For Rainfall shocks	0.37			7.51 **		
	[0.69]			[0.00]		
For Road dummies[A]	2.88*			4.20 **		
	[0.01]			[0.00]		
For Regional/Wereda dummies	1.16	3.16 **	2.49**	0.33	2.90**	2.95**
	[0.32]	[0.00]	[0.00]	[0.95]	[0.00]	[0.00]

Note : * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are absolute t-values. Numbers in brackets are p-values.
A) Individual coefficients of road dummies are not reported. Number of observations are 372 for column 1, 2, and 3, and 286 for column 4, 5, and 6.

household instead of per capita value. This turns the household size coefficient positive and still significant at the .05 level when wereda dummy variables are used.[46] This result implies that either the limits on one person per household are not widely enforced, or that participant workers with large families tend to work for longer periods in FFW programs.

The plot-shock covariates are never significant in the truncated OLS regressions explaining per capita values received; the F-statistics are 0.6 for free distribution and 0.5 for FFW. Hence there is no evidence for food aid being used for insurance purposes in terms of amounts received.

6.3. Robustness Checks

As discussed above, the income figures are incomplete in that they do not cover the secondary Belg harvest. This second cropping season is used only when the monthly rainfall distribution is double-peaked, which happens in a minority of areas in Ethiopia. As a robustness check on the income (and other) coefficients we drop weredas from areas with Belg production from the analyses. The results, reported in Appendix Table 1 for wereda and household levels, are broadly the same as the base results, particularly for income; for instance for the wereda results without history variables, a -.096 marginal probability excluding the south versus -.102 including it.

Some differences in results might be expected if allocation rules are different across regions. The biggest differences we find are in the household-level results, which reflects decisions within local weredas. As can be seen, however, the differences are in general not large. The fact that the wereda results in Appendix Table 1 are so close to the base results (Table 2) indicates that the central government uses essentially the same considerations in apportioning aid across all of Ethiopia. The truncated OLS results are also very close to the base case. They are available upon request.

As a second check we run the regressions without income. This specification is important because arguably the influence of factors such as shock variables may be understated when we hold income constant, if part of their influence comes through income. The results are reported in Appendix Table 2. Here the results are remarkably similar to those of the base specification. We conclude that the base case results are quite robust and unaffected by the inclusion or exclusion of endogenous income and areas with bi-modal rainfall patterns.

[46]Then log of per capita income coefficient becomes more negative and is significant at the .10 level.

7. RESULTS: REGIONAL LEVEL

This section examines potential regional differences in food aid targeting. Because of limited degrees of freedom, we do not run wereda-level probit regressions for each region. Rather, we confine our analysis to the household level in each of the four regions where adequate household observations were available: Tigray, Amhara, Oromiya, and the South.[47] Further, within these four regions, we confine the analysis to households in weredas where food aid was distributed. This is done to identify the inferred criteria driving allocations within weredas, which, as discussed in Section 2, are made by local committees, not by the central government.[48] This procedure resulted in 106 (68) valid observations for free distribution (food for work) in Tigray Region; 200 (184) for free distribution (food for work) in Amhara Region; 122 (136) in Oromiya, and 179 (149) in the South.

Figure 7 shows how the probability of receiving food aid varies with the log of per capita income in each region. Figure 8 shows how per capita amounts received (conditional on positive receipt) vary with the log of per capita income. These household-level graphs are conditioned on living in weredas that have some sample households receiving aid.

The figures indicate large differences in the probability of receiving free food and food for work across regions. For example, a household with log per capita income of 5 (which corresponds to 148 birr per capita, and is below the 25th per capita income percentile in each region except Southern), has a probability of about 60% of receiving free food if that household lived in Tigray (in a wereda where free food was distributed). A household with the same per capita income level in Amhara (and living in a wereda where free food was distributed) had a probability of near 75% of receiving free food, but this declined to 40% or less for households of the same income level living in either Oromiya or Southern Region. These results highlight several points: first, free food was distributed to a greater percentage of households within receiving weredas in Tigray and Amhara than in the other two regions; second, and relatedly, the proportion of relatively high-income households that received free food was markedly higher in Tigray and parts of Amhara than in the other regions. For example, the probability that households over the 75th per capita income percentile would receive free food in Amhara (within weredas receiving free food) was over 50%, while in Southern Region it was under 20%.

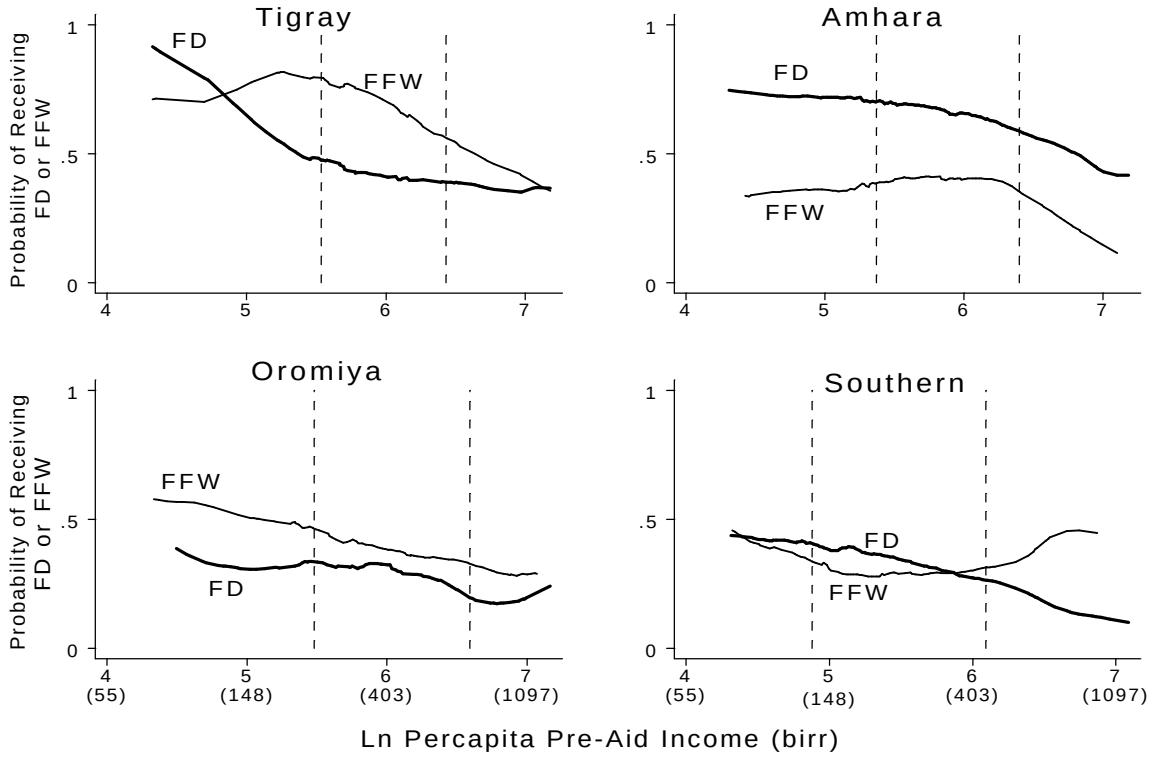
There are also major differences across regions in the probability of receiving FFW for a given level of household income. For example, at a log per capita income of 5, the probability of a household receiving FFW (again in weredas were FFW was operating) was near 75% in Tigray, 40% in Amhara, 50% in Oromiya, and less than 40% in the South.

---

[47]The Southern Region is formally called the Southern Nations, Nationalities and Peoples Region.

[48]While it would have been interesting to also examine how food aid was allocated to weredas within each region (inferring the allocation criteria of the federal authorities), there were insufficient weredas within each region to do this.

Figure 7. Free Distribution and Food for Work Distribution by Region



Note: Dotted lines are drawn at the 25th and 75th percentiles of ln pre-aid per capita income, corresponding to 214 and 612 birr for Tigray, 214 and 601 birr for Amhara, 240and 731 birr for Oromiya, and 131 and 443 birr for Southern.
Samples in all panels include all households residing in weredas where FD or FFW were distributed.

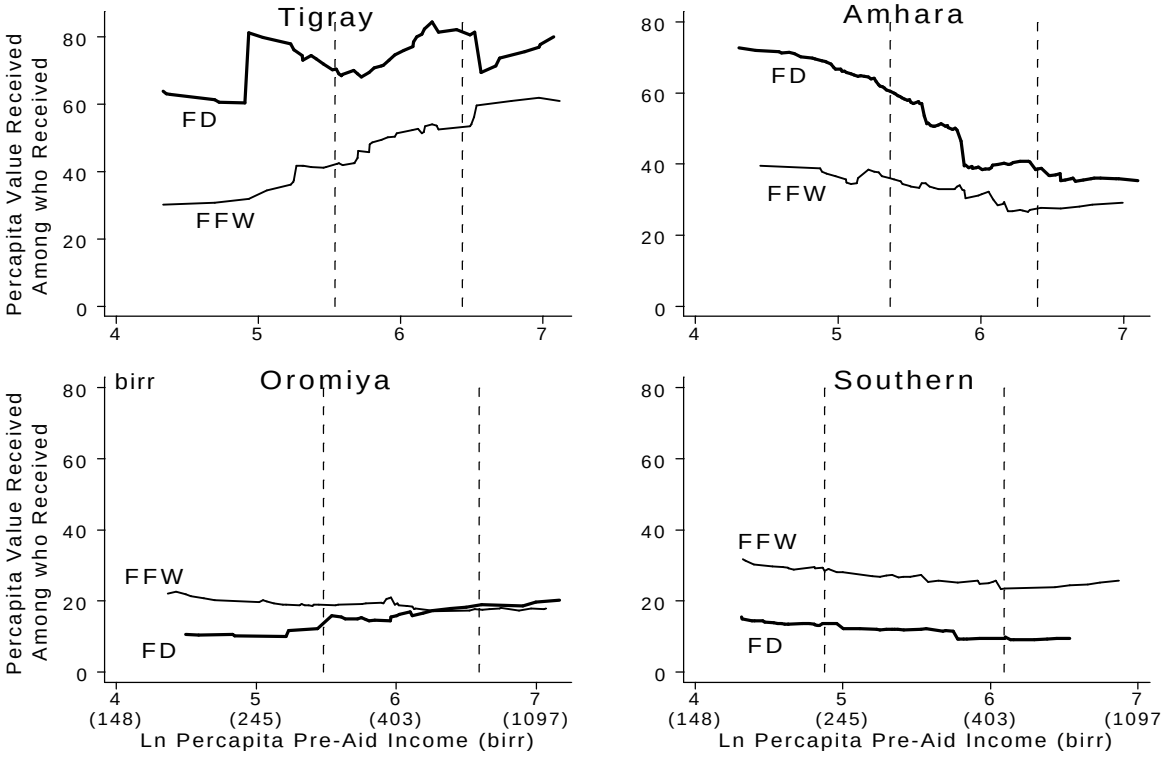
Perhaps surprisingly, the probability that households in the lowest income quartile would receive food aid was higher in the regions where per capita incomes were also relatively high.

There also appear to be major differences in the extent of income-based targeting of free food **within** regions. For example, within weredas in Tigray in which free food was distributed, the probability that a household will receive free food is near 100% at very low income levels, but is relatively constant at about 45% for households beyond the 25th per capita income percentile. The probability of receiving free food in the Southern Region is about 45% for the bottom 25th income percentile and declines to about 20% for households at the 75th income percentile. In Amhara and Oromiya regions, the probability of receiving free food is relatively flat over the lower half of the per capita income distribution, and then declines more markedly over the upper half of the income distribution.

By contrast, there is little discernable income-based targeting of food for work (within weredas where FFW was in operation) in any of the regions except Oromiya. In Tigray, participation in FFW is largely invariant to income over the bottom half of the income distribution (ranging from roughly 75 to 400 birr per capita), but declines moderately over the upper half of the income distribution.

Figure 8 shows how the value of free food and food for work varies with income (for those households that received aid). These figures indicate a mixed record of income-based targeting. Only in the case of free distribution in Amhara was the value of food aid inversely related to per capita income. In some areas, e.g., Tigray Region, the value of aid received was actually positively related to household per capita income (for both FD and FFW). The allocation of aid in Oromiya and Southern Regions were basically unrelated to income (for both FD and FFW).

Figure 8. Value of Food Aid Received Among Households Who Received by Region



Note: Dotted lines are drawn at the 25th and 75th percentiles of ln pre-aid per capita income, corresponding to 214 and 612 birr for Tigray; 214 and 601 birr for Amhara; 240and 731 birr for Oromiya; and 131 and 443 birr for Southern.
Samples in each panel include all households that received FD or FFW.

However, these relationships are only bivariate, and we now examine through conditional probit models whether they hold after controlling for other household covariates and wereda-level effects.

We present two different probit specifications for FD and FFW in each region. We use household-level covariates and wereda-level dummy variables, first without **household**-level food aid history variables and then with them. In both cases, the models measure within-wereda determinants of FD and FFW allocation by wereda and PA authorities.

7.1. Targeting of Free Food

Table 6 contains the probit results for the probability of receiving free food for households residing in weredas in which free food was distributed. The results show large regional differences in the degree of income-based targeting. Targeting according to income was most evident in Amhara Region, and this was the only region where the relationship between the log of per capita household income and receipt of free food was statistically significant at the 0.10 level or below. Households at the 25th percentile of log per capita income in weredas where free food was distributed in Amhara had an average probability of 78% of receiving free food; the probability declined to 62% and 56% for households at the 75th and 90th income percentile, respectively. There was little or no relationship between income and the probability of receiving food aid in the South and in Tigray. In the South, for instance, the average probability of receiving free food in weredas where free food was distributed was constant at 36% for households at the 25th, 75th, and 90th log per capita income percentiles (Table 7). In Tigray Region, the probability of receiving free food declined from 58% (for households at the 25th income percentile) to 55% and 53% for households at the 75th and 90th income percentile. The results indicate that the significant and moderate degree of within-wereda income-based targeting found in the household probits using the national level sample in Table 4 were driven largely by impressive income targeting of free distribution by peasant association authorities in Amhara Region. For each region, the predicted probabilities of receiving free distribution for households at various income levels is presented in Table 7. These predicted probabilities are derived after
holding all other covariates constant at their wereda-level means. Consistent with earlier findings in Section 6, the probability of a Tigray household at the 90th income percentile receiving free food is higher than the probability of receiving for a household at the 25th percentile nationwide.

The results in Table 6 also show regional differences in the kinds of criteria employed by local authorities in allocating free food. For example, there were four statistically significant (at the 0.05 level) household-level indicators of who received free food in Tigray: female-headed households/not married; percentage of family members over 55 years; percentage of crop area in which the household head reported a shortage of rain; and percentage of crop area in which the household head reported crop disease. In Amhara region, non-livestock households and households who stated that a large share of their crop area suffered from disease and/or pests

Table 6. Determinants of Free Distribution by Region: Household Level Results (Probit[A])

	Free Distribution (1 if the household received FD)							
	Tigray		Amhara		Oromiya		Southern	
ln (Per-capita Income)	-0.105	-0.061	-0.262	-0.265	-0.092	-0.093	-0.004	-0.024
	(0.81)	(0.39)	(3.82)**	(3.54)**	(1.40)	(1.42)	(0.13)	(0.78)
Household head has some education	-0.356	-0.362	-0.228	-0.226	-0.008	-0.029	-0.125	-0.132
(0,1)	(1.65)	(1.55)	(1.84)	(1.74)	(0.08)	(0.28)	(2.36)*	(2.49)*
Household size	0.015	0.019	-0.050	-0.038	-0.052	-0.058	0.002	0.001
	(0.39)	(0.36)	(1.26)	(0.89)	(1.85)	(1.99)*	(0.15)	(0.05)
Percentage of children	0.005	0.009	0.004	0.003	0.006	0.005	0.002	0.002
(0-9 yrs)	(1.02)	(1.52)	(1.56)	(1.18)	(2.06)*	(1.86)	(1.87)	(1.72)
Percentage of elder	0.015	0.020	-0.001	-0.001	0.004	0.003	-0.002	-0.002
(older than 55 yrs)	(2.37)*	(2.65)**	(0.33)	(0.32)	(1.31)	(1.07)	(0.96)	(0.93)
Female headed household, not married	0.732	0.880	-0.106	-0.077	0.233	0.267	-0.036	-0.049
(0,1)	(3.03)**	(3.54)**	(0.63)	(0.42)	(1.43)	(1.67)	(0.50)	(0.70)
Female headed household, but head is	0.384	0.628	-0.008	-0.103	-0.030	-0.092	0.014	0.003
married (0,1)	(0.92)	(1.43)	(0.03)	(0.32)	(0.19)	(0.66)	(0.16)	(0.04)
Land owned in ha	-0.082	-0.033	0.075	0.069	-0.084	-0.071	-0.007	-0.006
	(0.29)	(0.10)	(0.65)	(0.57)	(1.02)	(0.92)	(0.52)	(0.47)
Muslim household (0,1)	0.847	0.877	0.409	0.446	0.449	0.440	-0.376	-0.357
	(0.00)	(0.32)	(1.66)	(1.70)	(2.21)*	(2.20)*	(3.52)**	(3.60)**
Protestant household (0,1)					0.589	0.713	-0.045	-0.000
					(1.33)	(1.57)	(0.79)	(0.00)
Livestock household (0,1)			-0.515	-0.517				
			(2.03)*	(2.39)*				
Percentage of area with shortage of	0.009	0.010	0.000	0.001	0.004	0.005	-0.011	-0.009
rain	(2.26)*	(2.02)*	(0.13)	(0.67)	(1.89)	(1.97)*	(2.17)*	(1.97)*
Percentage of area with flood	-0.005	-0.002	-0.001	-0.000	0.005	0.006	0.003	0.002
	(0.73)	(0.23)	(0.17)	(0.07)	(1.51)	(1.53)	(1.39)	(0.93)
Percentage of areas with crop disease	0.013	0.018	-0.005	-0.006	0.003	0.004	0.003	0.002
or insect problems	(2.89)**	(3.04)**	(2.16)*	(2.51)*	(0.93)	(1.27)	(1.43)	(1.10)
History of Receiving Food Aid								
4 years in last 4 years (0,1)		0.460		0.034				
		(1.29)		(0.11)				
3 years in last 4 years (0,1)		-0.156		0.040				
		(0.43)		(0.15)				
2 years in last 4 years (0,1)		-0.164		-0.199				
		(0.60)		(1.39)				
1 years in last 4 years (0,1)		0.301		-0.363				
		(1.00)		(3.07)**				
At least 1 year in last 4 years (0,1)						-0.054		-0.071
						(0.37)		(1.09)
Previous participation in FFW (0,1)		0.730		-0.226		0.303		-0.136
		(2.31)*		(1.56)		(1.86)		(2.33)*
Wereda Dummies				– Wereda dummies –				
Wald tests: For History variables		2.35		10.9*				
		[0.67]		[0.03]				
For Plot level shocks	10.8*	10.7*	5.16	7.75	5.89	6.18	8.50*	5.80
	[0.01]	[0.01]	[0.16]	[0.05]	[0.12]	[0.10]	[0.04]	[0.12]
For Wereda dummies	18.0	16.1	46.34**	46.1**	25.5	24.9	21.5*	27.4**
	[0.52]	[0.52]	[0.00]	[0.00]	[0.08]	[0.10]	[0.04]	[0.01]
Log likelihood	-34.8	-29.0	-97.6	-91.0	-45.3	-43.5	-77.3	-73.9
Number of observations	106	106	200	200	122	122	179	179

Notes: * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are z-values. Numbers in brackets are p-values. Conditional on households being in Weredas with one or more households receiving Food Aid. Dummy variables for 'Protestant household' and 'Livestock households' are excluded in some areas because of small numbers of observations. For Oromiya and Southern, 'At least one year...' is used instead of '4 years ...' or '3 years...' because of small numbers of observations. A) Reported coefficients are changes in marginal probability.

Table 7. Predicted Probabilities of Receiving Free Distribution and Predicted Per capita Values Received, for Households in Weredas Where Free Food Was Distributed
(Derived from Results in Tables 6 and 8)

	Predicted Probability of Receiving FD for households in weredas where free food was distributed, by percentile of pre-aid log per capita income			
	25th percentile	75th percentile	90th percentile	Mean
National	42	35	33	38
Tigray	58	55	53	56
Amhara	58	40	34	50
Oromiya	31	21	17	26
Southern	31	30	30	30

	Predicted amount received (birr per capita) by recipient households, by percentile of pre-aid log per capita income			
	25th percentile	75th percentile	90th percentile	Mean
National	43	22	13	32
Tigray	69	76	80	72
Amhara	58	41	34	50
Oromiya	17	11	9	14
Southern	12	14	15	13

were more likely to receive free food. In Oromiya Region, households with many members and a high percentage of young children were more likely to receive food aid. Also in Oromiya Region, Muslim households were much more likely to receive free food than Orthodox households. And in the Southern Region, the most significant indicators of who received free food were households in which the family head had no formal education, households that were not Muslim, and, ironically, households that reported relatively little crop damage from inadequate rainfall. These results indicate that the PA leaders who are distributing food aid to recipient households at the local level **are** generally using some criteria for determining who receives. And most (not all) of these criteria appear to be reasonable, in the sense that they are generally considered to be correlated with need. In Section 10 we examine the extent to which these indicators actually are correlated with wereda and household income.

After including the household-level food aid history variables, there was generally little change in the magnitude and significance of the household covariates. The major observation that emerges from this set of specifications is that households that previously participated in FFW were substantially more likely to also receive free food in Tigray and Oromiya (the latter measured imprecisely) and less likely to receive free food in Amhara and the South. While we cannot account conclusively for these contrasting results across regions, they clearly reflect differences in the ability of local authorities to partition beneficiaries between the two types of programs. An analysis of field-level implementation in the various regions may help identify the attributes of successful targeting programs in areas where targeting is found to be relatively effective so that they can be replicated more widely throughout the country.

Turning to the amounts of free food received by recipients (Table 8), we find that few of the available household indicators explained how much free food was received per capita in any of the four regions. Per capita income was not significantly associated with amounts received in any region, although it was close to being so in Amhara. For each region, the predicted amounts received by beneficiaries (based on results in Table 8) are summarized for households at the 25th, 75th, and 90th per capita income percentiles in Table 7.[49] These results again show that the per capita amounts received by Tigrayan households at all income percentiles is higher than households at the 25th income percentile in all other regions. These findings corroborate earlier results that, if targeting according to income was an objective, a disproportionate amount of free food aid was allocated by the federal authorities to Tigray.

Amounts received per capita were inversely related to household size in all four regions, although earlier tests indicated that when the models were respecified in terms of total amounts received by the household, family size became a positive and generally significant indicator of amounts received. Only in the Southern Region was the amount of free food received inversely related to landholding, and even here, the effect was very small. Households with two hectares of land received only five birr per capita less over the entire year (about 2 kgs of wheat) than households that had one hectare.

7.2. Targeting of Food for Work

Major regional differences in targeting effectiveness also emerge from the food for work results (Table 9). Authorities in Tigray and Oromiya Regions were reasonably successful in encouraging participation among relatively poor households and in screening out households with relatively high incomes. For example, households at the 25th percentile of log per capita income in Tigray and Oromiya had an average probability of 61% and 42%, respectively. These probabilities decline to 47% and 31% in the two regions at the 75th income percentile. In contrast, there was virtually no relationship between household income and the probability of receiving FFW in either Amhara Region or the South. In both regions, the probabilities of receiving FFW declined by 2% or less between the 25th and 90th income percentiles.

[49]These predicted probabilities are derived after holding all other covariates constant at their wereda-level means.

Table 8. Determinants of the Value of Free Distribution Received by Recipients, by Region: Household Level (Truncated OLS)

	Free Distribution (Value received in Birr Per capita)							
	Tigray		Amhara		Oromiya		Southern	
ln (Per-capita Income)	7.944	-24.95	-17.09	-14.49	-5.355	-7.735	1.628	1.306
	(0.17)	(0.43)	(1.92)	(1.58)	(0.43)	(0.52)	(0.79)	(0.62)
Household head has some education	114.8	140.3	4.942	0.363	-51.25	-36.27	-2.404	-3.109
(0,1)	(1.07)	(1.21)	(0.30)	(0.02)	(1.76)	(0.85)	(0.65)	(0.80)
Household size	-33.91	-51.06	-8.487	-8.787	-8.680	-6.338	-1.781	-1.677
	(2.51)*	(3.00)**	(2.13)*	(2.22)*	(1.49)	(0.75)	(2.53)*	(2.35)*
Percentage of children	-1.865	-3.222	-0.002	-0.054	0.085	0.276	0.053	0.021
(0-9 yrs)	(1.33)	(1.73)	(0.01)	(0.18)	(0.24)	(0.60)	(0.79)	(0.30)
Percentage of elder	-1.372	-2.495	0.009	-0.122	1.123	1.952	-0.383	-0.320
(older than 55 yrs)	(1.17)	(1.74)	(0.03)	(0.40)	(1.01)	(1.19)	(2.20)*	(1.77)
Female headed household, not married	-9.965	-67.80	-7.170	-12.81	-65.46	-77.83	0.961	0.898
(0,1)	(0.15)	(0.72)	(0.40)	(0.71)	(1.61)	(1.39)	(0.21)	(0.18)
Female headed household, but head is	-1.474	-8.727	-14.16	-9.482	-149.1	-118.3	-2.614	-4.335
married (0,1)	(0.02)	(0.08)	(0.38)	(0.26)	(0.81)	(0.54)	(0.56)	(0.86)
Land owned in ha	-23.33	-35.11	-1.266	0.425	11.71	9.725	-4.799	-4.361
	(0.23)	(0.33)	(0.12)	(0.04)	(0.54)	(0.37)	(2.22)*	(1.99)
Muslim household (0,1)	-290.1	-571.8	-10.60	-9.475	-30.17	-28.12	-18.32	-18.74
	(1.08)	(1.74)	(0.38)	(0.34)	(0.93)	(0.71)	(1.69)	(1.66)
Protestant household (0,1)	13.87	-134.3						
	(0.07)	(0.56)						
Livestock household (0,1)	-0.266	-1.050	-0.111	-0.121	1.658	1.322	-0.224	-0.189
	(0.31)	(1.05)	(0.45)	(0.49)	(0.61)	(0.39)	(2.12)*	(1.68)
Percentage of area with shortage of	3.482	4.911	0.322	0.355	-3.413	-3.934	0.083	0.078
rain	(1.27)	(1.54)	(0.90)	(0.99)	(0.75)	(0.68)	(1.09)	(0.95)
Percentage of area with flood	0.954	1.003	-0.497	-0.506	1.134	1.009	0.052	0.060
	(1.07)	(1.06)	(1.55)	(1.58)	(2.85)*	(1.79)	(0.46)	(0.53)
Percentage of areas with crop disease	0.013	0.018	-0.005	-0.006	0.003	0.004	0.003	0.002
or insect problems	(2.89)**	(3.04)**	(2.16)*	(2.51)*	(0.93)	(1.27)	(1.43)	(1.10)
History of Receiving Food Aid								
4 years in last 4 years (0,1)		-182.2		85.77				
		(1.50)		(2.63)**				
3 years in last 4 years (0,1)		-55.19		4.222				
		(0.51)		(0.19)				
2 years in last 4 years (0,1)		-164.1		4.992				
		(1.43)		(0.28)				
1 years in last 4 years (0,1)		-138.1		20.06				
		(1.53)		(1.19)				
At least 1 year in last 4 years (0,1)						12.83		-7.265
						(0.35)		(1.40)
Previous reception of other type of		-90.86				-17.68		0.343
food aid (0,1)		(0.70)				(0.68)		(0.09)
Regional Dummies				– Wereda dummies –				
F tests: For History variables		1.04		1.96		0.53		1.04
		[0.42]		[0.10]		[0.66]		[0.37]
For Plot level shocks	0.88	1.25	1.30	1.44	4.03	3.00	2.06	1.48
	[0.47]	[0.33]	[0.28]	[0.23]	[0.11]	[0.26]	[0.13]	[0.24]
For Wereda dummies	1.09	1.00	5.87	4.71	0.81	0.63	11.5	11.5
	[0.43]	[0.52]	[0.00]**	[0.00]**	[0.67]	[0.77]	[0.00]**	[0.00]**
R squared	0.65	0.72	0.58	0.60	0.92	0.95	0.89	0.89
Number of observations	56	56	186	186	37	37	60	60

Notes: * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are z-values. Numbers in brackets are p-values. Conditional on households being in weredas with one or more households receiving Food Aid. Dummy variables for 'Protestant household' and 'Livestock households' are excluded in some areas because of small numbers of observations. For Oromiya and Southern, 'At least one year..' is used instead of '4 years ...' or '3 years...' because of small numbers of observations.

As with free distribution, criteria used to determine eligibility for, and participation in, FFW also vary by region (Table 9). For example, in Tigray Region, households with low per capita income, female headed households with no referent male in the family, smaller families, and households with a small proportion of elderly have a higher probability of participating. Households that reported more crop damage due to flood or crop disease were actually less likely to participate in FFW in Tigray, but more likely to do so in Oromiya Region and, to some extent, the South. Participation in FFW in Oromiya was negatively related to the percentage of small children in the household, education of the household head, and female-headed households. While there was a relatively small percentage of Muslim households sampled in Oromiya, Muslim households were substantially more likely to participate in FFW in this region. In Southern Region, the only significant factor having an important and significant effect on the probability of FFW participation was landholding. Households with relatively large land-holdings were substantially more likely to participate in FFW programs.

Findings from Table 10 show the factors associated with the value of food received through participation in FFW. These findings raise cause for concern. Amounts received are negatively related to log per capita income only in Amhara Region, and are actually positively related to income in Tigray. No covariates included in the model were significantly associated with per capita amounts received through FFW programs in any region except family size. As with free distribution, the predicted amounts of food distributed to households at the 90^{th} income percentile in Tigray were substantially higher than amounts received by beneficiaries at the 25^{th} income percentile in the other three regions (Table 11). The results again point to FFW resources targeted to Tigray region in excess of what would be justified based solely on the geographic incidence of poverty.

Table 9. Determinants of Food for Work by Region: Household Level Results (Probit[A])

	Food for Work (1 if the household received FFW)							
	Tigray		Amhara		Oromiya		Southern	
ln (Per-capita Income)	-0.374	-0.432	0.011	0.004	-0.171	-0.187	-0.023	-0.026
	(1.92)	(1.98)*	(0.17)	(0.05)	(1.92)	(2.07)*	(0.27)	(0.28)
Household head has some education	0.250	0.190	0.080	0.061	-0.337	-0.341	0.122	0.122
(0,1)	(0.90)	(0.66)	(0.80)	(0.62)	(2.90)**	(2.94)**	(0.85)	(0.85)
Household size	-0.166	-0.186	0.000	0.012	-0.009	-0.013	-0.048	-0.049
	(1.98)*	(1.47)	(0.00)	(0.39)	(0.30)	(0.45)	(1.43)	(1.41)
Percentage of children	0.008	0.005	0.002	0.001	-0.010	-0.010	-0.004	-0.003
(0-9 yrs)	(1.43)	(0.94)	(0.70)	(0.60)	(3.07)**	(3.10)**	(1.25)	(1.09)
Percentage of elder	-0.013	-0.024	-0.001	-0.001	-0.007	-0.007	-0.002	-0.003
(older than 55 yrs)	(1.75)	(1.96)*	(0.46)	(0.44)	(1.68)	(1.75)	(0.38)	(0.51)
Female headed household, not	0.636	0.487	-0.018	-0.018	-0.318	-0.323	0.178	0.189
married (0,1)	(2.28)*	(1.63)	(0.13)	(0.13)	(2.15)*	(2.23)*	(1.06)	(1.17)
Female headed household, but head	-0.378	-0.760	0.105	0.182	-0.304	-0.301	0.001	-0.020
is married (0,1)	(0.82)	(1.49)	(0.49)	(0.79)	(2.70)**	(2.65)*	(0.00)	(0.09)
Land owned in ha	0.758	0.712	-0.131	-0.178	0.196	0.210	0.373	0.425
	(1.54)	(1.42)	(1.58)	(1.96)*	(1.75)	(1.89)	(3.07)**	(3.33)**
Muslim household (0,1)					0.996	0.998	0.096	-0.113
					(3.15)**	(4.92)**	(0.30)	(0.34)
Protestant household (0,1)					0.716	0.734	-0.039	-0.074
					(1.69)	(1.66)	(0.27)	(0.49)
Percentage of area with shortage of	-0.011	-0.013	-0.002	-0.001	0.004	0.004	-0.003	-0.003
rain	(1.91)	(1.91)	(0.97)	(0.81)	(1.14)	(1.13)	(0.72)	(0.65)
Percentage of area with flood	-0.018	-0.016	0.001	0.002	0.027	0.027	-0.003	-0.002
	(2.00)*	(1.62)	(0.58)	(0.79)	(3.10)**	(3.13)**	(0.46)	(0.32)
Percentage of areas with crop	-0.021	-0.028	0.000	0.001	0.013	0.013	0.011	0.012
disease or insect problems	(1.88)	(2.16)*	(0.21)	(0.43)	(2.80)**	(2.65)**	(2.01)*	(2.06)*
History of Receiving Food Aid								
3 or 4 years in last 4 years (0,1)		0.259						0.306
		(0.82)						(1.73)
1 or 2 years in last 4 years (0,1)		-0.758						-0.026
		(2.15)*						(0.17)
At least 1 year in last 4 years (0,1)				-0.265		-0.158		
				(2.42)*		(1.45)		
Previous reception of free food		0.768		0.262		0.056		0.167
(0,1)		(2.16)*		(2.64)**		(0.36)		(1.22)
Wereda Dummies				– Wereda dummies –				
Wald tests: For History variables		5.53						4.11
		[0.06]						[0.13]
For Plot level shocks	6.15	5.32	1.43	1.56	11.4**	11.1	4.81	4.78
	[0.10]	[0.15]	[0.0.70]	[0.67]	[0.01]	[0.01]	[0.19]	[0.19]
For Wereda dummies	9.81	9.85	18.4	18.4	71.1**	93.1**	25.2*	22.1
	[0.55]	[0.54]	[0.24]	[0.24]	[0.00]	[0.00]	[0.02]	[0.05]
Log likelihood	-24.3	-17.8	-105.6	-99.6	-48.2	-47.1	-60.6	-58.0
Number of observations	68	68	184	184	136	136	149	149

Notes: * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are z-values. Numbers in brackets are p-values.

Conditional on households being in weredas with one or more households receiving Food Aid. Dummy variable for 'livestock households' is excluded from all models because of small numbers of observations. Dummy variables for 'Protestant household' and 'Muslim households' are excluded in some areas because of small numbers of observations. For Amhara and Oromiya, 'At least one year..' is used instead of '3 or 4 years ...' or '1 or 2 years...' because of small numbers of observations. For Tigray and Southern, '3 or 4 years ..' and '2 or 1 years..' are used instead of individual dummy variables for each year dummy because of small numbers of observations. A) Reported coefficients are changes in marginal probability.

Table 10. Determinants of the Value of Cereal Received by FFW Participants by Region: Household Level (Truncated OLS)

	Food for Work (The amount received in Birr)							
	Tigray		Amhara		Oromiya		Southern	
ln (Per-capita Income)	21.54	19.70	-15.53	-21.61	-4.214	-4.269	-3.504	-4.178
	(1.92)	(1.64)	(1.40)	(1.79)	(0.77)	(0.74)	(0.54)	(0.61)
Household head has some education	15.98	17.39	23.08	23.92	-1.762	-1.023	-1.837	-0.702
(0,1)	(1.08)	(1.18)	(1.76)	(1.80)	(0.19)	(0.10)	(0.11)	(0.04)
Household size	-2.785	-3.712	-12.69	-13.81	-2.004	-2.266	-8.157	-8.157
	(0.97)	(1.27)	(3.76)**	(3.93)**	(0.87)	(0.94)	(3.55)**	(3.42)**
Percentage of children	0.090	0.299	0.164	0.218	-0.112	-0.129	-0.249	-0.295
(0-9 yrs)	(0.33)	(0.97)	(0.67)	(0.87)	(0.48)	(0.53)	(1.08)	(1.14)
Percentage of elder	-0.093	-0.047	-0.276	-0.210	0.146	0.159	-0.227	-0.210
(older than 55 yrs)	(0.30)	(0.15)	(0.71)	(0.50)	(0.40)	(0.42)	(0.42)	(0.38)
Female headed household, not	-3.471	-20.08	6.649	4.991	-22.98	-23.02	-28.13	-28.43
married (0,1)	(0.19)	(0.97)	(0.31)	(0.23)	(0.80)	(0.77)	(1.90)	(1.84)
Female headed household, but head	43.90	32.70	-26.38	-25.04	3.598	-3.667	-7.710	-8.351
is married (0,1)	(1.50)	(1.09)	(1.26)	(1.18)	(0.17)	(0.15)	(0.36)	(0.38)
Land owned in ha	-3.458	-11.13	1.070	2.276	0.783	0.848	6.927	7.466
	(0.22)	(0.66)	(0.10)	(0.20)	(0.14)	(0.14)	(0.76)	(0.75)
Muslim household (0,1)			-25.62	-27.34	14.18	5.287	15.23	19.61
			(0.84)	(0.88)	(0.47)	(0.14)	(0.64)	(0.75)
Protestant household (0,1)	40.25	45.75						
	(0.87)	(0.99)						
Percentage of area with shortage of	0.041	0.065	-0.245	-0.348	-0.056	-0.042	0.469	0.492
rain	(0.18)	(0.28)	(1.00)	(1.28)	(0.30)	(0.21)	(1.27)	(1.28)
Percentage of area with flood	-0.003	-0.263	-0.090	-0.144	0.263	0.294	0.237	0.215
	(0.01)	(0.50)	(0.36)	(0.57)	(0.63)	(0.67)	(0.58)	(0.50)
Percentage of areas with crop	0.138	0.011	-0.387	-0.459	-0.184	-0.181	-0.056	-0.088
disease or insect problems	(0.51)	(0.04)	(1.34)	(1.47)	(0.59)	(0.55)	(0.14)	(0.19)
History of Receiving Food Aid								
3 or 4 years in last 4 years (0,1)		34.45		-12.76				
		(1.43)		(0.64)				
1 or 2 years in last 4 years (0,1)		-1.061		6.915				
		(0.07)		(0.52)				
At least 1 year in last 4 years (0,1)						-1.153		-3.382
						(0.09)		(0.24)
Previous reception of the other type				-34.96		-8.200		-5.308
of food aid (0,1)				(1.20)		(0.60)		(0.43)
Wereda Dummies								
F tests: For History variables		1.27		0.70				
		[0.30]		[0.50]				
For Plot level shocks	0.09	0.11	0.66	0.87	0.53	0.54	0.62	0.62
	[0.96]	[0.95]	[0.58]	[0.47]	[0.67]	[0.66]	[0.61]	[0.61]
For Wereda dummies	2.31	2.38	3.90	3.70	0.46	0.44	1.04	0.89
	[0.02]*	[0.02]*	[0.00]**	[0.00]**	[0.95]	[0.96]	[0.45]	[0.58]
Log likelihood	0.67	0.70	0.71	0.73	0.42	0.43	0.67	0.67
Number of observations	58	58	70	70	58	58	55	55

Notes: * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are z-values. Numbers in brackets are p-values.

Conditional on households being in weredas with one or more households receiving Food Aid. Dummy variable for 'livestock households' is excluded from all models because of small numbers of observations. Dummy variables for 'Protestant household' and 'Muslim households' are excluded in some areas because of small numbers of observations. For Amhara and Oromiya, 'At least one year..' is used instead of '3 or 4 years ...' or '1 or 2 years...' because of small numbers of observations. For Tigray and Southern, '3 or 4 years ..' and '2 or 1 years..' are used instead of individual dummy variables for each year dummy because of small numbers of observations.

Table 11. Predicted Probabilities of Participation in Food for Work and Predicted Per capita Value Received, for Households in Weredas Where Food for Work Programs Were Operating (derived from Results in Tables 9 and 10)

	Predicted probability of receiving food from FFW for households in weredas where FFW was operating, by percentile of pre-aid log per capita income			
	25th percentile	75th percentile	90th percentile	Mean
National	42	36	33	39
Tigray	61	47	39	55
Amhara	35	36	37	36
Oromiya	42	31	26	36
Southern	37	36	35	37

	Predicted amount received (birr per capita) by recipient households, by percentile of pre-aid log per capita income			
	25th percentile	75th percentile	90th percentile	Mean
National	31	29	30	30
Tigray	41	60	72	50
Amhara	37	21	15	30
Oromiya	21	16	14	18
Southern	30	25	24	27

8. PROGRAM EXIT AND CHRONIC PARTICIPATION

The results presented so far identify factors associated with **current** participation in food aid programs. We can actually do somewhat more. While we do not have panel data, we do know whether households received free food or food for work in the five-year period before June 1995, and how many years out of that period. We can therefore analyze factors associated with past participation and whether the household (or wereda) is a chronic participant. Moreover, as shown in Figure 2, there is a current trend toward using less food aid in Ethiopia. We can identify the inferred criteria used to allocate reduced amounts of food aid, both at wereda level and household level. We do the latter in this section and explore determinants of past food aid in the following sub-section.

8.1. Program Exit Probabilities

To explore the attributes of weredas and households that have exited from food aid programs, we condition on those households that participated in the past. We split the analysis into two parts: households that exit because the wereda seems to get no allocations; and exiting households that live in weredas still having some aid delivery. The first part corresponds to estimating exit probits at the wereda level for those weredas that had households that previously participated. The second amounts to restricting the sample to those weredas that still have households participating, and estimating exit probits for those households that had previously participated. If a household or wereda exited, we do not know in which year. Because of that, our income and shock variables are measured with error, which should bias their coefficients towards zero. Since the shock coefficients are never significant in these probits we drop them. Other than that difference, the variables are the same. For the household analysis we use wereda fixed effects.

Results are presented in Tables 12 and 13. We start out showing different wereda exit probabilities by region in Table 12. Weredas in Tigray and the "other regions" category (containing Gambela, Dire Dawa, and Harari) are less likely to exit free distribution programs, even after controlling for observed household and area covariates. Weredas in these regions were also less likely to exit from FFW as well (with the exception of Tigray). The strongest result among weredas receiving both free distribution and food for work is that a greater share of plots having drought problems in the 1995 Meher growing season is associated with a lower probability that food aid distribution is stopped. In the case of FFW, also having larger fractions of the population that are elderly, or Islamic, and having bad roads are all associated with higher exit probabilities. Having higher mean per capita incomes is associated with a greater likelihood of exiting, however, this effect is imprecisely estimated. Weredas that are chronic past recipients (3 or 4 years for free food, 4 years for food for work) are substantially less likely to be dropped. Interestingly, having had food for work programs in the past is negatively related to wereda exit probabilities for free distribution. However, past availability of free food makes it more likely that a wereda will be dropped from receiving food for work.

Table 12. Determinants of Exit from Food Aid: Wereda-Level Results (Probit[A])

	Free Distribution (1 if no household received in 1995/96, but at least one household received previously)			Food for Work (1 if no household received in 1995/96, but at least one household received previously)		
	(1)	(2)	(3)	(4)	(5)	(6)
ln (Per capita Income)		0.115	0.084		-0.015	-0.057
		(1.05)	(0.68)		(0.11)	(0.35)
Fraction of households with some education		0.292	0.249		-0.489	-0.396
		(1.19)	(0.85)		(1.38)	(0.93)
Mean household size		0.041	0.001		-0.016	0.008
		(0.63)	(0.01)		(0.15)	(0.07)
Mean % of children (0-9 yrs) in households		0.014	0.011		0.010	0.017
		(1.95)	(1.36)		(1.14)	(1.66)
Mean % of elder (over 55) in households		0.006	0.005		0.026	0.032
		(0.65)	(0.45)		(2.34)*	(2.60)**
Fraction of female headed, not married		-0.374	-0.450		0.121	0.478
		(0.92)	(0.94)		(0.22)	(0.75)
Fraction of female headed, married		0.118	-0.118		-1.131	-0.952
		(0.19)	(0.19)		(1.27)	(0.94)
Mean size of land owned		0.038	0.047		0.126	0.110
		(0.87)	(0.60)		(1.00)	(0.80)
Fraction of Muslim households		-0.110	-0.120		0.997	1.023
		(0.64)	(0.57)		(3.44)**	(2.81)**
Fraction of Protestant households		-0.036	-0.060		-0.196	-0.227
		(0.12)	(0.18)		(0.43)	(0.44)
Fraction of livestock households		0.797	0.553		3.140	4.014
		(1.11)	(0.71)		(1.72)	(1.76)
Mean % of plot area with shortage of rain		-0.009	-0.009		-0.016	-0.023
		(2.32)*	(2.17)*		(2.95)**	(2.66)**
Mean % of plot area with flood		-0.008	-0.012		-0.009	-0.005
		(1.31)	(1.84)		(1.08)	(0.44)
Mean % of plot area with crop disease or insect problems		0.002	0.003		-0.003	-0.002
		(0.44)	(0.46)		(0.43)	(0.29)
Average rainfall 1988-95 (mm) *10e-2		-0.048	-0.090		0.100	0.104
		(1.32)	(1.96)*		(1.97)*	(1.66)
Rainfall shocks in 1994 (mm) *10e-2		-0.027	-0.072		-0.072	-0.059
		(0.78)	(1.71)		(1.45)	(1.02)
Rainfall shocks in 1995 (mm) *10e-2		-0.064	-0.078		-0.054	-0.061
		(1.56)	(1.71)		(1.13)	(1.08)
Elevation *10e-2		-0.027	0.031		0.039	-0.058
		(2.06)*	(2.04)*		(2.02)*	(2.21)*
History of Receiving Food Aid[B]						
4 years in last 4 years (0,1)			-0.596			-0.667
			(3.07)**			(2.44)*
3 years in last 4 years (0,1)			-0.319			-0.132
			(1.54)			(0.50)
2 years in last 4 years (0,1)			-0.085			-0.191
			(0.57)			(0.87)
Previous experience with other type of food aid			-0.321			0.352
			(2.48)*			(1.60)
Tigray[D]	-0.374	-0.390	-0.082	0.123	0.339	0.382
	(2.78)**	(1.63)	(0.27)	(0.79)	(1.02)	(0.95)
Amhara	-0.263	-0.037	0.264	0.183	-0.031	-0.235
	(2.09)*	(0.15)	(1.00)	(1.25)	(0.09)	(0.59)
Oromiya	0.238	0.186	0.232	0.108	-0.573	-0.721
	(1.93)	(1.00)	(1.19)	(0.76)	(2.17)*	(2.47)*
Other Killils	-0.292	-0.500	-0.472	0.024	-0.689	-0.712
	(1.78)	(2.28)*	(2.04)*	(0.12)	(2.83)**	(3.11)**
Wald tests: For History variables			10.1*			6.13
			[0.02]			[0.11]
For Plot level shocks		6.66	7.41		9.07 *	7.08
		[0.08]	[0.06]		[0.03]	[0.07]
For Rainfall shocks		2.92	5.23		2.97	2.08
		[0.23]	[0.07]		[0.23]	[0.35]
For Road dummies[C]		3.38	3.96		6.13	6.68
		[0.64]	[0.56]		[0.29]	[0.25]
For Regional dummies		15.9**	9.58*		10.9 *	11.0 *
		[0.00]	[0.05]		[0.03]	[0.03]
Log likelihood	-86.5	-71.5	-60.8	-76.5	-46.2	-40.3
Observations	150	150	150	112	112	112

Note: * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are z-values. Numbers in brackets are p-values.
A) Reported coefficients are changes in marginal probability. B) At least one household received FD (or FFW) for 4 years in last 4 years, and so on. C) Coefficients of road dummies are not reported. D) Omitted region is "South."

For households living in weredas that did not exit the free distribution program (Table 13), having higher per capita income and having a head with some education are both associated with higher exit probabilities. A change in log of per capita income from the 25th to the 75th percentile raises the exit probability from 50.0% to 68.1%. Having a head with some schooling raises the exit probability by even more. Having a head who is Protestant is related to much lower exit probabilities. Having been a chronic recipient of free food in the past is also highly related to lower exit probabilities, and having been a participant in a FFW program raises the exit probability, just as it does for wereda probabilities.

In the case of FFW, there is little that explains household exit conditional on wereda fixed effects and being a chronic past participant.[50]

8.2. Chronic Aid Recipients

Chronic recipients of food aid may be at risk of becoming dependent on aid, changing their behavior significantly. For this analysis we define chronic use as whether a wereda or household has been a recipient of aid for 3 or more of the past five years. We use the same specifications used for the exit probits, except that obviously we do not include any past receipt variables as covariates. Tables 14 and 15 present the results. At the wereda level, we see that there is a strong Tigray effect on chronic receipt of free food. Of the 67 sampled weredas that were chronic recipients of free food, 30 of them are in Tigray. The probability of a wereda being a chronic recipient of free food is increased by 63 percentage points for weredas in Tigray. Smaller but significant regional effects are observed for Amhara and the South. These findings are consistent with either the inertia hypothesis or the income transfer hypothesis, or both. However, no such regional effects are observed for food for work. Remember that there is a significant Tigray effect on current year FFW, which suggests FFW is becoming more concentrated in Tigray within the five year recall period (1991/92-1995/96).

Higher mean log per capita income lowers the probability of a wereda receiving chronic food aid, with a larger and more precisely estimated impact on FFW. An increase from the 25th to the 75th income percentile lowers the predicted probability that a wereda is a chronic recipient of FFW from 10.4% to 7.0%, the mean rate being 8.9%; the income effect is smaller for free food. Having more heads of households with some education also lowers the likelihood of chronic receipt. Being in an area with higher long-run rainfall also significantly lowers the chances of being a chronic recipient, the impact being more precisely estimated for food for free. In that case, predicted probabilities of receiving FD at the inter-quartile range of long-run rainfall are 16.2% and 7.5%.

[50]Note that this is not because there are no leavers within these weredas, 38% of households that had participated in the past have not in the current year.

Table 13. Determinants of Exit From Food Aid: Household Level (Probit[A])

	Free Distribution (1 if the household did not receive in 1995/96, but received previously)			Food for Work (1 if the household did not receive in 1995/96, but received previously)		
	(1)	(2)	(3)	(4)	(5)	(6)
ln (Per capita Income)	0.132	0.269	0.334	-0.040	-0.129	-0.185
	(3.13)**	(3.88)**	(4.11)**	(0.78)	(1.26)	(1.70)
Household head has some education	0.205	0.429	0.494	0.002	0.009	0.079
(0,1)	(2.51)*	(3.46)**	(3.65)**	(0.02)	(0.05)	(0.46)
Household size	-0.009	-0.003	-0.014	-0.010	-0.060	-0.073
	(0.47)	(0.08)	(0.36)	(0.42)	(1.54)	(1.63)
Percentage of children	-0.001	-0.001	-0.001	0.002	0.007	0.007
(0-9 yrs)	(0.44)	(0.46)	(0.27)	(0.77)	(1.67)	(1.62)
Percentage of elder	-0.002	-0.002	-0.001	0.004	0.005	0.006
(older than 55 yrs)	(0.90)	(0.76)	(0.30)	(1.22)	(0.91)	(1.00)
Female headed household, not married	-0.110	0.013	-0.025	0.077	-0.323	-0.435
(0,1)	(1.12)	(0.08)	(0.14)	(0.54)	(1.48)	(1.90)
Female headed household, but head is	-0.090	-0.623	-0.619	0.435		
married (0,1)	(0.43)	(3.47)**	(3.27)**	(2.40)*		
Land owned in ha	-0.066	-0.014	0.010	-0.029	0.040	-0.066
	(1.55)	(0.20)	(0.12)	(0.35)	(0.29)	(0.41)
Muslim household (0,1)	0.114	-0.361	-0.662	0.058	-0.294	-0.414
	(0.93)	(0.80)	(1.56)	(0.29)	(0.84)	(1.11)
Protestant household (0,1)	-0.237	-0.584	-0.625	-0.186	-0.045	-0.083
	(1.55)	(2.53)*	(2.94)**	(1.15)	(0.15)	(0.23)
Livestock household (0,1)	0.044	-0.485	-0.550			
	(0.15)	(1.14)	(1.67)			
Percentage of area with shortage of rain	0.000	0.000	-0.001	0.000	-0.001	-0.003
	(0.38)	(0.19)	(0.35)	(0.23)	(0.46)	(0.89)
Percentage of area with flood	0.004	0.012	0.012	-0.002	0.004	0.006
	(1.50)	(2.23)*	(2.07)*	(0.92)	(0.56)	(0.77)
Percentage of areas with crop disease or	0.001	0.005	0.008	0.002	0.008	0.006
insect problems	(0.56)	(1.99)*	(2.63)**	(0.79)	(1.37)	(0.96)
Average Rainfall 1988-95 (mm)	-0.058			-0.018		
	(1.46)			(0.47)		
Rainfall shocks in 1994 (mm)	0.003			0.000		
	(0.11)			(0.02)		
Rainfall shocks in 1995 (mm)	-0.069			0.034		
	(1.36)			(0.73)		
Elevation	-0.004			0.030		
	(0.34)			(1.95)		
History of Receiving Food Aid						
4 in last 4 years (0,1)			-0.357			-0.585
			(2.02)*			(2.56)*
3 years in last 4 years (0,1)			-0.526			-0.347
			(2.92)**			(1.21)
2 years in last 4 years (0,1)			-0.296			-0.389
			(2.14)*			(1.80)
Previous reception of other type of food			0.547			-0.256
aid (0,1)			(3.78)**			(1.46)
Tigray	-0.270			-0.272		
	(1.21)			(0.85)		
Amhara	-0.015			-0.104		
	(0.06)			(0.40)		
Oromiya	0.296			-0.038		
	(1.29)			(0.22)		
Southern (SNNPR/SEPA)	-Omitted-	- with Wereda dummies -		-Omitted-	- with Wereda dummies -	
Gambela	-0.309			0.363		
	(0.97)			(0.92)		
Harari	- N.A. -			0.414		
				(1.72)		
Dire Dawa	0.534			-0.382		
	(2.52)*			(1.22)		
Wald tests: For History variables			17.7**			22.4
			[0.00]			[0.17]
For Plot level shocks	2.68	7.32	10.4 *	1.75	2.63	2.42
	[0.44]	[0.06]	[0.02]	[0.63]	[0.45]	[0.49]
For Rainfall shocks	2.13			0.58		
	[0.35]			[0.75]		
For Road dummies[B]	13.1*			7.40		
	[0.02]			[0.19]		
For Regional/Wereda dummies	13.0*	93.1**	92.7**	9.48	27.2	
	[0.02]	[0.00]	[0.00]	[0.15]	[0.06]	
Log likelihood	-190.2	-92.9	-82.0	-105.1	-48.7	-44.2
Number of observations	347	212	212	194	106	106

Note: * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are z-values. Numbers in brackets are p-values.
"Livestock household" is excluded in column 4, 5, and 6 because of too few observations. "Female headed household, but head is married" is excluded in column 5 and 6 for the same reason. A) Reported coefficients are changes in marginal probability. B) Coefficients of road dummies are not reported.

Table 14. Determinants of Chronic Food Aid: Wereda-Level Results (Probit[A])

	Free Distribution (1 if at least one household received FD for more than 3 years in last 5 years[B])		Food for Work (1 if at least one household participated FFW for more than 3 years in last 5 years[B])	
	(1)	(2)	(3)	(4)
ln (Per capita Income)		-0.028		-0.048
		(1.56)		(2.11)*
Fraction of households with some education		-0.084		-0.059
		(1.90)		(1.11)
Mean household size		-0.022		0.004
		(1.91)		(0.33)
Mean % of children (0-9 yrs) in households		-0.001		0.002
		(1.18)		(1.27)
Mean % of elder (over 55) in households		0.000		0.000
		(0.23)		(0.11)
Fraction of female headed, not married		-0.054		0.009
		(0.85)		(0.11)
Fraction of female headed, married		-0.117		0.042
		(0.89)		(0.35)
Mean size of land owned		0.002		-0.007
		(0.39)		(0.61)
Fraction of Muslim households		0.012		-0.054
		(0.40)		(1.49)
Fraction of Protestant households		0.120		-0.009
		(1.97)*		(0.15)
Fraction of livestock households		-0.107		-0.098
		(0.84)		(0.52)
Average rainfall 1988-95 (mm) *10e-2		-0.014		0.011
		(2.46)*		(1.60)
Elevation *10e-2		0.000		0.003
		(0.01)		(1.27)
Tigray	0.517	0.633	0.051	0.033
	(5.29)**	(3.88)**	(0.90)	(0.53)
Amhara	0.091	0.364	-0.019	0.041
	(1.77)	(3.31)**	(0.50)	(0.79)
Oromiya	-0.089	0.045	-0.087	-0.003
	(1.80)	(0.95)	(2.26)*	(0.07)
Other Killils	0.119	0.530	0.014	0.140
	(1.41)	(3.17)**	(0.23)	(1.36)
Wald tests: For Road dummies[C]		10.8		4.73
		[0.06]		[0.45]
For Regional dummies		25.3 **		3.65
		[0.00]		[0.46]
Log likelihood	-105.5	-78.3	-99.1	-83.4
Observations	348	348	348	348

Note : * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are z-values. Numbers in brackets are p-values.
A) Reported coefficients are changes in marginal probability. B) Including 1995/96. C) Coefficients of road dummies are not reported.

Table 15. Determinants of Chronic Food Aid: Household-Level Results (Probit[A])

	Free Distribution (1 if the household received FD for more than 3 years in last 5 years[B])		Food for Work (1 if the household received FFW for more than 3 years in last 5 years[B])	
	(1)	**(2)**	**(3)**	**(4)**
ln (Per capita Income)	-0.132	-0.125	-0.082	-0.066
	(4.03)**	(3.86)**	(2.75)**	(2.16)*
Household head has some	-0.108	-0.121	0.054	0.020
education (0,1)	(1.68)	(2.12)*	(0.89)	(0.32)
Household size	-0.003	-0.011	-0.014	-0.013
	(0.23)	(0.81)	(1.12)	(1.05)
Percentage of children	-0.001	0.000	0.000	-0.001
(0-9 yrs)	(0.65)	(0.16)	(0.35)	(0.69)
Percentage of elder	0.002	0.002	0.000	0.000
(older than 55 yrs)	(1.28)	(1.78)	(0.15)	(0.09)
Female headed household,	0.161	0.151	-0.007	0.023
not married	(2.13)*	(1.98)*	(0.09)	(0.30)
Female headed household,	-0.024	-0.032	-0.056	-0.052
but head is married	(0.18)	(0.25)	(0.49)	(0.49)
Land owned in ha	0.045	0.031	-0.004	-0.042
	(1.56)	(0.97)	(0.10)	(1.01)
Muslim household (0,1)	-0.336	-0.569	-0.125	-0.143
	(2.50)*	(5.29)**	(1.70)	(1.45)
Protestant household (0,1)	0.037	0.031	0.105	0.185
	(0.32)	(0.29)	(1.20)	(1.76)
Livestock household (0,1)	0.154	0.169	0.163	0.161
	(0.78)	(0.85)	(0.92)	(0.96)
Average Rainfall 1988-95 (mm) *10e-2	0.077 (2.01)*		0.043 (1.63)	
Elevation *10e-2	0.002		-0.019	
	(0.29)		(2.16)*	
Tigray	0.326		0.498	
	(1.37)		(2.98)**	
Amhara	0.168		0.116	
	(0.65)		(1.03)	
Oromiya	0.417		-0.144	
	(1.40		(1.70)	
Southern (SNNPR/SEPA)	– Omitted –	– Wereda dummies –	– Omitted –	– Wereda dummies –
Gambela	-0.267		-0.176	
	(1.07)		(2.37)*	
Harari	-0.192		-0.200	
	(0.95)		(2.02)*	
Wald tests: For Road dummies[C]	9.52		18.8**	
	[0.09]		[0.00]	
For Regional/Wereda dummies	13.5*	106.5 **	20.1**	34.6
	[0.02]	[0.00]	[0.00]	[0.22]
Log likelihood	-226.2	-174.2	-124.6	-113.1
Number of observations	425	408	308	303

Note: * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are z-values. Numbers in brackets are p-values.

A) Reported coefficients are changes in marginal probability. B) Including 1995/96. C) Coefficients of road dummies are not reported.

For chronic recipient households, the analysis is confined to households that live in weredas containing chronic recipients. We find that households with low current per capita income, a head without formal education, a high proportion of elderly members, and a female head without a living spouse are all more likely to be chronic free food aid recipients. Chronic participation in food for work is negatively related to current income, conditional on wereda dummies, but to little else. These conditional household participation probabilities range from 32.5% to 19.7% at the inter-quartile range for food for free, and from 18.5% to 12.0% for FFW. As mentioned, it is likely that attenuation bias affects the current income variable, so that the true income effects are likely to be larger in magnitude. However, it is also possible that past food aid may raise productivity among household workers which might raise current income, imparting a positive bias.

9. DOES PAST RECEIPT OF FOOD AID REFLECT CHRONIC NEEDS OR INERTIA?

A major question raised by these results is whether current and chronic allocations of food aid to particular areas reflect chronic need or other factors that impede changes in the location of program operations, or both. As discussed above, this is a very difficult question to answer because of the problem of unobserved heterogeneity. While we won't be able to claim to have answered this question conclusively, we can shed some light on it by including one additional variable: one showing food aid needs during the 1980s, as assessed by the Ethiopian RRC, the precursor to the current DPPC. RRC records at the old Administrative District (AD) level (there are 93) indicate that agency's estimate of the severity of the food situation in each year, measured as the proportion of the district population that "need" food aid.[51] We match the 1995/96 wereda boundaries to those of the old ADs and then construct a variable that averages by AD the RRC estimates of "needs" over the five year period 1984 to 1988.[52] By doing so, we create a variable that measures the food aid needs during and after the major 1984/85 famine. We use this variable as a proxy for unobserved time-invariant heterogeneity, μ_i in equation [1], to try to explain current year and chronic food aid receipt at the wereda level, adding this variable to our base specifications in Tables 2 and 10. We then add the wereda lagged receipt variables to see if they are still significant. To the extent that this RRC assessed needs variable, together with other measured variables such as current mean log per capita income and region and plot-level water shocks, adequately control for μ_i, this should greatly reduce, though possibly not eliminate, the bias when using the history variables.[53]

Before discussing the main results, it is useful to examine how much of the variation in RRC needs assessments represents time-invariant versus time series variation. If needs assessments have a strong time-invariant component then we can use that variable, or its average over time, as a measure (albeit imperfect) of unobserved time-invariant need. In that case, if we continue to find strong history effects when also controlling for the RRC needs assessment, that would be

---

[51]The data cover the period from 1979 through 1988. How "needs" are established by the RRC is unclear, but according to Patrick Webb, a nutrition scientist who spent much time conducting field work in Ethiopia during the mid- and late-1980s, they are an assessment of perceived food aid needs (personal communication).

[52]The program MapInfo was used to rescale maps with the current wereda boundaries to the same scale as the hardcopy maps of the former ADs. In about 80% of the cases, weredas were simply subsets of particular ADs, and in these cases, the matching of former ADs to current weredas was straightforward. In 20% of the cases, weredas fell into 2 different ADs. In most of these cases, it was clear that the wereda was almost exclusively or predominantly in one AD. After completing this exercise of allocating current weredas to particular ADs, we compared our findings with those from an analogous exercise undertaken at IFPRI. Of the 348 weredas used in our study, there were 11 in which MSU and IFPRI differed in their wereda-to-AD allocation decision. After checking maps and populations again, we made a final determination.

[53]We also considered using the RRC variable as an instrument for the history variables, but since there are four of those, we need additional instruments for identification. Lagged rainfall deviations were tried, but did not explain the history variables very well. Furthermore, given that we do not measure current needs completely, a lagged needs measure would arguably be correlated with the omitted indicators of current needs in the allocation equations, and hence produce biased estimates when used as an instrument.

evidence in favor of inertia in food aid program operations, since we would be controlling for needs that are time-invariant. If on the other hand, perceived needs do change over time, then one would have to worry more about controlling for current year needs when interpreting the history variables.

To explore this question we take the raw RRC assessments of the percent of the AD population that needs food aid, for each year of available data (1979-1988, giving 813 observations), and regress these percentages on a set of AD dummy variables. This is equivalent to an analysis of variance, and it turns out that 52% of the needs variation is across ADs (that is the R^2 is .52), the other 48% being over time, within districts.[54] Thus the RRC needs assessment variable does have a strong time-invariant component to it, but it does vary over time as well.

Most of the ADs which were significant in this pooled regression equation, representing chronic need, were in Wello and Tigray. Only 5 of the 73 ADs outside of Tigray and Wello were found to be chronically needy based on RRC needs assessment figures. It should be kept in mind that the 1979-1988 period in question coincided with severe civil disruption primarily in these northern areas.

The wereda results using the RRC needs assessment variable are presented in Table 16. We first see that both chronic receipt of food for free and food for work are positively and significantly related to the average RRC needs assessment from 1984 through 1988. An increase in the percent affected from 0% to 17% (the inter-quartile range) doubles the mean probability of chronic free food receipt, from .05 to .10. An increase of the percent of population assessed in need to .44 (the 90th percentile) raises the predicted wereda chronic probability to .24 (remember that only 13.5% of weredas are chronic receivers, so that these are very large impacts). For FFW, the historical needs impact is smaller; a rise in predicted probability of chronic receipt from .05 to .08 at the 25th and 75th percentiles of needs assessment, and to .16 at the 90th percentile (only 9% of weredas are chronic receivers of FFW). Notice in the free distribution food probit that the Tigray coefficient drops in half from roughly .6 to .29, being just significant at the .05 level.[55] These results indicate that a large part of the Tigray Region's chronic receipt of free food during the early- and mid-1990s stems from perceptions of its neediness during the 1980s (when it experienced severe civil turbulence and famine). We conclude that assessed food aid needs during the 1984-1988 period does influence which weredas have remained chronic recipients of food aid in the mid-1990s.

For free food it turns out that needs assessment during one year only, 1984, does as well as the average from 1984-1988 in predicting chronic recipient weredas in the 1991/92-1995/96

[54]Using region dummies instead, we find very strong effects for Tigray and Wello, the two most affected areas in 1984; coefficients of .39 for Tigray and .33 for Wello, with t-statistics of 8.6 and 8.2 respectively. The only other region with a coefficient significant at the .05 level is Harrage and its coefficient is only .09 with a t-statistic of 2.3.

[55]For food for work, the Tigray coefficient is near zero before the RRC variable is added so that this argument is not relevant.

Table 16. Determinants of Food Aid Allocation with 1980s Post-Famine Variable: Wereda Level Results (Probit[A])

	Free Distribution			Food for Work		
	Chronic	Current FD		Chronic	Current FFW	
Average % of needy households in wereda	0.217	0.518	0.072	0.166	0.526	0.271
population, RRC 1984 - 88	(2.95)**	(2.25)*	(0.29)	(1.93)	(2.75)**	(1.76)
ln (Per capita Income)	-0.028	-0.092	-0.019	-0.045	-0.101	-0.043
	(1.54)	(1.79)	(0.35)	(2.02)*	(2.46)*	(1.31)
Fraction of households with some	-0.81	-0.062	0.035	-0.048	0.147	0.158
education	(1.84)	(0.05)	(0.27)	(0.92)	(1.51)	(2.09)*
Mean household size	-0.013	0.013	0.044	0.009	0.018	0.030
	(1.15)	(0.43)	(1.33)	(0.73)	(0.73)	(1.48)
Mean % of children (0-9 yrs) in	-0.001	-0.006	-0.005	0.002	-0.008	-0.006
households	(1.17)	(1.87)	(1.35)	(1.37)	(2.90)**	(2.88)**
Mean % of elder (over 55) in households	-0.000	-0.004	-0.004	0.000	-0.006	-0.005
	(0.07)	(1.10)	(0.81)	(0.27)	(1.77)*	(1.72)
Fraction of female headed, not married	-0.019	0.265	0.358	0.036	-0.001	-0.130
	(0.30)	(1.35)	(1.66)	(0.46)	(0.01)	(1.00)
Fraction of female headed, married	-0.037	0.123	0.010	0.048	0.541	0.371
	(0.30)	(0.45)	(0.03)	(0.40)	(2.50)*	(2.08)*
Mean size of land owned	-0.002	-0.017	-0.029	-0.007	0.005	0.008
	(0.49)	(0.94)	(1.05)	(0.61)	(0.64)	(1.35)
Fraction of Muslim households	-0.009	0.083	0.121	-0.060	–0.091	-0.094
	(0.31)	(1.01)	(1.38)	(1.70)	(1.35)	(1.68)
Fraction of Protestant households	0.092	0.046	0.032	-0.011	0.084	0.128
	(1.55)	(0.32)	(0.21)	(0.17)	(0.73)	(1.30)
Fraction of livestock households	-0.108	-0.575	-0.558	-0.081	-0.533	-0.475
	(0.78)	(1.45)	(1.25)	(0.43)	(1.27)	(1.39)
Mean % of plot area with shortage of rain		0.004	0.004		0.003	0.003
		(2.41)*	(2.67)**		(2.52)*	(3.30)**
Mean % of plot area with flood		0.003	0.005		0.005	0.005
		(1.19)	(1.99)*		(2.46)*	(3.07)**
Mean % of plot area with crop disease or		0.002	0.001		-0.001	-0.002
insect problems		(0.65)	(0.23)		(0.57)	(1.11)
Average rainfall 1988-95 (mm) *10e-2	-0.003	-0.011	0.003	-0.004	-0.011	0.000
	(0.41)	(0.77)	(0.20)	(0.47)	(0.85)	(0.04)
Rainfall shocks in 1994 (mm) *10e-2		0.019	0.028		0.018	0.015
		(1.05)	(1.45)		(1.25)	(1.33)
Rainfall shocks in 1995 (mm) *10e-2		-0.029	-0.028		-0.015	-0.013
		(1.96)*	(1.78)		(1.24)	(1.38)
Elevation *10e-2	-0.002	0.011	0.013	0.003	0.015	0.016
	(0.65)	(1.83)	(2.09)*	(0.97)	(3.02)**	(3.81)**
History of Receiving Food Aid						
4 years in last 4 years (0,1)			0.788			0.858
			(4.19)**			(4.21)**
3 years in last 4 years (0,1)			0.505			0.257
			(2.82)**			(2.72)*
2 years in last 4 years (0,1)			0.288			0.396
			(2.63)**			(3.36)**
1 year in last 4 years (0,1)			0.171			0.300
			(2.28)*			(4.36)**
Previous experience with other type of			0.209			0.075
food aid			(3.04)**			(1.83)
Tigray	0.291	0.266	0.098	-0.026	0.076	0.127
	(2.03)*	(1.47)	(0.57)	(0.55)	(0.53)	(0.90)
Amhara	0.139	-0.023	-0.091	-0.022	-0.008	0.047
	(1.56)	(0.19)	(0.72)	(0.45)	(0.08)	(0.49)
Oromiya	0.023	-0.016	-0.045	-0.021	0.102	0.123
	(0.49)	(0.17)	(0.48)	(0.51)	(1.29)	(1.74)
Other Killils	0.287	0.379	0.278	0.052	0.251	0.230
	(2.07)*	(2.23)*	(1.54)	(0.65)	(1.59)	(1.51)
Wald tests: For History variables			22.3**			32.3**
			[0.00]			[0.00]
For Plot level shocks		6.53	9.54*		11.5**	18.3**
		[0.09]	[0.02]		[0.01]	[0.00]
For Rainfall shocks		4.57	4.81		2.80	3.35
		[0.10]	[0.09]		[0.25]	[0.19]
For Road dummies[B]	8.96	5.12	7.43	3.99	4.32	7.73
	[0.11]	[0.40]	[0.19]	[0.55]	[0.50]	[0.17]
For Regional dummies	7.93	11.6*	6.92	1.96	4.72	4.48
	[0.09]	[0.02]	[0.14]	[0.74]	[0.32]	[0.34]
Observations	348	348	348	348	348	348

Note: * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are z-values. Numbers in brackets are p-values.
A) Reported coefficients are changes in marginal probability. B) Coefficients of road dummies are not reported.

period.[56] The first year of the mid-80s major famine in Ethiopia was 1984, so that evidently, free food programs initiated after the famine operated recurrently in those areas for at least a decade. Food for work programs became more prominent later in the 1980s, which is why the 1984-1988 average and not the 1984 variable explains chronic placement in that case.

Not only is the 1980s needs assessment variable associated with chronic wereda food aid receipt, it is also significantly associated with current year receipt as well, as shown in columns 2 and 5. These impacts are also large, as they are in the case of chronic receipt.[57] Note, too, that the Tigray coefficients greatly shrink towards 0: it halves for food for free and shrinks almost to 0 in the case of FFW. Thus, the 1980s needs assessment variable is having a very similar impact to the 1990s lagged receipt variables. This is exactly what we would expect if unobserved, time-invariant heterogeneity is important; that is $Y_{i,t-1}$ and μ_i have similar impacts when entered separately into the probits.

To distinguish the separate influences of lagged receipt and time-invariant needs, we add the lagged receipt variables to the current year wereda receipt probit. As one can see in columns 3 and 6, the coefficient on the historical needs variable drops to near 0 in the free food probit, and it is positive, but half the magnitude for FFW. On the other hand, comparing the magnitudes of the receipt history coefficients to their values in Table 2, one can see that the two are very close, and that the history coefficients are still jointly highly significant when the RRC needs variable is introduced.

We conclude from this exercise that the very large wereda-level impacts of lagged receipt of food aid is only in small part a reflection of persistent need from the 1984-1988 period. While chronic food aid allocations during the 1991/92-1994/95 period are affected by assessed needs during the 1984 famine period and after, much of their influence on survey year 1995/96 allocations is evidently independent of past assessed needs, since the lagged receipt variables remain significant despite the inclusion of the RRC needs variable. On the other hand, our results show that past needs, while having a strong time-persistent component, do vary over time. Therefore it is possible that part of the effect of lagged receipt on current year receipt of aid may be capturing some unmeasured dimensions of current needs that persist through the 1990s, but that are different from needs as measured by the RRC during the 1984-1988 period. However, remember that we do control for certain measures of current needs, such as current year income, plot-level shocks and regional rainfall shocks, so that any such unmeasured variables would have to be different.

---

[56]The marginal probability for free food is .517 with a t-statistic of 3.15. For food for work the coefficient is .097 with a t-statistic of only 0.69.

[57]Predicted probabilities at the inter-quartile range of the RRC variable range from 20.7% to 28.1% for free distribution and from 13.7% to 21.7% for food for work.

Given the large current and historical allocations of per capita food aid to Tigray and the Wello areas of Amhara, one might speculate whether the finding of inertia holds nationwide or is driven primarily by these areas. If the finding of inertia were being driven by these northern areas, then we wouldn't expect these influences to persist when we drop Tigray from the analysis. However, as can be seen in Appendix Table 3, the impact of the history variables, alone and with the RRC needs assessment variable, are quite close to the results in Table 16. Hence the key findings hold outside of Tigray as well as within it.[58] Hence while not absolutely conclusive, the evidence is consistent with the premise that inertia in the spatial allocation of food aid operations is an important part of the story explaining current year allocations throughout Ethiopia.

[58]Even when we drop the areas of north and south Wello in addition to Tigray, the overall pattern of results stays the same (results available from the authors). This result means that even in areas less affected by the 1984/85 famine, receipt during recent years greatly affects current year receipt.

10. POTENTIAL STRATEGIES FOR IDENTIFYING LOW-INCOME WEREDAS AND HOUSEHOLDS FOR FOOD AID TARGETING

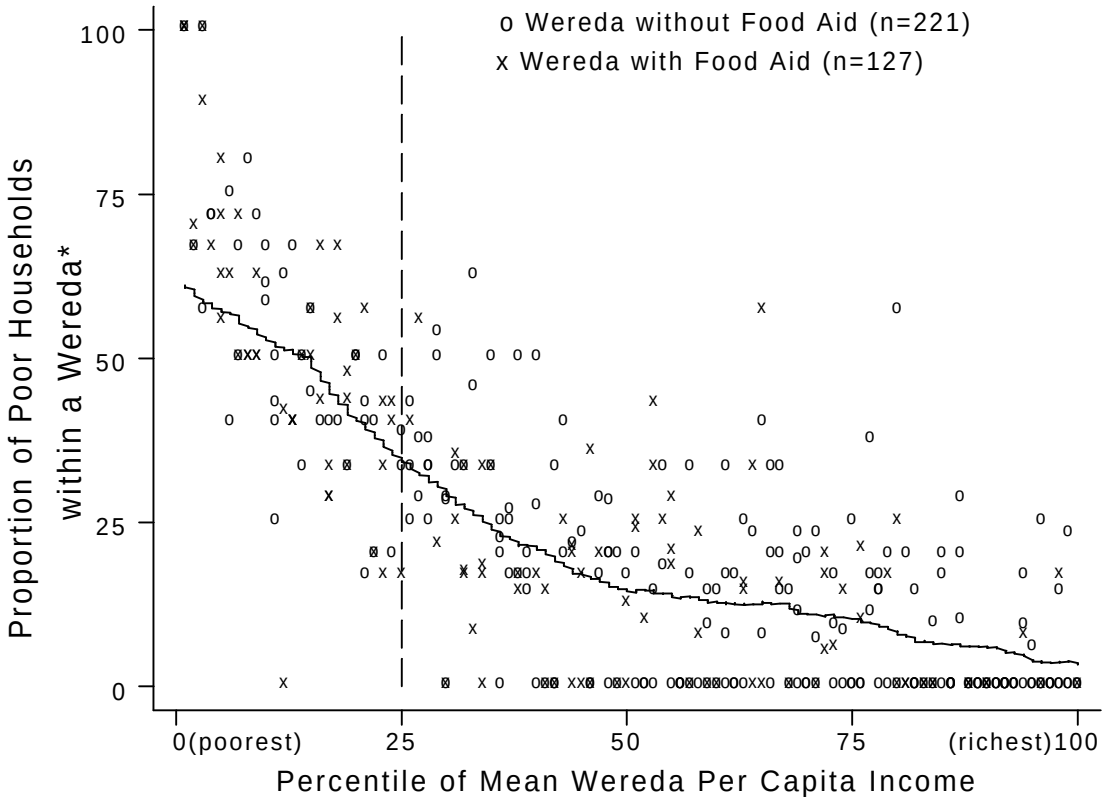
This section is designed to identify easily measurable indicators and strategies for improving targeting of food aid in the future. As described in Section 2, food aid in Ethiopia is allocated in two basic steps: (1) Federal authorities allocate quantities for distribution to regions and weredas within regions; and (2) Wereda authorities provide the food aid to local peasant authorities to allocate to needy households. The results presented in this section have implications for both stages of targeting.

10.1. Wereda-level Targeting

Recent policy statements by the federal Government of Ethiopian indicate that its targeting priority will be on Step 1 – identifying the needy weredas – and if need is equated with low incomes, then most of the nation's poorest households will receive assistance. This strategy of targeting needy weredas rather than worrying about distribution within weredas is built on the premise that there is greater variability in incomes and need across than within these geographic areas. To examine this premise, we ranked all weredas in the national sample (n=348) according to their mean per capita income and plotted these values against the percentage of households in each wereda falling into the bottom per capita income quartile ranked nationally. Figure 9 shows the expected negative relationship, but also shows a high degree of variability in the relationship. For example, roughly 30% of the households in weredas at the 25th percentile of mean per capita income fell into the bottom national income quartile on average. But in other weredas at 25th mean income percentile, as many as 60% or as little as 15% of the households belonged to the poorest national income quartile. Because of the wide within-wereda variation in per capita income, it is the case that during the 1995/96 sample year, the poorest 25% of the weredas in the country were found to contain only 54% of the nation's poorest households (those falling into the bottom per capita income quartile, ranked nationally). The other 45% of households in the bottom national income quartile were scattered throughout the other 75% of the weredas. These findings indicate that there are many relatively poor people that are not located in the poorest weredas in the country, and that a targeting strategy that focused only on relatively poor weredas would miss a large percentage of needy people.

However, identifying and including the poorest weredas for food aid distribution is clearly an important element of a well-targeted food aid program. Of the 348 weredas in our national sample, 127 had at least one household receiving FD or FFW. Out of these 127 weredas, only 47 were contained in the poorest mean wereda income quartile. Of course, even if income were the sole criterion used to determine which weredas should receive food aid, we would expect to see less than 100% targeting of poor weredas due to a lack of information on wereda incomes at the time that food aid allocations need to be made.

Figure 9. Poor Households Relative to Mean Wereda Per Capita Income



* "Poor" defined as falling in the poorest 25% of all households in the national sample.

Referring back to Table 1, the national survey data from 1995/96 indicate that the greatest incidence of poverty was in the Southern and "other" regions (e.g., Gambela, Beneshangul, Dire, and Dawa), which, for the most part, were not the areas that received the highest amounts of food aid. This raises the question of whether there exist observable indicators that can be used to target vulnerable regions more precisely.

Addressing this question requires us to understand the factors associated with wereda-level poverty, so we regressed wereda-level income (both mean per capita income and mean total household income) on household and locational variables, using OLS. Incomes were comprised of crop income, non-farm income, and a fraction of animal assets. Results are presented in Table 17.

Table 17. Determinants of Mean Wereda Income (OLS)

	Mean Per capita Income	Mean Total Household Income
Fraction of Household Head with Some Education	47.10	116.6
	(0.66)	(0.33)
Mean Household Size	-25.57	347.6
	(1.44)	(3.95)**
Mean % Children (0-9 yrs) in Households	-2.758	-13.69
	(1.48)	(1.48)
Mean % of Elderly (over 55 yrs) in Households	2.303	9.029
	(1.05)	(0.83)
Fraction of Female Headed, not married	-189.3	-830.4
	(1.67)	(1.48)
Fraction of Female Headed, married	-93.20	-547.5
	(0.59)	(0.70)
Mean Size of Land Owned, splined at 3 ha	77.51	448.7
	(2.92)**	(3.42)**
Mean Size of Land Owned, above 3 ha	-90.68	-526.9
	(2.93)**	(3.44)**
Fraction of Muslim Households	-59.20	-233.0
	(1.23)	(0.98)
Fraction of Protestant Households	-107.4	-455.0
	(1.26)	(1.08)
Mean % of Plot Area with Shortage of Rainfall	-2.122	-10.63
	(2.08)*	(2.11)*
Mean % of Plot Area with Flood	-0.634	-5.377
	(0.41)	(0.70)
Mean % of Plot Area with Crop Disease/Insect Problems	-2.324	-12.38
	(1.57)	(1.69)
Average Rainfall 1988-95 (mm) * 10 e-2	13.31	58.48
	(1.54)	(1.37)
Rainfall Shocks in 1994 (mm) * 10 e-2	3.445	4.601
	(0.34)	(0.09)
Rainfall Shocks in 1995 (mm) * 10 e-2	12.40	42.21
	(1.45)	(1.00)
Elevation * 10 e-2	2.652	20.88
	(0.75)	(1.20)
Average % of Needy Households, RRC 1984-88	-102.2	-428.6
	(0.73)	(0.62)
Road dummy 1 (the best road)	115.5	586.6
	(2.84)**	(2.91)**
Road dummy 2	53.66	216.9
	(1.00)	(0.82)
Road dummy 3	3.687	6.238
	(0.09)	(0.03)
Road dummy 4	-63.69	-187.7
	(1.50)	(0.89)
Road dummy 5 (the worst road)	-15.36	-16.43
	(0.26)	(0.06)
Tigray	249.1	1,342
	(2.61)**	(2.85)**
Amhara	-2.788	83.02
	(0.04)	(0.23)
Oromiya	128.7	539.5
	(2.34)*	(1.98)*
Southern (SNNPR/SEPA)	– Omitted –	– Omitted –
Other Killils	111.9	320.5
	(1.23)	(0.72)
Constant	333.5	-958.0
	(1.92)	(1.11)
F tests For		
Plot Level shocks	2.12 [0.10]	2.29 [0.08]
Rainfall shocks	1.15 [0.32]	0.51 [0.60]
Road dummies	2.03 [0.07]	1.85 [0.10]
Prices ofcereals	0.74 [0.57]	0.37 [0.83]
Regional dummies	4.67 [0.00]**	3.97 [0.00]**
R squared	0.27	0.33
Observations	348	348

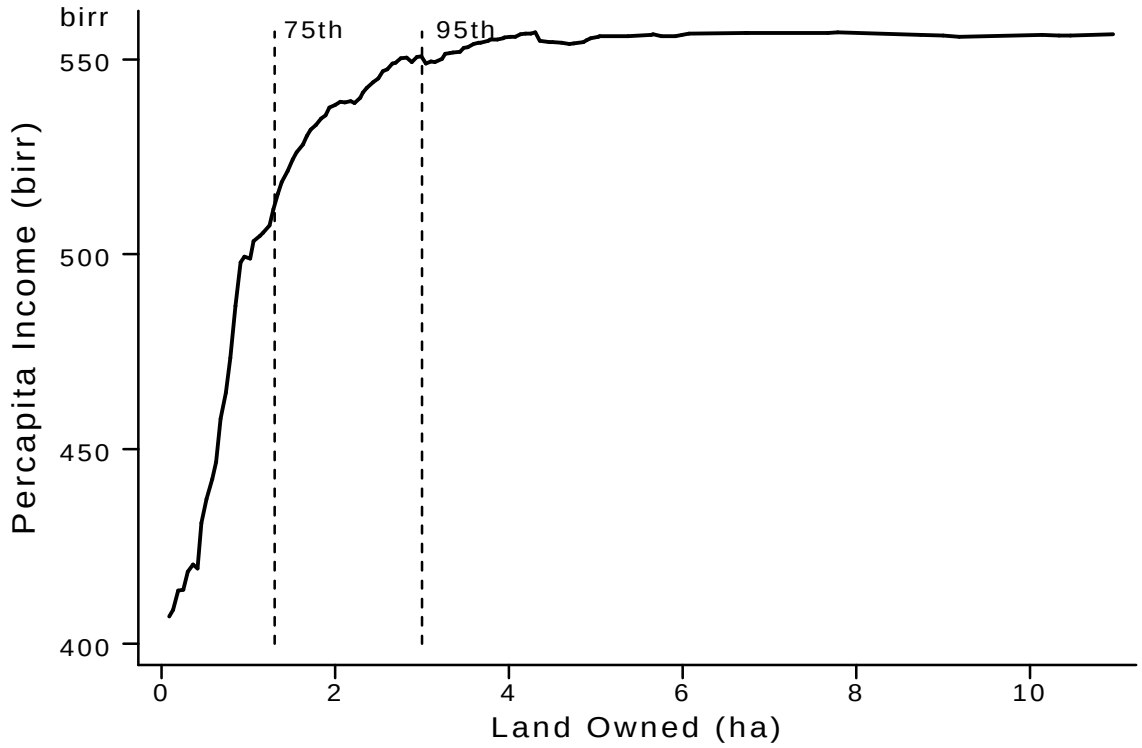
Note: Absolute values of t-statistics are in parentheses. * indicates significant at 5% level; ** indicates significant at 1% level. Prices of four cereals are included but not reported. None of the prices are significant.

At the wereda-level, a common set of variables emerged as important determinants of both mean per capita and total household income models. First of all, after controlling for observed household characteristics, average annual rainfall, recent rainfall shocks, elevation, cereal prices (for teff, maize, and wheat), and road infrastructure, households in Tigray Region (and to a lesser extent, Oromiya Region) had significantly higher income levels than in the rest of the country. Proximity to tarmac roads (road dummy 1) also appeared to be associated with higher income levels. Other factors constant, weredas containing a tarmac road were associated with mean wereda incomes of 115 birr per capita higher than in weredas not having tarmac roads. This amount (115 birr per capita) is the amount separating households at the 25th income percentile and the 40th income percentile. Weredas with tarmac roads also had total household incomes almost 600 birr higher than those that did not, controlling for other factors. The second best road type (all-weather dirt) also had a positive but less dramatic and precisely estimated effect on income levels. Average long-run rainfall was associated with 13.3 birr per capita higher mean wereda incomes for every additional 100 mm of rainfall, but this effect was not significant at even 0.10. Rainfall shocks (deviation from long-run average rainfall) in the preceding year were also not closely associated with current year wereda incomes.

The most important household variable explaining the variation in wereda level incomes (both per capita and total household incomes) was mean size of landholdings – up to three hectares. A bivariate scatterplot showed that per capita incomes increase sharply with landholding size up to three hectares (which accounts for about 95% of all households), and then is basically flat beyond 3 hectares (Figure 10). Based on this relationship, we modeled land size as a spline function in the model. Table 17 shows that each additional one hectare increase in average wereda landholdings (up to 3 hectares) is associated with a 77 birr increase in wereda per capita income (and a 448 birr increase in average household income). Other household-level characteristics associated with variations in wereda mean incomes were the fraction of female headed households with no referent male, and the mean percentage of cropped area in which rainfall shortages or crop diseases or pests were reported. All these variables had the same directional effects of both per capita and total household incomes. The only variable that had different qualitative effects on the two measures of income was, as expected, mean household size. The association between mean household size and per capita income was negative but not significant, but each additional family member was significantly associated with 347 birr increase in total mean household income at the wereda level. By contrast, mean wereda income over the entire sample was 488 birr per capita. Thus, larger family sizes are associated with smaller wereda per capita incomes, but larger total household incomes.

Thus, for purposes of identifying low-income weredas, both per capita and total household income, the following indicators appear to be important: weredas in the Southern and Amhara regions, weredas lacking all-weather roads, weredas in which a large portion of cropped area suffers from crop damage, weredas with relatively small average land holdings, and female-headed households with no adult male in the family.

Figure 10. Relationship Between Per capita Income and Land Owned, National Level



Note: The dotted lines indicate 75th and 95th percentile of land owned.

10.2. Household-level Targeting

This section identifies household and locational characteristics associated with variations in household incomes. As with the wereda-level models, we estimate household-level models for both income per capita and total household income. For each of these different formulations of income, we estimate models with regional dummies and wereda-level rainfall shocks, cereal prices, and road types, as well as wereda-fixed effects models (which focus on intra-wereda variations in income). Results for each of these models are presented in Table 18.

The models with regional and wereda-level effects showed a similar set of indicators being associated with low-income households (in both per capita and total terms). These were: households located in the Southern Region as well as in Beni-Shangul, Somalie, Gambela, and Dire Dawa Regions; low average rainfall; lack of good roads in the wereda; percentage of cropped area affected by crop disease and drought; low household landholding; female-headed households with no adult male in the family; and the percentage of family members that are young children. The wereda-fixed effects models showed an almost identical set of household variables explaining the variation in within-wereda household incomes.

Table 18. Determinants of Household Income (OLS)

	Per capita Income		Total household Income	
		Wereda Fixed Effect		Wereda Fixed Effect
Household Head's Education (0,1)	43.137	30.563	216.630	190.982
	(1.81)	(1.22)	(1.87)	(1.57)
Household Size	-46.251	-47.633	266.088	263.712
	(8.86)**	(8.77)**	(10.48)**	(10.05)**
Percentage of children (0-9 yrs)	-2.991	-2.996	-12.511	-12.332
	(5.47)**	(5.31)**	(4.70)**	(4.53)**
Percentage of elder (55 yrs over)	0.312	-0.013	-1.729	-3.778
	(0.51)	(0.02)	(0.58)	(1.25)
Female headed, not married (0,1)	-135.669	-120.014	-408.495	-279.609
	(4.14)**	(3.55)**	(2.56)*	(1.71)
Female headed, married (0,1)	-61.358	-61.200	-199.205	-150.518
	(1.33)	(1.29)	(0.89)	(0.66)
Land owned in ha	124.736	147.717	647.180	765.523
	(8.79)**	(8.33)**	(9.37)**	(8.93)**
	-133.127	-155.173	-689.722	-804.963
	(8.91)**	(8.37)**	(9.49)**	(8.98)**
Muslim household (0,1)	8.543	59.329	86.805	278.163
	(0.31)	(1.26)	(0.64)	(1.22)
Protestant household (0,1)	-76.503	-71.645	-404.501	-390.507
	(2.16)*	(1.70)	(2.35)*	(1.92)
Percentage of areas with shortage of rain	-1.248	-0.644	-5.910	-3.162
	(2.59)**	(1.09)	(2.52)*	(1.10)
Percentage of areas with flood	-0.518	-1.446	-4.144	-8.033
	(0.74)	(1.74)	(1.22)	(2.00)*
Percentage of areas with crop disease	-1.191	-0.772	-6.295	-3.764
	(2.03)*	(1.18)	(2.20)*	(1.19)
Average rainfall 1988-95 (mm) * 10e-2	11.766		62.845	
	(2.11)*		(2.32)*	
Rainfall shocks in 1994 (mm) * 10e-2	3.517		-0.289	
	(0.53)		(0.01)	
Rainfall shocks in 1995 (mm) * 10e-2	9.276		38.831	
	(1.46)		(1.26)	
Elevation * 10 e-2	-0.409		7.324	
	(0.15)		(0.56)	
Tigray	225.1		1274	
	(3.90)**		(4.53)**	
Amhara	-20.18		35.46	
	(0.52)		(0.19)	
Oromiya	138.5		608.4	
	(4.09)**		(3.70)**	
Somalie	-155.9		-788.6	
	(1.79)		(1.86)	
Beni-Shanguru	-269.8		-1014	
	(3.35)**		(2.59)	
Southern (SNNPR/SEPA)	– Omitted –	– Wereda dummies –	– Omitted –	– Wereda dummies –
Gambela	-71.11		-248.9	
	(0.77)		(0.56)	
Harari	309.6		1052	
	(3.01)**		(2.11)*	
Addis Ababa	704.9		2927	
	(7.92)**		(6.76)**	
Dire Dawa	-80.33		-640.1	
	(0.76)		(1.24)	
Constant	630.9		118.4	
	(6.28)**		(0.24)	
F test For				
Plot level shocks	3.27 [0.02]*	1.65 [0.18]	3.58 [0.01]*	1.97 [0.12]
Rainfall shocks	1.29 [0.28]		0.79 [0.45]	
Cereal prices	1.90 [0.11]		1.07 [0.37]	
Road dummies[A]	4.31 [0.00]**		2.91 [0.01]*	
Regional/Wereda dummies	15.1 [0.00]**		11.9 [0.00]**	
R-squared	0.15	0.08	0.18	0.12
Observations	2867	2867	2867	2867

Note: Absolute values of t-statistics are in parentheses. * indicates significant at 5% level; ** indicates significant at 1% level. Prices of four cereals and five orad dummies are included in the models but not reported. A) Coefficients of road dummies are not reported.

10.3. Alternative Indicators of Need

As noted elsewhere in this report, current income is an incomplete indicator of need. Nutritional information is another clear criterion of need, but at this time such information was not available. Ownership of animal assets is another reasonable indicator of need, as it is the most important stock of wealth in most areas of Ethiopia. To examine the robustness of the findings above concerning indicators of need, we also specified several models in which the value of household animal ownership (including cattle, sheep, goats, poultry, pigs, donkeys, and horses) was specified as the dependent variable. Results of these models are contained in the annex (Table A4 and A5).

Factors explaining wereda-level variations in the mean value of animal assets were largely but not entirely similar to those explaining wereda-level variations in income. The common set of variables associated with need in both the income and animal asset models were mean size of landholdings (up to 3 hectares), mean percentage of cropped area with disease and pest problems, and household size on total mean value of animal ownership (Table A4). However, there were a few striking differences. First, weredas in Amhara region tended to have lower accumulated animal assets than those in other regions, and weredas in Oromiya region tended to have more animal assets than in other areas. Second, weredas with a relatively large percentage of elderly members tended to have a higher value of animal assets, both in terms of per capita and total value per household. Also, and most interesting, the average percentage of needy households as identified by the RRC in 1984 to 1988 (which might be considered to control for variations in historical need during the 1980s famine period) was positively associated with wereda-level animal assets, and this association was significant in both the per capita and total value models at 0.10. One possible interpretation is that the historical famine areas have built up higher than average stocks of animal assets that can be liquidated for cash to buy food during periods of shortfall. Another possible interpretation is that the areas of historical famine tended to be pastoral areas where livestock activities are prominent. It is noteworthy that neither average long-term rainfall nor rainfall shocks in 1994 and 1995 were associated with current animal wealth at the wereda level.

At the household level, there were striking similarities in the set of variables explaining variations in income and animal wealth. These were: household size; households with a relatively large percentage of small children; female-headed households with no referent male; size of landholding (up to 3 hectares); percentage of cropped area suffering from drought or disease; proximity to all-weather roads; and households residing in Tigray Region. Wereda-level cereal prices, often taken as a measure of need, were positively associated with animal wealth. Households in Oromiya, Somali, and Dire Dawa also tended to have more animal assets, other factors constant, than households in other regions. These findings indicate that, in terms of the several ways in which need was measured in this section – per capita income, total household income, per capita animal wealth, and total household animal wealth – there was a small set of variables that consistently were associated with need. These were household members with a relatively large number of small children, female-headed households with no adult male, size of landholding up to three hectares, road infrastructure, and households in the Southern Region.

11. CONCLUSIONS

Effective targeting of food aid recipients can contribute to improved nutrition, health and other important welfare objectives. But in spite of the large amount of international food aid flows over the past thirty years, very little is known regarding the degree of targeting, if any, that is used by recipient governments. There is a dearth of empirical information on which to assess the cost-effectiveness of alternative targeting programs that could provide useful feedback to improve the design of food assistance programs in the future. Importantly in the Ethiopian case, neither food aid donors nor central government agencies determine how food aid is distributed in local communities, nor do they generally have the means of determining the characteristics of those who do and do not receive food aid.

This report sheds light on how food aid was targeted in rural Ethiopia, and identifies the factors, both at the regional and household level, that are correlated with low incomes. This information can be used to identify low-income areas and low-income households within particular areas more efficiently. Moreover, while the allocation of food aid is a highly politicized issue, this study reports simply on the outcome of the process – how food aid was allocated and the regional and household-level characteristics with which it was correlated. The results and their implications may be useful for donors and NGOs in assessing the results of their food aid programs and in their dialogue with government in improving the impacts of food aid in the future.

Findings are based on analysis of national household-level survey data of over 2,200 households in rural Ethiopia. The survey was based on a sub-sample of the CSA's 1995 Agricultural Production Survey, and was designed to be representative of the four largest regions in Ethiopia. The surveys were implemented by CSA in 1995 and 1996.

The report highlights six major findings. First, there is substantial relative variation in the extent of poverty across weredas (local administrative units) and across households within weredas, as measured by per capita income. While the argument is often heard that targeting is not necessary or cost-effective because the majority of rural Ethiopian households live in absolute poverty by current world standards, our findings show that per capita incomes were three times higher at the 75^{th} per capita income percentile than at the 25^{th} percentile. Per capita incomes were eight times higher at the 90^{th} percentile than at the 10^{th} percentile. These findings from Ethiopia are not unique – almost all survey data from Sub-Saharan Africa show a high degree of relative variation in incomes and assets across regions and across households within regions. These findings imply that targeting of food aid to the poorest of the poor remains an important objective in food aid programs.

Second, we find evidence that, at the national level, food aid was targeted to some extent according to income. The poorer households and poorer weredas had higher probabilities of receiving food aid than households or weredas with higher per capita incomes. The probability that a particular wereda (local administrative unit) would receive free food varies from 30.4% for the 25^{th} percentile of wereda mean log per capita income, to 24.1% for the 75^{th} income

percentile, to 21.1% for the 90th income percentile. Assets, such as size of landholding and livestock ownership, were not related to food aid allocations. Long-term rainfall, in most of the estimated models, was not correlated with food aid allocations, even though wereda-level incomes were not significantly related to long-term rainfall. The probability of receiving food aid was higher in areas experiencing short-run shocks in rainfall, but not by much. Amounts of food aid received by beneficiaries, on the other hand, are not responsive to weather shocks. Within local areas it does not appear that field-level rainfall shocks affect local allocations to households, so that a potential insurance role of food aid was not being used.

Third, the fact that only 30% of the poorest weredas received food aid indicates that, at least in this particular year (1995-96) and using income as the criteria of need, there were very large targeting errors of exclusion. Over the national sample, the probability of receiving food aid was 35% or below, other factors held constant, even for the poorest weredas in the country. Within weredas where food aid was distributed (about 28% and 22% of the weredas sampled nationally, for free food and food for work), well under half of the poorest 25% of households received any type of food aid. These findings suggest that the amount of food aid distributed in 1995/96 was inadequate to meet the needs of households under the 25th per capita income percentile. The finding of large targeting errors of exclusion is consistent with the findings of Clay, Molla, and Debebe (1999).

Fourth, the amount of food received by households through FFW programs was not related to per capita incomes. This was in contrast to free distribution of food aid, which displayed more effective income-based targeting. However, there were wide variations in the extent of targeting across regions. Receipt of free food was most closely related to low per capita incomes in Amhara Region, but not related to per capita incomes in the South. Food for work participation was confined to the poor most effectively in Tigray, but was almost totally unrelated to household per capita incomes in Amhara and the South. There are difficulties in accommodating the dual objectives of FFW, which include development objectives as well as hunger alleviation. At policy levels, donors and government regard both objectives as important, but at the field level there is often less emphasis on the need to promote these objectives simultaneously. Officials from one local donor agency involved in FFW programs in Ethiopia have stated that their primary objective in implementing FFW was to use food as a means of financing local development projects and did not contain an explicit targeting objective. Targeting through FFW activities also was likely to have been impeded by the practice of offering wages to participants that typically exceeded prevailing agricultural labor wages. Other studies have examined the potential to improve food aid targeting through careful selection of cereals for work rations whose consumption tends to be inversely related to incomes (e.g., Dorosh, Ninno, and Sahn 1995; Jayne et al. 1996).

Fifth, there were significant differences in the amounts of per capita food aid allocated regionally, which were not related to observable household and wereda level characteristics. Weredas in Tigray Region were more likely to receive both free food and food for work than households in other regions even after controlling for income levels, assets, long-term rainfall and short-term rainfall shocks, and other household and wereda characteristics. However,

nutritional studies indicate that Tigray has somewhat higher levels of child stunting than the national average, which may partially justify some increased amounts of aid to this region.

Sixth, the single most important factor associated with who received free food or food for work was who received free food or food for work in the past. This was true at both the wereda-level and household-level. On its face, it is unclear whether historical use should be interpreted as indicating that inertia is driving current allocations, or whether unobserved, time-invariant factors related to chronic needs are important. In an attempt to differentiate, albeit imperfectly, we find that the spatial pattern of food aid receipt during the early and mid 1990s is highly correlated with assessments of food aid needs from 1984 through 1988, which we use as a proxy for unobserved time-invariant needs. The 1984/85 famine was a defining event that influenced the subsequent location of investments of food aid operations in Ethiopia. And the current spatial allocation of food aid is highly correlated with the regions of greatest need during the famine period. However, the available survey data indicate that the poorest areas of the country in 1995/96 were generally not the ones hardest hit by the famine. Yet conditional on historical needs during the 1980s, it is the recent 1990s pattern of food aid allocation that is most important in determining receipt in the 1995/96 survey year; i.e., the 1980s pattern of vulnerability has little explanatory power over and above the more recent pattern of allocation in the 1990s in influencing current food aid allocations.

From these results, and the fact that current weather shocks have only a small impact on allocations, we tentatively conclude that there is a degree of inertia, or time-invariant rigidity in food aid distribution over time. This rigidity in food aid distribution cannot be explained by time-invariant or time-varying unobserved needs. These findings are consistent with the view that spatial inertia in program operations may be an important factor behind current year allocations. This may arise from high fixed program costs, rigidities in the governmental process of determining food aid allocations to local administrative units, political income transfer objectives, or possibly other reasons. This spatial inertia, whatever the exact cause(s), is a factor that has so far been ignored in both the theoretical targeting and the policy-related food aid literatures.

What can be done to improve targeting effectiveness in the future? Although policy statements in Ethiopia are sufficiently clear that food aid should be targeted to only the neediest households, they do not indicate specifically how to identify the needy – the guidelines to be used. Our analysis in Section 10 reveals that for purposes of identifying low-income weredas (both per capita and total household income), the following indicators appear to be important: weredas in the Southern Region; weredas lacking tarmac or all-weather roads; weredas in which a large portion of cropped area suffers from crop damage; weredas with relatively small average land holdings; and weredas with a large percentage of female-headed households with no adult male in the family. Within particular weredas, relatively low-income households tended to be associated with small landholdings, the percentage of household cropped area affected by disease and drought, female-headed households with no adult male in the family, and the percentage of family members that are young children.

In recent years in Ethiopia, government policy statements indicate a priority on targeting the poorest weredas in the country and then distributing widely within these weredas. However, this study indicates that this approach may miss a large percentage of the poorest households. Because of wide within-wereda variation in per capita income, it is the case that during the 1995/96 sample year, the poorest 25% of the weredas in the country were found to contain only 54% of the nation's poorest households (those falling into the bottom per capita income quartile, ranked nationally). The other 45% of households in the bottom national income quartile were scattered throughout the other 75% of the weredas. These findings indicate that there are many relatively poor people that are not located in the poorest weredas in the country, and that a targeting strategy that focused only on relatively poor weredas would miss a large percentage of needy people.

There is still a great deal that is unknown about the actual implementation of food aid programs in the field. We observe that targeting effectiveness varies, sometimes greatly, between regions. But there is a dearth of insight on how food aid programs are actually implemented in the field, and this kind of descriptive information could be usefully matched up with findings such as those presented in this paper to better understand what kinds of operations lead to relatively effective targeting and vice versa. There may be high payoffs to comparative field-level analyses that identify how indicators of targeting effectiveness vary with the actual implementation and organization of food aid programs in particular locations. This would shed considerable light on the enduring "black box" stage of food aid programs – the criteria and forces driving food aid allocation at the local level.

APPENDIX

Table A1. Wereda Level Food Aid Distribution, Excluding South (Probit [A])

	Wereda Level		Household Level	
	FD	FFW	FD	FFW
ln (Per capita Income)	-0.096	-0.092	-0.125	-0.008
	(1.62)	(2.12)*	(4.05)**	(0.22)
Household head has some education (0,1)	-0.110	0.067	-0.153	-0.063
	(0.80)	(0.70)	(2.81)**	(1.03)
Household size	-0.025	-0.005	-0.034	-0.002
	(0.71)	(0.20)	(2.45)*	(0.11)
Percentage of children	-0.003	-0.008	0.002	0.000
(0-9 yrs)	(0.88)	(2.65)**	(1.75)	(0.09)
Percentage of elder	-0.002	-0.005	0.001	-0.003
(older than 55 yrs)	(0.37)	(1.70)	(0.76)	(1.69)
Female headed household, not married	0.183	-0.285	0.144	-0.083
(0,1)	(0.84)	(1.77)	(1.90)	(1.04)
Female headed household, but head is	0.018	0.399	0.044	-0.192
married (0,1)	(0.05)	(1.65)	(0.38)	(1.84)
Land owned in ha	-0.033	-0.067	0.014	-0.057
	(0.90)	(1.64)	(0.40)	(1.29)
Muslim household (0,1)	0.174	-0.106	0.203	-0.149
	(1.93)	(1.54)	(1.57)	(0.94)
Protestant household (0,1)	0.091	-0.227	0.766	-0.279
	(0.44)	(1.13)	(4.24)**	(1.94)
Livestock household (0,1)	-0.639	-0.590	-0.115	-0.148
	(1.80)	(1.32)	(0.72)	(0.82)
Percentage of area with shortage of rain	0.005	0.003	0.001	-0.002
	(2.70)**	(2.17)*	(1.55)	(1.50)
Percentage of area with flood	0.002	0.004	0.000	-0.001
	(1.08)	(2.26)*	(0.27)	(0.31)
Percentage of areas with crop disease or	0.001	0.000	0.000	-0.000
insect problems	(0.41)	(0.17)	(0.23)	(0.09)
Average Rainfall 1988-95 (mm)	-0.037	-0.027		
*10e-2	(2.46)*	(2.31)*		
Rainfall shocks in 1994 (mm)	0.019	0.015		
*10e-2	(0.99)	(1.15)		
Rainfall shocks in 1995 (mm)	-0.042	-0.013		
*10e-2	(2.40)*	(1.13)		
Elevation *10e-2	0.017	0.011		
	(2.50)*	(2.30)*		
Tigray	-0.126	-0.024		
	(0.86)	(0.20)		
Amhara	-0.341	-0.130		
	(2.81)**	(1.41)		
Oromiya	-0.482	-0.101	– with Wereda dummies –	
	(3.78)**	(1.06)		
Wald tests For Plot level shocks	7.68	8.05*	2.47	2.45
	[0.05]	[0.05]	[0.48]	[0.48]
For Rainfall shocks	6.67*	2.35		
	[0.04]	[0.31]		
For Road dummies [B]	16.1**	3.69		
	[0.01]	[0.60]		
For Regional/Wereda dummies	21.7**	3.54	156.5**	111.3**
	[0.00]	[0.32]	[0.00]	[0.00]
Log likelihood	-110.5	-102.6	-271.8	-271.5
Observations	283	283	659	532

Note: * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are z-values. Numbers in brackets are p-values.
A) Reported coefficients are changes in marginal probability. B) Coefficients of road dummies are not reported.

Table A2. Wereda Level Food Aid Distribution Model Without Income (Probit[A])

	Wereda Level		Household Level	
	FD	FFW	FD	FFW
Household head has some education (0,1)	-0.097	0.128	-0.135	-0.066
	(0.79)	(1.30)	(2.98)**	(1.24)
Household size	-0.001	0.003	-0.011	-0.005
	(0.02)	(0.11)	(1.09)	(0.40)
Percentage of children	-0.006	-0.008	0.003	-0.000
(0-9 yrs)	(1.69)	(2.70)**	(2.74)**	(0.44)
Percentage of elder	-0.005	-0.007	0.001	-0.003
(older than 55 yrs)	(1.29)	(2.12)*	(0.76)	(1.80)
Female headed household, not married	0.238	-0.015	0.150	-0.008
(0,1)	(1.22)	(0.10)	(2.42)*	(0.12)
Female headed household, but head is	-0.001	0.405	0.115	-0.143
married (0,1)	(0.00)	(1.88)	(1.32)	(1.62)
Land owned in ha	-0.021	0.004	-0.005	0.015
	(0.97)	(0.55)	(0.39)	(1.06)
Muslim household (0,1)	0.154	-0.050	0.043	-0.041
	(1.94)	(0.72)	(0.39)	(0.31)
Protestant household (0,1)	0.102	0.116	0.207	-0.111
	(0.73)	(1.00)	(2.41)*	(1.20)
Livestock household (0,1)	-0.552	-0.506	-0.020	-0.059
	(1.40)	(1.18)	(0.11)	(0.33)
Percentage of area with shortage of rain	0.004	0.004	0.001	-0.002
	(2.75)**	(3.29)**	(1.22)	(1.46)
Percentage of area with flood	0.003	0.005	0.002	-0.000
	(1.39)	(2.62)**	(1.07)	(0.02)
Percentage of areas with crop disease or	0.002	0.000	0.001	0.001
insect problems	(0.96)	(0.17)	(0.51)	(0.84)
Average Rainfall 1988-95 (mm)	-0.029	-0.032		
*10e-2	(2.12)*	(2.72)**		
Rainfall shocks in 1994 (mm)	0.008	0.006		
*10e-2	(0.47)	(0.42)		
Rainfall shocks in 1995 (mm)	-0.027	-0.011		
*10e-2	(1.87)	(0.97)		
Elevation *10e-2	0.013	0.016		
	(2.17)*	(3.28)**		
Tigray	0.430	0.259		
	(2.90)**	(1.95)		
Amhara	0.126	0.150		
	(1.18)	(1.49)		
Oromiya	-0.026	0.091		
	(0.29)	(1.18)		
Other Killils	0.464	0.359	– with Wereda dummies –	
	(2.86)**	(2.24)*		
Wald tests For Plot level shocks	8.80*	15.2**	2.55	3.78
	[0.03]	[0.00]	[0.47]	[0.29]
For Rainfall shocks	3.59	1.06		
	[0.17]	[0.59]		
For Road dummies[B]	9.16	7.93		
	[0.10]	[0.16]		
For Regional/Wereda dummies	21.8**	7.50	167.3**	141.7**
	[0.00]	[0.11]	[0.00]	[0.00]
Log likelihood	-153.8	-139.3	-386.6	-386.9
Observations	348	348	838	681

Note: * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are z-values. Numbers in brackets are p-values.
A) Reported coefficients are changes in marginal probability. B) Coefficients of road dummies are not reported.

Table A3. Wereda Level Food Aid Distribution Without Tigray (Probit [A])

	Free Distribution (1 if at least one household in the Wereda received FD)			Food for Work (1 if at least one household in the Wereda received FFW)		
	(1)	(2)	(3)	(4)	(5)	(6)
ln (Per capita Income)	-0.004	-0.057	-0.002	-0.048	-0.099	-0.041
	(0.07)	(1.15)	(0.03)	(1.70)	(2.52)*	(1.46)
Fraction of households with some education	0.033	-0.095	0.035	0.156	0.143	0.159
	(0.27)	(0.78)	(0.29)	(2.23)*	(1.49)	(2.31)*
Mean household size	0.028	0.001	0.029	0.019	0.015	0.023
	(0.98)	(0.02)	(1.01)	(1.12)	(0.64)	(1.34)
Mean % of children (0-9 yrs) in households	-0.002	-0.004	-0.002	-0.003	-0.006	-0.003
	(0.56)	(1.26)	(0.55)	(1.79)	(2.38)*	(1.78)
Mean % of elder (over 55) in households	-0.001	-0.003	-0.001	-0.004	-0.005	-0.004
	(0.19)	(0.73)	(0.19)	(1.63)	(1.68)	(1.53)
Fraction of female headed, not married	0.483	0.385	0.488	-0.022	0.083	-0.011
	(2.33)*	(2.01)*	(2.35)*	(0.19)	(0.53)	(0.09)
Fraction of female headed, married	-0.103	0.012	-0.097	0.225	0.441	0.230
	(0.37)	(0.04)	(0.35)	(1.40)	(2.19)*	(1.45)
Mean size of land owned	-0.021	-0.014	-0.021	0.004	0.003	0.004
	(1.19)	(0.98)	(1.19)	(0.95)	(0.35)	(0.92)
Fraction of Muslim households	0.100	0.062	0.095	-0.047	-0.075	-0.052
	(1.37)	(0.84)	(1.28)	(1.00)	(1.20)	(1.12)
Fraction of Protestant households	0.005	0.024	0.005	0.076	0.054	0.077
	(0.04)	(0.19)	(0.04)	(0.94)	(0.52)	(0.97)
Fraction of livestock households	-0.610	-0.513	-0.613	-0.428	-0.421	-0.391
	(1.29)	(1.30)	(1.29)	(1.21)	(0.99)	(1.16)
Mean % of plot area with shortage of rain	0.004	0.004	0.004	0.003	0.003	0.002
	(2.66)**	(2.47)*	(2.63)**	(3.40)**	(2.48)*	(3.15)**
Mean % of plot area with flood	0.004	0.003	0.004	0.004	0.004	0.003
	(1.96)*	(1.18)	(1.92)	(2.73)**	(1.86)	(2.60)**
Mean % of plot area with crop disease or insect problems	0.000	0.001	0.000	-0.001	0.000	-0.001
	(0.08)	(0.40)	(0.07)	(0.33)	(0.04)	(0.40)
Average rainfall 1988-95 (mm) *10e-2	0.002	-0.008	0.004	-0.000	-0.007	0.003
	(0.15)	(0.62)	(0.25)	(0.11)	(0.65)	(0.38)
Rainfall shocks in 1994 (mm) *10e-2	0.015	0.011	0.016	0.005	0.016	0.006
	(0.82)	(0.65)	(0.86)	(0.47)	(1.13)	(0.62)
Rainfall shocks in 1995 (mm) *10e-2	-0.021	-0.021	-0.021	-0.010	-0.015	0.011
	(1.51)	(1.55)	(1.53)	(1.25)	(1.34)	(1.46)
Elevation *10e-2	0.006	0.007	0.006	0.012	0.014	0.012
	(1.09)	(1.14)	(1.10)	(3.39)**	(2.96)**	(3.43)**
Average RRC 1984 -88		0.550	0.072		0.503	0.165
		(2.28)*	(0.28)		(2.63)**	(1.14)
History of Receiving Food Aid[B]						
4 years in last 4 years (0,1)	0.749		0.742	0.850		0.837
	(3.15)**		(3.07)**	(3.85)**		(3.80)**
3 years in last 4 years (0,1)	0.508		0.498	0.224		0.215
	(2.36)*		(2.29)*	(2.15)*		(2.09)*
2 years in last 4 years (0,1)	0.264		0.256	0.592		0.572
	(2.44)*		(2.32)*	(4.25)**		(4.13)**
1 year in last 4 years (0,1)	0.164		0.161	0.312		0.315
	(2.38)*		(2.33)*	(4.51)**		(4.55)**
Previous experience with the other type of food aid (0,1)	0.234		0.232	0.073		0.063
	(3.47)**		(3.46)**	(1.97)*		(1.74)
Amhara	-0.067	-0.072	-0.085	0.088	-0.024	0.028
	(0.72)	(0.65)	(0.74)	(1.17)	(0.26)	(0.36)
Oromiya	-0.069	-0.042	-0.071	0.085	0.085	0.072
	(0.87)	(0.52)	(0.90)	(1.54)	(1.21)	(1.34)
Other Killils	0.197	0.280	0.183	0.211	0.196	0.156
	(1.27)	(1.77)	(1.16)	(1.56)	(1.36)	(1.26)
Wald tests: For History variables	16.1**		14.7**	35.7**		34.9**
	[0.00]		[0.01]	[0.00]		[0.00]
For Plot level shocks	9.50*	6.71	9.18*	15.6**	8.36*	13.9**
	[0.02]	[0.08]	[0.03]	[0.00]	[0.04]	[0.00]
For Rainfall shocks	2.77	2.63	2.84	1.70	2.67	2.34
	[0.25]	[0.27]	[0.24]	[0.43]	[0.26]	[0.31]
For Road dummies[C]	6.10	4.35	5.96	7.13	3.48	7.80
	[0.30]	[0.50]	[0.32]	[0.21]	[0.63]	[0.17]
For Regional dummies	5.11	6.94	5.16	3.07	4.13	2.69
	[0.16]	[0.07]	[0.16]	[0.38]	[0.25]	[0.44]
Log likelihood	-108.8	-133.1	-108.8	-85.4	-115.0	-84.7
Observations	317	317	317	317	317	317

Note: * indicates 5% significance; ** indicates 1% significance. Numbers in parentheses are z-values. Numbers in brackets are p-values.
A) Reported coefficients are changes in marginal probability. B) At least one household received FD (or FFW) for 4 years in last 4 years, and so on.
C) Coefficients of road dummies are not reported.

Table A4. Wereda-Level Value of Animal Assets (OLS)

	Mean Per capita Value of Animal owned	Mean Total Value of Animal owned
Fraction of Household Head with Some Education	129.4	979.7
	(1.00)	(1.37)
Mean Household Size	16.74	985.5
	(0.51)	(5.49)**
Mean % Children (0-9 yrs) in Households	-0.435	-10.21
	(0.13)	(0.54)
Mean % of Elderly (over 55 yrs) in Households	10.83	48.23
	(2.69)**	(2.17)*
Fraction of Female Headed, not married	111.7	719.3
	(0.54)	(0.63)
Fraction of Female Headed, married	-61.94	-303.5
	(0.21)	(0.19)
Mean Size of Land Owned, splined at 3 ha	256.1	1,423
	(5.28)**	(5.31)**
Mean Size of Land Owned, above 3 ha	-291.9	-1,640
	(5.16)**	(5.25)**
Fraction of Muslim Households	-108.1	-717.6
	(1.23)	(1.48)
Fraction of Protestant Households	-82.02	-542.4
	(0.53)	(0.63)
Mean % of Plot Area with Shortage of Rainfall	1.492	7.486
	(0.80)	(0.73)
Mean % of Plot Area with Flood	1.899	3.761
	(0.67)	(0.24)
Mean % of Plot Area with Crop Disease/Insect Problems	-6.035	-31.76
	(2.23)*	(2.12)*
Average Rainfall 1988-95 (mm) * 10 e-2	-2.981	6.893
	(0.19)	(0.08)
Rainfall Shocks in 1994 (mm) * 10 e-2	22.19	136.7
	(1.19)	(1.33)
Rainfall Shocks in 1995 (mm) * 10 e-2	15.11	57.27
	(0.96)	(0.66)
Elevation * 10 e-2	18.76	84.89
	(2.92)**	(2.39)*
Average % of Needy Households, RRC 1984-88	479.8	2,601
	(1.88)	(1.85)
Road dummy 1 (the best road)	54.95	487.0
	(0.74)	(1.19)
Road dummy 2	60.37	178.6
	(0.62)	(0.33)
Road dummy 3	-54.43	-109.8
	(0.74)	(0.27)
Road dummy 4	-65.82	-296.1
	(0.85)	(0.69)
Road dummy 5 (the worst road)	22.50	259.9
	(0.21)	(0.44)
Tigray	72.96	468.0
	(0.42)	(0.49)
Amhara	-252.2	-1,466
	(1.92)	(2.02)*
Oromiya	196.0	904.9
	(1.95)	(1.63)
Southern (SNNPR/SEPA)	– Omitted –	– Omitted –
Other Killils	3.645	-140.6
	(0.02)	(0.15)
Constant	44.24	-4,322
	(0.14)	(2.46)*
F tests For		
Plot Level shocks	2.18 [0.09]	1.81 [0.15]
Rainfall shocks	1.28 [0.28]	1.19 [0.31]
Road dummies	0.50 [0.78]	0.50 [0.78]
Prices of cereals	0.79 [0.53]	0.81 [0.52]
Regional dummies	5.55 [0.00]**	5.21 [0.00]**
R squared	0.28	0.37
Observations	348	348

Note: Absolute values of t-statistics are in parentheses. * indicates significant at 5% level; ** indicates significant at 1% level. Prices of four cereals are included but not reported. None of the prices are significant.

Table A5. Household-Level Value of Animal Assets (OLS)

	Per capita Value of Animal Owned		Total Value of Animal Owned	
		Wereda Fixed Effect		Wereda Fixed Effect
Household Head's Education (0,1)	50.46	41.07	274.6	204.4
	(1.24)	(0.98)	(1.39)	(1.02)
Household Size	-42.63	-48.73	644.7	606.6
	(4.80)**	(5.38)**	(14.9)**	(14.0)**
Percentage of children (0-9yrs)	-6.174	-6.541	-24.65	-26.06
	(6.63)**	(6.96)**	(5.44)**	(5.79)**
Percentage of elder (55 yrs over)	2.311	1.418	6.266	2.644
	(2.22)*	(1.36)	(1.23)	(0.53)
Female headed, not married (0,1)	-106.0	-116.0	-521.6	-530.1
	(1.90)	(2.06)*	(1.92)	(1.96)*
Female headed, married (0,1)	-11.02	-15.73	105.2	126.7
	(0.14)	(0.20)	(0.28)	(0.34)
Land owned in ha, splined at 3 ha	260.4	254.5	1,407	1,444
	(10.8)**	(8.61)**	(12.0)**	(10.2)**
Land owned in ha, over 3 ha	-271.0	-265.2	-1,469	-1,509
	(10.7)**	(8.58)**	(11.9)**	(10.2)**
Muslim household (0,1)	-82.44	-51.59	-491.6	-185.2
	(1.74)	(0.66)	(2.13)*	(0.49)
Protestant household (0,1)	-47.99	-31.69	-494.1	-536.7
	(0.80)	(0.45)	(1.69)	(1.59)
Percentage of areas with shortage of rain	2.187	2.242	10.18	9.784
	(2.66)**	(2.27)*	(2.55)*	(2.07)*
Percentage of areas with flood	-0.375	-3.038	-6.504	-18.36
	(0.31)	(2.19)*	(1.12)	(2.76)**
Percentage of areas with crop disease	-1.818	-0.206	-10.35	-4.068
	(1.82)	(0.19)	(2.13)*	(0.78)
Average rainfall 1988-95 (mm) * 10e-2	-15.40		-49.64	
	(1.62)		(1.07)	
Rainfall shocks in 1994 (mm) * 10e-2	10.46		56.24	
	(0.93)		(1.03)	
Rainfall shocks in 1995 (mm) * 10e-2	8.132		-16.97	
	(0.75)		(0.32)	
Elevation * 10 e-2	23.02		117.0	
	(5.07)**		(5.30)**	
Tigray	301.3		1,644	
	(3.06)**		(3.43)**	
Amhara	-81.42		-453.4	
	(1.24)		(1.41)	
Oromiya	294.5		1,143	
	(5.12)**		(4.08)**	
Somalie	348.0		1,021	
	(2.34)*		(1.41)	
Beni-Shanguru	17.84		629.6	
	(0.13)		(0.94)	
Southern (SNNPR/SEPA)	– Omitted –	– Wereda dummies –	– Omitted –	– Wereda dummies –
Gambela	-233.3		-795.8	
	(1.49)		(1.04)	
Harari	-42.35		-1,187	
	(0.24)		(1.39)	
Addis Ababa	230.0		291.2	
	(1.52)		(0.39)	
Dire Dawa	368.6		1,062	
	(2.05)*		(1.21)	
Constant	676.6	1,042	-1,473	552.8
	(3.96)**	(15.5)**	(1.77)	(1.72)
F test For				
Plot level shocks	3.98 [0.01]**	3.49 [0.02]*	4.66 [0.00]**	4.39 [0.00]**
Rainfall shocks	0.79 [0.46]		0.56 [0.57]	
Cereal Prices	2.18 [0.07]		2.40 [0.05]*	
Road dummies	1.06 [0.38]		2.27 [0.05]*	
Regional dummies	8.23 [0.00]**		7.03 [0.00]**	
R-squared	0.13	0.08	0.22	0.12
Observations	2867	2867	2867	2867

Note: Absolute values of t-statistics are in parentheses. * indicates significant at 5% level; ** indicates significant at 1% level. Prices of four cereals and five orad dummies are included in the models but not reported.

REFERENCES

Barrett, C. 1998. Food Security and Food Assistance Programs. In *Handbook of Agricultural Economics*, eds. B. Gardner and G. Rausser. Amsterdam: North Holland Press.

Basu, K. 1982. Food for Work: Some Economic and Political Consequences. *Economic and Political Weekly*, March: A9-A14.

Besley, T. 1997. Political Economy of Alleviating Poverty: Theory and Institutions. In *Annual World Bank Conference on Development Economics 1996*, eds. M. Bruno and B. Pleskovic. Washington, D.C.: World Bank.

Besley, T., and A. Case. 1995. Does Electoral Accountability Affect Economic Policy Choices? Evidence from Gubernatorial Term Limits. *Quarterly Journal of Economics* 110.3: 769-98.

Besley, T., and S. Coate. 1992. Workfare vs. Welfare: Incentive Arguments for Work Requirements in Poverty-Alleviation Programs. *American Economic Review* 82.1: 249-61.

Besley, T., and S. Coate. 1995. The Design of Income Maintenance Programs. *Review of Economic Studies* 62.2:187-222.

Besley, T., S. Coate, and T.W. Guinnane. 1993. *Understanding the Workhouse Test: Information and Poor Relief in Nineteenth-Century England*. Economic Growth Center Discussion Paper No. 701. New Haven: Yale University.

Besley, T., and R. Kanbur. 1988. Food Subsidies and Poverty Alleviation. *Economic Journal* 98 (September): 701-19.

Besley, T., and R. Kanbur. 1993. Principles of Targeting. In *Including the Poor*, eds. M. Lipton and J. van der Gaag. Washington, D.C.: World Bank.

Clay, D.C., D. Molla, and H. Debebe. 1999. Food Aid Targeting in Ethiopia: A Study of Who Needs It and Who Gets It. *Food Policy* 24: 391-409.

Clay, E., N. Pillai, and C. Benson. 1998. *The Future of Food Aid: A Policy Review*. Research Report. London: Overseas Development Institute.

Cleveland, W. 1979. Robust Locally-Weighted Regression and Smoothing Scatterplots. *Journal of the American Statistical Association* 74: 829-36.

Commission of the European Communities (EC). 1993. Management and Effects of Food Aid Interventions in Ethiopia. Report prepared by the German Development Assistance Agency (GTZ) for EC. Addis Ababa, Ethiopia.

Datt, G., and M. Ravallion. 1993. Regional Disparities, Targeting, and Poverty in India. In *Including the Poor*, eds. M. Lipton and J. van der Gaag. Washington, D.C.:World Bank.

Datt, G., and M. Ravallion. 1994. Transfer Benefits From Public-Works Employment: Evidence For Rural India. *Economic Journal* 104 (November): 1346-1369.

Dercon, S., and P. Krishnan. 1998. *Changes in Poverty in Rural Ethiopia 1989-1995: Measurement, Robustness Tests and Decomposition.* WPS/98-7. Oxford University: Centre for the Study of African Economies.

Disaster Prevention and Preparedness Commission (DPPC). 1997. *Guidelines for Planning and Implementation of Employment Generation Schemes (EGS).* September. Addis Ababa, Ethiopia: DPPC.

Dorosh, P., C. Ninno, and D.E. Sahn. 1995. Poverty Alleviation in Mozambique: A Multi-market Analysis of the Role of Food Aid. *Agricultural Economics* 13 (November): 89-99.

Falkner, F., and J.M. Tanner (eds.). 1986. *Human Growth: A Comprehensive Treatise, Volume 3*. New York: Plenum Press.

Federal Democratic Republic of Ethiopia (FDRE). 1996. *Food Security Strategy, 1996.* Addis Ababa: Federal Democratic Republic of Ethiopia.

Heckman, J.J. 1981. Statistical Models for Discrete Panel Data. In *Structural Analysis of Discrete Data With Econometric Applications*, eds. C. Manski and D. McFadden. Cambridge, Massachusetts: MIT Press.

Jalan, J., and M. Ravallion. 1998. Transient Poverty in Post-reform Rural China. *Journal of Comparative Economics* 26: 338-57.

Jaspars, S., and H. Young. 1995. General Food Distribution in Emergencies from Nutritional Needs to Political Priorities, ODI/Eurocard Relief and Rehabilitation Network. *Good Practice Review* 3. London: Overseas Development Institute.

Jayne, T., L. Ruby, F. Lupi, D.Tschirley, and M. Weber. 1996. Estimating Consumer Response to Food Market Reform Using Stated Preference Data: Evidence from Eastern and Southern Africa. *American Journal of Agricultural Economics* 77 (August): 820-824.

Joint Danish Ethiopia Development Programme. 1999. Some Issues on Food Security and Food Aid: Impact Study. Joint Danish Ethiopia Development Programme in North Wello, Addis Ababa.

Kebede, B., T. Jayne, and M. Tadesse. 1996. Urban Grain Consumption Patterns in Ethiopia: Implications for Food Pricing Policy and Food Aid Programs. Paper presented at Discussion Forum on Grain Market Performance in Ethiopia, 9-10 November. Sodere, Ethiopia: Ministry of Economic Development and Cooperation.

Kumar, S., H. Neka-Tebeb, S. Tafesse, and T. Demissie. 1993. Public Works Projects in Ethiopia: Potential for Improving Seasonal Food Security and Agricultural Productivity. Paper prepared for joint IFPRI/ENI/INN Project on Seasonality in Agriculture. Washington, D.C.: International Food Policy Research Institute.

Maxwell, S., D. Belshaw, and Alemayehu Lirenso. 1994. The Disincentive Effect of Food-for-Work on Labour Supply and Agricultural Intensification and Diversification in Ethiopia. *Journal of Agricultural Economics* 45:3.

Pinstrup-Andersen, P. 1988. *Food Subsidies in Developing Countries: Costs, Benefits, and Policy Options*. Baltimore: Johns Hopkins University Press.

Ravallion, M., G. Datt, and S. Chaudhuri. 1993. Does Maharashtra's 'Employment Guarantee Scheme' Guarantee Employment? *Economic Development and Cultural Change* 41.2: 251-76.

Reardon, Thomas, Peter Matlon, and Christopher Delgado. 1988. Coping with Household-level Food Insecurity in Drought-affected Areas of Burkina Faso. *World Development* 16: 1065-1074.

Sharp, Kay. 1997. *Targeting Food Aid in Ethiopia*. Addis Ababa: Save the Children Fund (UK).

Strauss, J., and D. Thomas. 1995. Human Resources: Empirical Modeling of Household and Family Decisions. In *Handbook of Development Economics, Volume 3A,* eds. J.R. Behrman and T.N. Srinivasan. Amsterdam: North Holland Press.

Transitional Government of Ethiopia (TGE). 1993. *Directives for Disaster Prevention and Management.* Addis Ababa: Rehabilitation and Reconstruction Commission.

Tschirley, D., C. Donovan, and M. Weber. 1996. Food Aid and Food Markets: Lessons from Mozambique. *Food Policy* 21 (May): 189-209.

USAID. 1998. *USAID Title III Program Bellmon Analysis for FY 1998 Food Delivery*. Report prepared by USAID. Addis Ababa, Ethiopia: USAID.

Van de Walle, D. 1998. Targeting Revisited. *World Bank Research Observer* 13.2: 231-48.

Van de Walle, D., and K. Nead. 1995. *Public Spending and the Poor: Theory and Evidence*. Baltimore: Johns Hopkins Press.

von Braun, J., T. Teklu, and P. Webb. 1998. *Famine in Africa: Causes, Responses and Prevention.* Baltimore: Johns Hopkins University Press.

Webb, P., and J. von Braun. 1994. *Famine and Food Security in Ethiopia: Lessons for Africa*. New York: John Wiley and Sons.

Webb, P., J. von Braun, and Y. Yohannes. 1992. *Famine in Ethiopia: Policy Implications of Coping Failure at National and Household Levels*. Research Report 92. Washington, D.C.: International Food Policy Research Institute.

World Bank. 1990. *World Development Report, 1990*. Washington, D.C.: World Bank.

World Bank. 1999. *Food Security Programme, Report of the Multi-Donor Team.* Washington, D.C.: World Bank.

World Food Programme (WFP). 1995. *World Food Programme and Food Aid in Ethiopia.* Addis Ababa: World Food Program.

MSU International Development Papers

How to order from the MSU Bulletin Office:

All domestic orders under $100 must be prepaid either by check or credit card. Make checks payable to MICHIGAN STATE UNIVERSITY. Charges against credit cards (VISA and MasterCard) must be accompanied by the card's full number and expiration date and the cardholder's signature and daytime business/home phone number. Orders totaling $100 or more can be billed by MSU. Institutions and firms should use their official purchase order.

All foreign orders must be prepaid only in U.S. dollars by American Express Money Order, International Money Order, U.S.A. Postal Money Order, U.S. Dollar World Money Order, or check, which must be drawn on a United States bank.

For foreign orders, include an additional 20 percent for surface postage. For air mail orders, please call for the appropriate amount due.

Please do not send cash. Payment must be included with orders. All sales are final. When ordering from the Bulletin Office by mail, you will need each item's complete identification number and price. Be sure to print your complete address, including ZIP code.

Fill out and send the order form provided to:

MSU Bulletin Office
10-B Agriculture Hall
Michigan State University
East Lansing, MI 48824-1039
Fax: (517)353-7168
Tel: (517)355-0240
E-mail: distbulk@msue.msu.edu

Selected copies are available free of charge to individuals in developing countries, although supplies of these are limited. If free copies are no longer available, MSU will send you order information. USAID officials may obtain free copies through USAID's Center for Development Information and Evaluation (CDIE) or single copies are available free of charge by writing to the above address at Michigan State University.

Available from the MSU Bulletin Office

MSU INTERNATIONAL DEVELOPMENT PAPERS

IDP 13 ..... *Sources and Effects of Instability in the World Rice Market* by T. S. Jayne. 1993. 104 pp. $11.00 **(CDIE reference PN-ABJ-359)**

IDP 14 ..... *The Impact of Agricultural Technology in Sub-Saharan Africa: A Synthesis of Symposium Findings* by James F. Oehmke and Eric C. Crawford. 1993. 33 pp. $7.00 **(CDIE reference PN-ABP-321)**

IDP 14F ..... *L'Impact de la technologie agricole en Afrique subsaharienne: Synthese des conclusions du colloque* par James F. Oehmke and Eric W. Crawford. 1993. 34 pp. $7.00 **(CDIE reference PN-ABQ-056)**

IDP 15 ..... *Market-Oriented Strategies to Improve Household Access to Food: Experience from Sub-Saharan Africa* by T.S. Jayne, D.L. Tschirley, John M. Staatz, James D. Shaffer, Michael T. Weber, Munhamo Chisvo, and Mulinge Mukumbu.* 1994. 61 pp. $9.00 **(CDIE reference PN-ABS-755)**

IDP 16 ..... *Improving the Measurement and Analysis of African Agricultural Productivity: Promoting Complementarities between Micro and Macro Data* by Valerie Kelly, Jane Hopkins, Thomas Reardon, and Eric Crawford. 1995. 44 pp. $7.00 **(CDIE reference PN-ABX-166)**

IDP 17 ..... *Promoting Food Security in Rwanda Through Sustainable Agricultural Productivity: Meeting the Challenges of Population Pressure, Land Degradation, and Poverty* by Daniel C. Clay, Fidele Byiringiro, Jaakko Kangasniemi, Thomas Reardon, Bosco Sibomana, Laurence Uwamariya, and David Tardif-Douglin. 1995. 115 pp. $11.00 **(CDIE reference PN-ABX-501)**

IDP 18 ..... *Promoting Farm Investment for Sustainable Intensification of African Agriculture* by Thomas Reardon, Eric Crawford, and Valerie Kelly. 1995. 37 pp. $7.00 **(CDIE reference PN-ABX-753)**

IDP 19 ..... *Effects of Market Reform on Access to Food by Low-Income Households: Evidence from Four Countries in Eastern and Southern Africa* by T.S. Jayne, L. Rube, D. Tschirley, M. Mukumbu, M. Chisvo, A. Santos, M. Weber, and P. Diskin. 1995. 83 pp. $9.00. **(CDIE reference PN-ABX-754)**

IDP 20 ..... *Cash Crop and Foodgrain Productivity in Senegal: Historical View, New Survey Evidence, and Policy Implications* by Valerie Kelly, Bocar Diagana, Thomas Reardon, Matar Gaye, and Eric Crawford. 1996. 140 pp. $13.00 **(CDIE reference PN-ABY-173)**

IDP 21 ..... *Fertilizer Impacts on Soils and Crops of Sub-Saharan Africa* by David Weight and Valerie Kelly. 1999. 96 pp. $11.00 **(CDIE reference PN-ACG-493)**

IDP 22 ..... *Determinants of Farm Productivity in Africa: A Synthesis of Four Case Studies* by Thomas Reardon, Valerie Kelly, Eric Crawford, Thomas Jayne, Kimseyinga Savadogo, and Daniel Clay. 1996. 50 pp. $7.00 **(CDIE reference PN-ABZ-220)**

IDP 23 ..... *Targeting of Food Aid in Rural Ethiopia: Chronic Need or Inertia?* by T.S. Jayne, John Strauss, Takashi Yamano, and Daniel Molla. 2000. 84 pp. $9.00 **(CDIE reference PN-ACH-396)**

WORKING PAPERS

IDWP 39/1 .... *The Impact of Investments in Maize Research and Dissemination in Zambia. Part I: Main Report*. Julie Howard with George Chitalu and Sylvester Kalonge. 1993. 112 pp. $11.00 **(CDIE reference PN-ABS-724)**

IDWP 39/2 .... *The Impact of Investments in maize Research and Dissemination in Zambia. Part II: Annexes.* Julie Howard with George Chitalu and Sylvester Kalonge. 1993. 81 pp. $9.00 **(CDIE reference PN-ABS-727)**

IDWP 40 ..... *An Economic Analysis of Research and Technology Transfer of Millet, Sorghum, and Cowpeas in Niger* by Valentina Mazzucato and Samba Ly. 1994. 104 pp. $11.00. **(CDIE reference PN-ABT-283 or PN-ABS-728)**

IDWP 41 ..... *Agricultural Research Impact Assessment: The Case of Maize Technology Adoption in Southern Mali* by Duncan Boughton and Bruno Henry de Frahan. 1994. 95 pp. $11.00 **(CDIE reference PN-ABS-729)**

IDWP 42 ..... *The Rate of Return to Agricultural Research in Uganda: The Case of Oilseeds and Maize* by Rita Laker-Ojok. 1994. 56 pp. $7.00 **(CDIE reference PN-ABS-730)**

IDWP 43 ..... *Assessing the Impact of Cowpea and Sorghum Research and Extension in Northern Cameroon* by James A. Sterns and Richard H. Bernsten. 1994. 48 pp. $7.00 **(CDIE reference PN-ABS-731)**

IDWP 44 ..... *Food Security II Cooperative Agreement: Project Fact Sheets (1994 Version)* by MSU Food Security II Research Team. 1994. 104 pp. $11.00 **(CDIE reference PN-ABW-277)**

IDWP 45 ..... *The Potential Returns to Oilseeds Research in Uganda: The Case of Groundnuts and Sesame* by Rita Laker-Ojok. 1994. 50 pp. $7.00 **(CDIE reference PN-ACF-662)**

IDWP 46 ..... Understanding Linkages among Food Availability, Access, Consumption, and Nutrition in Africa: Empirical Findings and Issues from the Literature by Patrick Diskin.* 1994. 47 pp. $7.00 **(CDIE reference PN-ABS-732)**

IDWP 47 ..... *Targeting Assistance to the Poor and Food Insecure: A Review of the Literature* by Mattias Lundberg and Patrick Diskin.* 1994. 56 pp. $7.00 **(CDIE reference PN-ABS-733)**

IDWP 48 ..... *Interactions Between Food Market Reform and Regional Trade in Zimbabwe and South Africa: Implications for Food Security* by T.S. Jayne, T. Takavarasha, and Johan van Zyl. 1994. 39 pp. $7.00 **(CDIE reference PN-ACA-239)**

IDWP 49 ..... *A Strategic Approach to Agricultural Research Program Planning in Sub-Saharan Africa*, by Duncan Boughton, Eric Crawford, Julie Howard, James Oehmke, James Shaffer, and John Staatz. 1995. 59 pp. $9.00 **(CDIE reference PN-ABU-948)**

IDWP 49F ..... *Une approche stratégique pour la planification du programme de recherche agricole en Afrique sub-saharienne*, by Duncan Boughton, Eric Crawford, Julie Howard, James Oehmke, James Shaffer et John Staatz. 1997. 67 pp. $9.00 **(CDIE reference PN-ACA-071)**

IDWP 50 ..... *An Analysis of Alternative Maize Marketing Policies in South Africa*, by T.S. Jayne, Milan Hajek and Johan van Zyl. 1995. 51 pp. $7.00 **(CDIE reference PN-ABW-091)**

IDWP 51 ..... *Confronting the Silent Challenge of Hunger: A Conference Synthesis,* by T.S. Jayne, David Tschirley, Lawrence Rube, Thomas Reardon, John M. Staatz, and Michael Weber. 1995. 37 pp. $7.00 **(CDIE reference PN-ABW-276)**

IDWP 52 ..... *An Ex-Ante Evaluation of Farming Systems Research in Northeastern Mali: Implications for Research and Extension Policy,* by Bruno Henry de Frahan. 1995. 82 pp. $9.00 **(CDIE reference PN-ABW-761)**

IDWP 53 ..... *Who Eats Yellow Maize? Preliminary Results of a Survey of Consumer Maize Preferences in Maputo, Mozambique,* by David L. Tschirley and Ana Paula Santos. 1995. 16 pp. $7.00 **(CDIE reference PN-ABX-988)**

IDWP 54 ..... *Food Security II Cooperative Agreement: Project Fact Sheets (1995/96 Version),* compiled by MSU Food Security II Research Team. 1996. 151 pp. $13.00. **(CDIE reference PN-ABY-072)**

IDWP 55 ..... *Trends in Real Food Prices in Six Sub-Saharan African Countries*, by T.S. Jayne, et al. 1996. 70 pp. $9.00 **(CDIE reference PN-ABY-172)**

IDWP 56 ..... *Food Marketing and Pricing Policy in Eastern and Southern Africa: Lessons for Increasing Agricultural Productivity and Access to Food*, by T.S. Jayne and Stephen Jones. 1996. 40 pp. $7.00 **(CDIE reference PN-ABY-547)**

IDWP 57 ..... *An Economic and Institutional Analysis of Maize Research in Kenya*, by Daniel David Karanja. 1996. 24 pp. $7.00 **(CDIE reference PN-ABY-548)**

IDWP 58 ..... *Fighting an Uphill Battle: Population Pressure and Declining Land Productivity in Rwanda* by Daniel C. Clay. 1996. 28 pp. $7.00 **(CDIE reference PN-ABM-627)**

IDWP 59 ..... *Finding the Balance Between Agricultural and Trade Policy: Rwanda Coffee Policy in Flux* by David Tardif-Douglin, Jean-Léonard Ngirumwami, Jim Shaffer, Anastase Murekezi, and Théobald Kampayana. 1996. 14 pp. $7.00 **(CDIE reference PN-ABY-802)**

IDWP 60 ..... *Agriculture R&D and Economic Growth* by Elias Dinopoulos. 1996. 25 pp. $7.00 **(CDIE reference PN-ABY-804)**

IDWP 61 ..... *Zambia's Stop-And-Go Revolution: The Impact of Policies and Organizations on the Development and Spread of Maize Technology* by Julie A. Howard and Catherine Mungoma. 1996. 39 pp. $7.00 **(CDIE reference PN-ABY-803)**

IDWP 62 ..... *Intrahousehold Allocations: A Review of Theories, Empirical Evidence and Policy Issues* by John Strauss and Kathleen Beegle. 1996. 60 pp. $9.00 **(CDIE reference PN-ABY-848)**

IDWP 63 ..... *Transforming Poultry Production and Marketing in Developing Countries: Lessons Learned with Implications for Sub-Saharan Africa* by Laura L. Farrelly. 1996. 46 pp. $7.00 **(CDIE reference PN-ABY-849)**

IDWP 64 ..... *Market Information Sources Available Through the Internet: Daily to Yearly Market and Outlook Reports, Prices, Commodities and Quotes* by Jean-Charles Le Vallée. 1999. 30 pp. $7.00 **(CDIE reference PN-ACF-672)**

IDWP 65 ..... *Food Security II Cooperative Agreement: Project Fact Sheets (1996 Version)* by MSU Food Security II Research Team. 1997. 190 pp. $15.00 **(CDIE reference PN-ABZ-902)**

IDWP 66 ..... *Improving the Impact of Market Reform on Agricultural Productivity in Africa: How Institutional Design Makes a Difference* by T.S. Jayne, James D. Shaffer, John M. Staatz, and Thomas Reardon. 1997. 39 pp. $7.00 **(CDIE reference PN-ACB-867)**

IDWP 67 ..... *Final Report--Workshop on Experiences and Options for Priority Setting in NARS, August 12-16, 1996, Nairobi, Kenya,* edited by Julie Howard and Eric Crawford. 1997. 76 pp. $9.00 **(CDIE reference PN-ACB-868)**

IDWP 68 ..... *The Effect of Liberalization on Grain Prices and Marketing Margins in Ethiopia,* by T.S. Jayne, Asfaw Negassa, and Robert J. Myers. 1998. 21 pp. $7.00 **(CDIE reference PN-ACC-230)**

IDWP 69 ..... *What Makes Agricultural Intensification Profitable for Mozambican Smallholders?* by Julie A. Howard, José Jaime Jeje, David Tschirley, Paul Strasberg, Eric W. Crawford, and Michael T. Weber. 1998. 98 pp. $11.00. **(CDIE reference PN-ACD-889)**

IDWP 70 ..... *Incentives for Fertilizer Use in Sub-Saharan Africa: A Review of Empirical Evidence on Fertilizer Response and Profitability* by David Yanggen, Valerie Kelly, Thomas Reardon, and Anwar Naseem. 1998. 109 pp. $11.00 **(CDIE reference PN-ACD-890)**

IDWP 71 ..... *Effects of Agricultural Commercialization on Food Crop Input Use and Productivity in Kenya* by Paul J. Strasberg, T.S. Jayne, Takashi Yamano, James Nyoro, Daniel Karanja, and John Strauss. 1999. 28 pp. $7.00 **(CDIE reference PN-ACE-364)**

IDWP 72 ..... *Successes and Challenges of Food Market Reform: Experiences from Kenya, Mozambique, Zambia, and Zimbabwe* by T.S. Jayne, Mulinge Mukumbu, Munhamo Chisvo, David Tschirley, Michael T. Weber, Ballard Zulu, Robert Johansson, Paula Santos, and David Soroko. 1999. 45 pp. $7.00 **(CDIE reference PN-ACE-389)**

IDWP 73 ..... *Macro Trends and Determinants of Fertilizer Use in Sub-Saharan Africa* by Anwar Naseem and Valerie Kelly. 1999. 31 pp. $7.00 **(CDIE reference PN-ACE-290)**

IDWP 74 ..... *Effects of Cash Crop Production on Food Crop Productivity in Zimbabwe: Synergies Or Trade-offs?* by Jones Govereh and T.S. Jayne. 1999. 23 pp. $7.00 **(CDIE reference PN-ACF-371)**

IDWP 75 ..... *Workshop on Agricultural Transformation in Africa: Abidjan, Cote d'Ivoire, September 26-29, 1995* by Moussa Batchily Ba, John M. Staatz, Laura Farrelly, Youssouf Camara, and Georges Dimithè. 1999. 51 pp. $7.00 **(CDIE reference PN-ACF-624)**

IDWP 75F ..... *Atelier Sur la Transformation de l'Agriculture en Afrique*, by Moussa Batchily Ba, John M. Staatz, Laura Farrelly, Youssouf Camara, et Georges Dimithe. 1999. 48 pp. $7.00 **(CDIE reference PN-ACF-390)**

IDWP 76 ..... *Green Revolution Technology Takes Root in Africa* by Julie A. Howard, Valerie Kelly, Julie Stepanek, Eric W. Crawford, Mulat Demeke, and Mywish Maredia. 1999. 66 pp. $9.00 **(CDIE reference PN-ACF-370)**
Statistical Annex and Copies of Questionnaire **(CDIE reference PN-ACF-623)**

IDWP 77..... *Increasing Seed System Efficiency in Africa: Concepts, Strategies and Issues* by Mywish Maredia, Julie Howard, and Duncan Boughton, with Anwar Naseem, Mariah Wanzala and Kei Kajisa. 1999 60 pp. $7.00 **(CDIE reference PN-ACG-551)**

..... * Also published by A.I.D./Washington

Mail your marked form
(via mail or fax) to:

MSU Bulletin Office

10-B Agriculture Hall

Michigan State University

East Lansing, MI 48824-1039

Fax: (517) 353-7168

Phone: (517) 355-0240

E-mail:
distbulk@msue.msu.edu

ORDER FORM for Papers Available from MSU

Required with all charge card orders:

Check one: _____ VISA ____MasterCard

Card number: _____

Signature: _____

Expiration Date: _____ Daytime Phone Number: ( )_____

SHIP TO:
Name: _____
Address: _____
_____
_____
_____

Domestic orders totaling $100 or more can be billed by MSU. Institutions and firms should use their official purchase order. All other orders, including foreign orders, must be pre-paid.

Mark each choice with the quantity needed and enter total charges.

____IDP 13 $11.00
____IDP 14 $7.00
____IDP 14F $7.00
____IDP 15 $9.00
____IDP 16 $7.00
____IDP 17 $11.00
____IDP 18 $7.00
____IDP 19 $9.00
____IDP 20 $13.00
____IDP 21 $11.00
____IDP 22 $7.00
____IDP 23 $9.00
____IDWP 39/1 $11.00
____IDWP 39/2 $9.00
____IDWP 40 $11.00
____IDWP 41 $11.00
____IDWP 42 $7.00
____IDWP 43 $7.00
____IDWP 44 $11.00
____IDWP 45 $7.00
____IDWP 46 $7.00
____IDWP 47 $7.00
____IDWP 48 $7.00
____IDWP 49 $9.00
____IDWP 49F $9.00
____IDWP 50 $7.00
____IDWP 51 $7.00
____IDWP 52 $9.00
____IDWP 53 $7.00
____IDWP 54 $13.00
____IDWP 55 $9.00
____IDWP 56 $7.00
____IDWP 57 $7.00
____IDWP 58 $7.00
____IDWP 59 $7.00
____IDWP 60 $7.00
____IDWP 61 $7.00
____IDWP 62 $9.00
____IDWP 63 $7.00
____IDWP 64 $7.00
____IDWP 65 $15.00
____IDWP 66 $7.00
____IDWP 67 $9.00
____IDWP 68 $7.00
____IDWP 69 $11.00
____IDWP 70 $11.00
____IDWP 71 $7.00
____IDWP 72 $7.00
____IDWP 73 $7.00
____IDWP 74 $7.00
____IDWP 75 $7.00
____IDWP 75F $7.00
____IDWP 76 $9.00
____IDWP 77 $7.00

Sub-Total	$_____
20% (foreign orders, surface mail)	$_____
International Airmail postage (call or e-mail for rates)	$_____
Total Amount	$_____

The MSU International Development Papers published before 1993 (IDP numbers 1-11, IDWP numbers 1-38, and RP numbers 1-31) may be obtained through USAID's Center for Development Information and Evaluation (CDIE) and are not available from the MSU Bulletin Office.

How to Order MSU International Development Papers from USAID:

The MSU International Development Papers published before 1993 (IDP numbers 1-11, IDWP numbers 1-38, and RP numbers 1-31) may be obtained **only** through USAID's Center for Development Information and Evaluation (CDIE).

The CDIE reference numbers are shown on the following list. Document identification necessary to order the full document in paper or microfiche form from the USAID Development Experience Clearinghouse (DEC) is included with the citations.

If you would like to order any of the pre-1993 IDP's, IDWP's or RP's, please do not request them from MSU, but send your request--with the correct CDIE reference number--directly to the DEC:

Mail: USAID Development Experience Clearinghouse

1611 North Kent Street, Suite 200

Arlington, VA 22209-2111 USA

Electronic:

Web site: http://www.dec.org

Email address: docorder@dec.cdie.org

Telephone: +1 703-351-4006

Fax: +1 703-351-4039

If you cannot provide the CDIE reference number for the publication you wish to order, contact the USAID Library, who will supply you with the complete order information:

Telephone: +1 202-712-0579
Fax: +1 202-216-3515

Prices

Documents are provided to USAID employees without charge. Others are required to pay reproduction and mailing/handling costs. Current prices may be obtained by contacting the Document Distribution Unit (docorder@dec.cdie.org) or by searching the Development Experience System (DEXS) available through the DEC's web site (http://www.dec.org). A limited number of microfiche copies are provided without charge to LDC institutions.

Exchange programs

CDIE has established reciprocal agreements with selected development organizations who provide documents or other information resources to CDIE in exchange for distribution of CDIE documents or information. The materials received as a result of these exchange agreements are located in CDIE.

Deposit accounts

Deposit accounts may be established by USAID contractors and other users to facilitate the payment for documents ordered.

Available in A.I.D.'s Development Information System (CDIE)

MSU INTERNATIONAL DEVELOPMENT PAPERS

IDP 1 ..... *Research on Agricultural Development in Sub-Saharan Africa: A Critical Survey* by Carl K. Eicher and Doyle C. Baker. 1982. 346 pp. **(CDIE reference PN-AAL-692)**

IDP 1F ..... *Etude Critique de la Recherche sur la Developpement Agricole en Afrique Subsaharienne* par Carl K. Eicher et Doyle C. Baker. 1982. 345 pp. **(CDIE reference PN-ABA-840)**

IDP 2 ..... *A Simulation Study of Constraints on Traditional Farming Systems in Northern Nigeria* by Eric W. Crawford. 1982. 136 pp. **(CDIE reference PN-AAP-677)**

IDP 3 ..... *Farming Systems Research in Eastern Africa: The Experience of CIMMYT and Some National Agricultural Research Services, 1976-81* by M.P. Collinson. 1982. 67 pp. **(CDIE reference PN-AAM-826)**

IDP 4 ..... *Animal Traction in Eastern Upper Volta: A Technical, Economic and Institutional Analysis* by Vincent Barrett, Gregory Lassiter, David Wilcock, Doyle Baker, and Eric Crawford. 1982. 132 pp. **(CDIE reference PN-AAM-262)**

IDP 5 ..... *Socio-Economic Determinants of Food Consumption and Production in Rural Sierra Leone: Application of an Agricultural Household Model with Several Commodities* by John Strauss. 1983. 91 pp. **(CDIE reference PN-AAM-031)**

IDP 6 ..... *Applications of Decision Theory and the Measurement of Attitudes Towards Risk in Farm Management Research in Industrialized and Third World Settings* by Beverly Fleisher and Lindon J. Robison. 1985. 105 pp. **(CDIE reference PN-AAU-740)**

IDP 7 ..... *Private Decisions and Public Policy: The Price Dilemma in Food Systems in Developing Countries* by Peter Timmer. 1986. 58 pp. **(CDIE reference PN-AAZ-091)**

IDP 8 ..... *Rice Marketing in Senegal River Valley: Research Findings and Policy Reform Options* by Michael L. Morris. 1987. 89 pp. **(CDIE reference PN-AAZ-092)**

IDP 9 ..... *Small Scale Industries in Developing Countries: Empirical Evidence and Policy Implications* by Carl Liedholm and Donald Mead. 1987. 141 pp. **(CDIE reference PN-AAX-734)**

IDP 10 ..... *Maintaining the Momentum in Post-Green Revolution Agriculture: A Micro-Level Perspective from Asia* by Derek Byerlee. 1987. 57 pp. **(CDIE reference PN-AAZ-093)**

IDP 11 ..... *The Economics of Smallholder Maize Production in Zimbabwe: Implications for Food Security* by David D. Rohrbach. 1989. 100 pp. **(CDIE reference PN-ABD-549)**

WORKING PAPERS

IDWP 1 ..... *Farming Systems Research (FSR) in Honduras, 1977-81: A Case Study* by Daniel Galt, Alvaro Diaz, Mario Contreras, Frank Peairs, Joshua Posner, and Franklin Rosales. 1982. 48 pp. **(CDIE reference PN-AAM-827)**

IDWP 2 ..... *Credit Agricole et Credit Informal dans la Region Orientale de Haute-Volta: Analyse Economique, Performance Institutionnelle et Implications en Matiere de Politique de Developpement Agricole* by Edouard K. Tapsoba. 1982. 125 pp. **(CDIE reference PN-AAZ-527)**

IDWP 3 ..... *Employment and Construction: Multicountry Estimates of Costs and Substitutions Elasticities for Small Dwellings* by W.P. Strassmann. 1982. 42 pp. **(CDIE reference PN-AAM-455)**

IDWP 4 ..... *Sub-Contracting in Rural Areas of Thailand* by Donald C. Mead. 1982. 53 pp. **(CDIE reference PN-AAN-192)**

IDWP 5 ..... *Microcomputers and Programmable Calculators for Agricultural Research in Developing Countries* by Michael T. Weber, James Pease, Warren Vincent, Eric W. Crawford, and Thomas Stilwell. 1983. 113 pp. **(CDIE reference PN-AAN-441)**

IDWP 6 ..... *Periodicals for Microcomputers: An Annotated Bibliography* by Thomas Stilwell. 1983. 70 pp. **(CDIE reference PN-AAN-443)**

IDWP 7 ..... *Employment and Housing in Lima, Peru* by Paul Strassmann. 1983. 96 pp. **(CDIE reference PN-AAN-396)**

IDWP 8 ..... *Faire Face a la Crise Alimentaire de l'Afrique* by Carl K. Eicher. 1983. 29 pp. **(CDIE reference PN-AAN-444)**

IDWP 9 ..... *Software Directories for Microcomputers: An Annotated Bibliography* by Thomas C. Stilwell. 1983. 14 pp. **(CDIE reference PN-AAN-442)**

IDWP 10 ..... *Instructional Aids for Teaching How to Use the TI-59 Programmable Calculator* by Ralph E. Hepp. 1983. 133 pp. **(CDIE reference PN-AAP-133)**

IDWP 11 ..... *Programmable Calculator (TI-59) Programs for Marketing and Price Analysis in Third World Countries* by Michael L. Morris and Michael T. Weber. 1983. 105 pp. **(CDIE reference PN-AAP-134)**

IDWP 12 ..... *An Annotated Directory of Statistical and Related Microcomputer Software for Socioeconomic Data Analysis* by Valerie Kelly, Robert D. Stevens, Thomas Stilwell and Michael T. Weber. 1983. 165 pp. **(CDIE reference PN-AAP-135)**

IDWP 13 ..... *Guidelines for Selection of Microcomputer Hardware* by Chris Wolf. 1983. 90 pp. **(CDIE reference PN-AAR-106)**

IDWP 14 ..... *User's Guide to BENCOS A SuperCalc Template for Benefit-Cost Analysis* by Eric W. Crawford, Ting-Ing Ho and A. Allan Schmid. 1984. 35 pp. **(CDIE reference PN-AAQ-682)**

IDWP 15 ..... *An Evaluation of Selected Microcomputer Statistical Programs* by James W. Pease and Raoul Lepage with Valerie Kelly, Rita Laker-Ojok, Brian Thelen, and Paul Wolberg. 1984. 187 pp. **(CDIE reference PN-AAQ-683)**

IDWP 16 ..... *Small Enterprises in Egypt: A study of Two Governorates* by Stephen Davies, James Seale, Donald C. Mead, Mahmoud Badr, Nadia El Sheikh and Abdel Rahman Saidi. 1984. 187 pp. **(CDIE reference PN-AAU-610)**

IDWP 17 ..... *Microcomputer Statistical Packages for Agricultural Research* by Thomas C. Stilwell. 1984. 23 pp. **(CDIE reference PN-AAZ-516)**

IDWP 18 ..... *An Annotated Directory of Citation Database, Educational, System Diagnostics and Other Miscellaneous Microcomputer Software of Potential Use to Agricultural Scientists in Developing Countries* by Thomas C. Stilwell and P. Jordan Smith. 1984. 34 pp. **(CDIE reference PN-AAZ-523)**

IDWP 19 ..... *Irrigation in Southern Africa: An Annotated Bibliography* by Amalia Rinaldi. 1985. 60 pp. **(CDIE reference PN-AAZ-524)**

IDWP 20 ..... *A Microcomputer Based Planning and Budgeting System for Agricultural Research Programs* by Daniel C. Goodman, Jr., Thomas C. Stilwell and P. Jordan Smith. 1985. 75 pp. **(CDIE reference PN-AAZ-525)**

IDWP 21 ..... *Periodicals for Microcomputers: An Annotated Bibliography, Second Edition* by Thomas C. Stilwell. 1985. 89 pp. **(CDIE reference PN-AAZ-526)**

IDWP 22 ..... *Software Directories for Microcomputers: An Annotated Bibliography, Second Edition* by Thomas C. Stilwell. 1985. 21 pp. **(CDIE reference PN-AAZ-528)**

IDWP 23 ..... *A diagnostic Perspective Assessment of the Production and Marketing System for Mangoes in the Eastern Caribbean* by Alan Hrapsky with Michael Weber and Harold Riley. 1985. 106 pp. **(CDIE reference PN-AAZ-529)**

IDWP 24 ..... *Subcontracting Systems and Assistance Programs: Opportunities for Intervention* by Donald C. Mead. 1985. 32 pp. **(CDIE reference PN-AAZ-943)**

IDWP 25 ..... *Small Scale Enterprise Credit Schemes: Administrative Costs and the Role of Inventory Norms* by Carl Liedholm. 1985. 23 pp. **(CDIE reference PN-AAU-615)**

IDWP 26 ..... *Subsector Analysis: Its Nature, Conduct and Potential Contribution to Small Enterprise Development* by James J. Boomgard, Stephen P. Davies, Steve Haggblade and Donald Mead. 1986. 57 pp. **(CDIE reference PN-AAZ-101)**

IDWP 27 ..... *The Effect of Policy and Policy Reforms on Non-Agricultural Enterprises and Employment in Developing Countries: A Review of Past Experiences* by Steve Haggblade, Carl Liedholm, and Donald C. Mead. 1986. 133 pp. **(CDIE reference PN-AAV-001)**

IDWP 28 ..... *Rural Small Scale Enterprises in Zambia: Results of a 1985 Country-Wide Survey* by John T. Milimo and Yacob Fisseha. 1986. 76 pp. **(CDIE reference PN-AAZ-102)**

IDWP 29 ..... *Fundamentals of Price Analysis in Developing Countries' Food Systems: A Training Manual to Accompany the Microcomputer Software Program 'MSTAT'* by Stephen Goetz and Michael T. Weber. 1986. 148 pp. **(CDIE reference PN-AAZ-103)**

IDWP 30 ..... *Rapid Reconnaissance Guidelines for Agricultural Marketing and Food System Research in Developing Countries* by John S. Holtzman. 1986. 75 pp. **(CDIE reference PN-AAZ-104)**

IDWP 31 ..... *Contract Farming and Its Effect on Small Farmers in Less Developed Countries* by Nicholas William Minot. 1986. 86 pp. **(CDIE reference PN-AAZ-105)**

IDWP 32 ..... *Food Security Policy and the Competitiveness of Agriculture in the Sahel: A Summary of the "Beyond Mindelo" Seminar* by Thomas S. Jayne and Nicholas Minot. 1989. 27 pp. **(CDIE reference PN-ABF-570)**

IDWP 33 ..... *Small Scale Manufacturing Growth in Africa: Initial Evidence* by Carl Liedholm and Joan Parket. 1989. 18 pp. **(CDIE reference PN-ABB-945)**

IDWP 34 ..... *Food Security and Economic Growth in the Sahel: A Summary of the September 1989 Cereals Workshop* by Victoire C. D'Agostino and John M. Staatz. 1989. 44 pp. **(CDIE reference PN-ABD-956)**

IDWP 35 ..... *User's Manual for the SADCC Cereals Trade Database Compiled by the University of Zimbabwe and Michigan State University* by David Kingsbury. 1989. 44 pp. **(CDIE reference PN-ABF-378)**

IDWP 36 ..... *Managing Food Security Action Programs in Botswana* by Sisay Asefa. 1989. 36 pp. **(CDIE reference PN-ABF-377)**

IDWP 37 ..... *User's Guide to BENCOS Lotus 1-2-3 Templates for Benefit-Cost Analysis* by Eric Crawford and A. Allan Schmid. 1990. 23 pp. **(CDIE reference PN-ABF-530)**

IDWP 38 ..... *Research Methods in the MSU Food Security in Africa Project: Conceptualizing and Implementing Policy Relevant Studies* by James F. Tefft with Michael T. Weber and John M. Staatz. 1990. 128 pp. **(CDIE reference PN-ABU-249)**

REPRINT PAPERS

RP 1 ..... *The Private Sector Connection to Development* by Carl Liedholm. 1986. 19 pp. **(CDIE reference PN-AAW-353)**

RP 2 ..... *Influencing the Design of Marketing Systems to Promote Development in Third World Countries* by James D. Shaffer with Michael Weber, Harold Riley and John Staatz. 1987. 21 pp. **(CDIE reference PN-AAV-230)**

RP 3 ..... *Famine Prevention in Africa: The Long View* by Carl K. Eicher. 1987. 18 pp. **(CDIE reference PN-AAZ-119)**

RP 4 ..... *Cereals Marketing in the Senegal River Valley* by Michael L. Morris. 1987. 126 pp. **(CDIE reference PN-AAZ-120)**

RP 5 ..... *The Food Security Equation in Southern Africa* by Mandivamba Rukuni and Carl K. Eicher. 1987. 32 pp. **(CDIE reference PN-AAZ-121)**

RP 6 ..... *Economic Analysis of Agronomic Trials for the Formulation of Farmer Recommendations* by Eric Crawford and Mulumba Kamuanga. 1988. 41 pp. **(CDIE reference PN-AAZ-370)**

RP 6F ..... *L'Analyse Economiques des Essais Agronomiques pour la Formulation des Recommandations aux Paysans* par Eric Crawford et Mulumba Kamuanga. 1987. 33 pp. **(CDIE reference PN-AAZ-122)**

RP 7 ..... *Economic Analysis of Livestock Trials* by Eric Crawford. 1987. 36 pp. **(CDIE reference PN-AAZ-371)**

RP 7F ..... *L'Analyse Economique des Essais Zootechniques* par Eric Crawford. 1987. 36 pp. **(CDIE reference PN-AAZ-123)**

RP 8 ..... *A Field Study of Fertilizer Distribution and Use in Senegal, 1984: Summary Report* by Eric Crawford and Valerie Kelly. 1987. 32 pp. **(CDIE reference PN-AAZ-124)**

RP 8F ..... *Enquete sur la Distribution et l'Utilisation de l'Engrais au Sénégal, 1984: Résumé Analytique* par Eric Crawford et Valerie Kelly. 1988. 43 pp. **(CDIE reference PN-ABC-173)**

RP 9 ..... *Improving Food Marketing Systems in Developing Countries: Experiences from Latin America* by Kelly Harrison, Donald Henley, Harold Riley and James Shaffer. 1987. 135 pp. **(CDIE reference PN-AAZ-125)**

RP 10 ..... *Policy Relevant Research on the Food and Agricultural System in Senegal* by Mark Newman, Eric Crawford and Jacques Faye. 1987. 30 pp. **(CDIE reference PN-AAZ-126)**

RP 10F ..... *Orientations et Programmes de Recherche Macro-Economiques sur le Systeme Agro-Alimentaire Sénégalais* par Mark Newman, Eric Crawford et Jacques Faye. 1987. 37 pp. **(CDIE reference PN-AAZ-127)**

RP 11 ..... *A Field Study of Fertilizer Distribution and Use in Senegal, 1984: Final Report* by Eric Crawford, Curtis Jolly, Valerie Kelly, Philippe Lambrecht, Makhona Mbaye, and Matar Gaye. 1987. 106 pp. **(CDIE reference PN-AAZ-128)**

RP 11F ..... *Enquête sur la Distribution et l'Utilisation de l'Engrais au Sénégal, 1984: Rapport Final* par Eric Crawford, Curtis Jolly, Valerie Kelly, Philippe Lambrecht, Makhona Mbaye, et Matar Gaye. 1987. 106 pp. **(CDIE reference PN-ABC-173)**

RP 12 ..... *Private and Public Sectors in Developing Country Grain Markets: Organization Issues and Options in Senegal* by Mark D. Newman, P. Alassane Sow, and Ousseynou NDoye. 1987. 14 pp. **(CDIE reference PN-AAZ-129)**

RP 13 ..... *Agricultural Research and Extension in Francophone West Africa: The Senegal Experience* by R. James Bingen and Jacques Faye. 1987. 23 pp. **(CDIE reference PN-AAV-929)**

RP 13F ..... *La Liaison Recherche-Developpement en Afrique de l'Ouest Francophone: L'Experience du Sénégal* par James Bingen et Jacques Faye. 1987. 32 pp. **(CDIE reference PN-AAZ-130)**

RP 14 ..... *Grain Marketing in Senegal's Peanut Basin: 1984/85 Situation and Issues* by Mark D. Newman. 1987. 16 pp. **(CDIE reference PN-AAZ-131)**

RP 15 ..... *Tradeoffs between Domestic and Imported Cereals in Senegal: A Marketing Systems Perspective* by Mark D. Newman, Ousseynou NDoye, and P. Alassane Sow. 1987. 41 pp. **(CDIE reference PN-AAZ-372)**

RP 15F ..... *Céréales Locales et Céréales Importées au Sénégal: La Politique Alimentaire a Partier Systemes de Commercialisation* par Mark D. Newman, Ousseynou NDoye, et P. Alassane Sow. 1987. 48 pp. **(CDIE reference PN-ABC-326)**

RP 16 ..... *An Orientation to Production Systems Research in Senegal* by R. James Bingen. 1987. 88 pp. **(CDIE reference PN-AAZ-373)**

RP 16F ..... *Orientation de la Recherche sur les Systemes de Productions au Sénégal* par R. James Bingen. 1987. 94 pp. **(CDIE reference PN-AAZ-374)**

RP 17 ..... *A Contribution to Agronomic Knowledge of the Lower Casamance (Bibliographical Synthesis)* by J.L. Posner. 1988. 47 pp. **(CDIE reference PN-AAZ-375)**

RP 17F ..... *Contribution a la Connaissance Agronomique de la Basse Casamance (Synthese Biblographique)* par J.L. Posner. 1988. 47 pp. **(CDIE reference PN-ABC-167)**

RP 18 ..... *Acquisition and Use of Agricultural Inputs in the Context of Senegal's New Agricultural Policy: The Implications of Farmers' Attitudes and Input Purchasing Behavior for the*

Design of Agricultural Policy and Research Programs by Valerie Auserehl Kelly. 1988. 30 pp. **(CDIE reference PN-AAZ-376)**

RP 18F ..... *Acquisition et Utilisation d'Intrants Agricoles dans le Context de la Nouvelle Politique Agricole du Sénégal: Implications des Attitudes et du Comportement d'Achat d'Intrants des Exploitants pour l'Elaboration d'une Politique Agricole et de Programmes de Recherches* par Valerie Auserehl Kelly. 1988. 35 pp. **(CDIE reference PN-AAZ-377)**

RP 19 ..... *Farmers' Demand for Fertilizer in the Context of Senegal's New Agricultural Policy: A Study of Factors Influencing Farmers' Fertilizer Purchasing Decisions* by Valerie Auserehl Kelly. 1988. 47 pp. **(CDIE reference PN-AAZ-378)**

RP 19F ..... *Demande d'Engrais de la Part des Exploitants dans les Contexte de la Nouvelle Politique Agricole au Sénégal: Une Etude des Facteurs Influencant les Decisions d'Achat d'Engrais Prises par les Exploitants* par Valerie Auserehl Kelly. 1988. 58 pp. **(CDIE reference PN-AAZ-379)**

RP 20 ..... *Production Systems in the Lower Casamance and Farmer Strategies in Response to Rainfall Deficits* by J.L. Posner, M. Kamuanga, and S. Sall. 1988. 33 pp. **(CDIE reference PN-ABC-162)**

RP 20F ..... *Les Systemes de Production en Basse Casamance et les Stratégies Paysannes Face du Deficit Pluviométrique* par J.L. Posner, M. Kamuanga, et S. Sall. 1988. 33 pp. **(CDIE reference PN-ABC-163)**

RP 21 ..... *Informing Food Security Decisions in Africa: Empirical Analysis and Policy Dialogue* by Michael T. Weber, John M. Staatz, John S. Holtzman, Eric W. Crawford, and Richard H. Bernsten. 1989. 11 pp. **(CDIE reference PN-ABE-627)**

RP 21F ..... *Comment Informer les Decisions Traitant de la Sécurité Alimentaire en Afrique: Analyses Empiriques et Dialogue Politique* par Michael T. Weber, John M. Staatz, John S. Holtzman, Eric W. Crawford, et Richard H. Bernsten. 1989. 13 pp. **(CDIE reference PN-ABD-104)**

RP 22 ..... *The Creation and Establishment of Production Systems Research in a National Agricultural Research Institute: The Senegal Experience* by Jacques Faye, James Bingen, and Etienne Landais. 1988. 25 pp. **(CDIE reference PN-ABC-161)**

RP 23 ..... *Foreign Trade of Agricultural Products and Inputs in Senegal from 1975 to 1984* by Frederic Martin and Alioune Dieng. 1988. 45 pp. **(CDIE reference PN-ABC-164)**

RP 23F ..... *Le Commerce Exterieur de Produits et d'Intrants Agricoles du Sénégal de 1975 a 1984* par Frederic Martin et Alioune Dieng. 1990. 45 pp. **(CDIE reference PN-ABF-529)**

RP 24 ..... *Regulatory Uncertainty and Government Objectives for the Organization and Performance of Cereal Markets: The Case of Senegal* by Mark D. Newman, P. Alassane Sow, and Ousseynou NDoye. 1988. 24 pp. **(CDIE reference PN-ABC-159)**

RP 24F ..... *Incertitude Réglementaire, Objectifs Gouvernementaux, Organisation et Performances des Marchés Céréaliers: Le Cas du Sénégal* par Mark D. Newman, P. Alassane Sow, and Ousseynou NDoye. 1988. 24 pp. **(CDIE reference PN-ABC-160)**

RP 25F ..... *Etude sur la Commercialisation des Céréales dans la Région du Fleuve Sénégal: Méthodologie* par Michael Morris. 1988. 48 pp. **(CDIE reference PN-ABC-172)**

RP 26 ..... *The Regulation and Organization of Cereal Markets in Senegal: Report on the Marketing Campaigns of 1983/84 and 1984/85* by P. Alassane Sow and Mark D. Newman. 1988. 29 pp. **(CDIE reference PN-ABC-165)**

RP 26F ..... *La Réglementation et l'Organisation des Marchés Céréaliers au Sénégal: Situation des Campagnes des Commercialisation 1983/84 et 1984/85* par P. Alassane Sow et Mark D. Newman. 1988. 35 pp. **(CDIE reference PN-ABC-166)**

RP 27 ..... *Farm Level Cereal Situation in Lower Casamance: Results of a Field Study* by C.M. Jolly, M. Kamuanga, S. Sall, and J.L. Posner. 1988. 35 pp. **(CDIE reference PN-ABC-157)**

RP 27F ..... *Situation Céréaliere en Milieu Paysan en Basse Casamance: Résultats d'une Enquête de Terrain* par C.M. Jolly, M. Kamuanga, S. Sall, et J.L. Posner. 1988. 41 pp. **(CDIE reference PN-ABC-158)**

RP 28F ..... *Budgets de Culture au Sénégal* par Frédéric Martin. 1988. 54 pp. **(CDIE reference PN-ABC-168)**

..... *Annexe 1 Budgets de Culture et Analyse des Marges dans le Bassin Arachidier.* 1988. 134 pp. **(CDIE reference PN-ABC-169)**

..... *Annexe 2 Budgets de Culture et Analyse des Marges au Sénégal Oriental et en Casamance.* 1988. 204 pp. **(CDIE reference PN-ABC-170)**

..... *Annexe 3 Budgets de Culture et Analyse des Marges dans la Vallée du Fleuve Sénégal.* 1988. 214 pp. **(CDIE reference PN-ABC-171)**

RP 29 ..... *Agricultural Development and Policy in Senegal: Annotated Bibliography of Recent Studies, 1983-89* by Eric Crawford, R. James Bingen, and Malcolm Versel. 1990. 254 pp. **(CDIE reference PN-ABE-271)**

RP 30 ..... *Lowland Cropping Systems in the Lower Casamance of Senegal: Results of Four Years of Agronomic Research (1982-1985)* by Joshua Posner, Mulumba Kamuanga, and Mamadou Lo. 1990. 130 pp. **(CDIE reference PN-ABU-251)**

RP 31 ..... *Farming Systems Research in Southern Senegal: The Djibelor Experience (1982-1986)* by Mulumba Kamuanga and Joshua L. Posner. 1992. 57 pp. **(CDIE reference PN-ABT-624)**