ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

"Tracing the Impacts of Food Aid on Agriculture and Consumers: A Computable General Equilibrium Approach."

By

Sherefedin Kedir Nuri

Approved by the Board of Examiners:

Fos/Dr. Syed H.	
Advisor	Signature
Mulat Demeke	
Examiner	Signature
Berhanu Adenew	
Examiner	Signature

Acknowledgements

Alhamdulillah,

I would like to appreciate and thank many people and institutions that helped me to finalize my postgraduate studies. I gratefully acknowledge all invaluable supports from resident representative office of IMF.

I am very much grateful to my advisors, Dr. Syed Hasan and Dr. Alemu Mekonnen, for their intellectual guidance.

I am greatly indebted to Mr. Arnim Schwidrowski (Senior IMF Resident Representative) for his insights, guidance and helpful comments on the draft. I also thank, Muche Nester (IMF staff) and Zekarias Hussien , for their helpful comments on the draft. There are many at the IMF whom I would like to thank. Thank you Felege, Tigist ,Zehara, and Hailu you contributed a lot to my success.

I am grateful to Dr. Mulat Demeke, Dr.Alemayehu Geda, Dr.Abbi.M.Keidr, and Dr.Tassew W/Hanna for teaching me many invaluable lessons during my graduate studies.

I would also like to thank Abdulaziz Arage, Yusuf Mohammed, Yimam Workneh for their editorial support.

I am also very much indebted to Solomon, who introduced me with GAMS software, his patience and generosity with his time.

My family was invaluable in this endeavor. Mom, Dad, Brothers and sisters I am forever indebted to you. I would like to thank Sadiya and Salim for all their assistance particularly for their Laptop.

I will never forget cooperation of brothers and sisters in FBE during my first year specially, Nuru Mohammed, Abdu Shimelis and Abdulaziz Arage.

Last but not least, for those of you who in one way or another extend your support, I am forever grateful for your support.

Thank you all indeed.

Sherefedin kedir

July 2007

Contents page

LIST OF TABLES

Abstract

This paper has analyzed the impact of four different food aid shocks on production, prices and welfare on different household groups in Ethiopia, using a computable general equilibrium (CGE) model and a social accounting matrix constructed for Ethiopia. The researcher simulated the impact of (i) a 20 percent decline in in-kind food aid, (ii) a 20 percent in-kind food aid cut replaced by direct cash transfer equivalent, (iii) abolishment of in-kind emergency food aid, and (iv) all in-kind emergency food aid converted into direct cash transfer equivalent.

The results suggest that food aid has some disincentive effects on food crops production through reduced prices. The simulation of the partial as well as the full shift from in-kind emergency food aid to direct cash transfer equivalent has positive but not large effects on food crops price. Moreover, direct cash transfer has expansionary effects on local agricultural production.

A policy implication is that to limit the use of in-kind food aid to situations of local food shortage. In other situations, food aid should be provided in cash form to purchase food locally or regionally.

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the study

Food aid has been a usual practice now for over three decades in Ethiopia. Although the major events that cause the food aid responses from donors and humanitarian agencies are severe famines triggered by frequent droughts, food aid remained a permanent response to the chronic food insecurity for a significant proportion of the population. Due to environmental problems and land degradation, asset depletion, poor productive capacity and poor agricultural performance, millions became vulnerable to food insecurity problems. Though the volume of food aid fluctuates depending on the weather, the average during the last fifteen years reached about 700,000 metric tons per annum (EEA, 2004/05).

Despite the recovery in agriculture in the years 2003/04 and 2004/05, Ethiopia has a structural food problem, and over 7 million Ethiopians (10 percent of the population) required outside assistance even in 2005 (FAO/WFP, 2006).

Food aid arrives in Ethiopia usually in-kind and takes two forms: Emergency food aid and project food aid. The emergency food aid is provided specifically in response to disasters including droughts,

famine, floods etc. This form of food aid has been distributed to the needy population freely to provide short-term relief and supply immediate food requirements. Project food aid is provided to the needy population in support for development (i.e. to support public activities like soil conservation, road construction etc). This study focuses on the emergency food aid.

Food aid has been credited with saving millions of lives and supporting the vulnerable population. Nevertheless, it has long been controversial for its potential to act as a disincentive to local agricultural production and depress prices in recipient countries.

Currently, the Ethiopian government is working on several fronts to shift away from emergency food aid to alternative methods. These include: direct food production interventions, a Productive Safety Net Program (PSNP), and voluntary resettlement. Among the programs being implemented, PSNP is central to this study.

Productive safety net program - the switch from direct food aid to cash aid is intended to stimulate the development of local markets and enable internal trading between surplus and deficit localities-, which was devised in 2003 as part of the government's coalition for food security, is being implemented since January 2005 with donor funding (FAO/WFP, 2006).

The last few years have seen increasing discussions, among governments, donors and NGOs regarding the role of cash transfers in both developmental and emergency contexts (Kebede, 2006). Cash transfer may be more effective in reducing transaction costs -in money and time, more flexible, and less dumping to local production. Despite these positive effects, attention must be paid to the potential of cash transactions to distort local markets raising food price for poor consumers who do not receive food aid.

This study attempts to envisage the impact of food aid on production and prices. Moreover, the study analyzes the costs and benefits of moving from in kind food aid to cash transfer by using different policy scenarios or experiments.

1.2. Statement of the problem

Food aid programs are large enough to generate significant system wide effects. It has been argued that long-term dependency on in-kind food aid might have repercussions on domestic prices, local agricultural production, labor supply, macro-economy and etc.

Although most of the literature on food aid impacts adopted the partial equilibrium modeling framework, the general equilibrium modeling approach is particularly relevant to the quantitative analysis of the impact of food aid on the overall economy as this usually involves multi-sector and multi-market impact analysis (Awokuse, 2006).

The partial equilibrium analysis is clearly unsuitable when the feedback effects of a particular policy change or a shock are considered to be significant (Bandara, 2002). Despite vastly increased capacity to conduct Computable General Equilibrium (CGE) analysis in recent years, very little is known about the impact of food aid in economic wide framework.

The CGE analyses carried out in developing countries so far have generally focused on assessment of food aid requirements (Sadoulate and Janvry, 1992), the relative effectiveness of monetization of food aid by government and direct distribution to the household (Arndt and Tarp, 2001), and the effect of cash transfer (Gelan,2006). It is therefore very important to assess the likely impact of food aid on agriculture and consumers by using general equilibrium model.

1.3. Objectives of the study

The main objective of the study is to simulate the economy-wide implications of alternative food aid policies by using CGE model particularly on production and prices.

The specific objectives of the study are:

1. To show recent trends in food aid.
2. To examine the relative impacts of cash and in-kind food aid on domestic market price and production.
3. To examine the welfare impacts of alternative food aid policies.

4. To suggest policy recommendations based on simulation experiments.

Specific policy experiments to be undertaken:

Specific experiments or simulation exercises to be considered to achieve some of the above objectives include the following:

(i) Simulation 1: 20 % reduction in in-kind food aid. This policy experiment addresses the question, what would happen to production, prices and welfare of different household groups if donors cut in-kind food aid by 20%.

(ii) Simulation 2: 20 % reduction in in-kind food aid transferred into 20 % increase in direct cash transfer. This policy experiment is to examine the current move from in-kind food aid to cash transfer on production, price and welfare.

(iii) Simulation 3: abolishment of in-kind emergency food aid, and

(iv) Simulation 4: all in-kind emergency food aid converted into direct cash transfer.

1.4. Significance of the study

One of the primary significance of the study is that it provides policymakers and analysts with a mechanism for examining the differential impacts of potential policy changes with respect to food aid. In addition, it adds another CGE study to few existing at national level and also it will initiate further research using Computable General Equilibrium models.

1.5. Scope and limitations of the study

The social accounting matrix that the study will employ is constructed in 1999/2000. Since then, there are some changes in Ethiopian economy (for instance introduction of PSNP and VAT). In addition, it lacks disaggregated data (for example, distinction between food aid recipients and non-recipients households). Updating the SAM is beyond the scope of this study. Despite this, greater effort will be made to generate valuable insight about the issue under consideration.

1.6 Organization of the paper

This paper is organized as follows: Chapter two presents an overview of food aid to Ethiopia, while chapter three provides the theoretical and empirical literature. Chapter four presents Social Accounting Matrix (SAM) description and features of Computable General Equilibrium (CGE) model. Chapter five contains simulation and an analysis of the impacts of food aid on production, prices and welfare of different household groups. Conclusions and policy implications are presented in chapter six.

CHAPTER TWO

2. OVERVIEW OF FOOD AID TO ETHIOPIA

2.1 Definition of food aid

Definitions of food aid originated in the 1950s when agricultural surpluses from the developed countries were 'disposed of' in a way that was also intended to benefit the food security of recipient nations (Mounder, 2006). However, there has been a lack of consensus on the definition of food aid among food aid experts. While defining food aid might seem like an easy task, even food aid experts struggle to agree. At a meeting in Berlin in 2003, experts developed (but by no means as the result of a consensus) the following expansive definition (FAO, 2006).

> *The definition of 'food aid' should not just be focused on its source of funding, or by specific transactions, such as "items donated from external donors to recipient", but should include consideration of a) all related international and domestic actions and programs, and b) the role of non-food resources brought to bear jointly with food to address key elements of hunger problems. As such, food aid can be understood as all food supported interventions aimed at improving the food security of poor people in the short and long term, whether funded via international, national, public and private resources* (Von Braun, 2003).

The Berlin definition includes all international and domestic actions and distributions of food, as well as non-food resources used in combination with food for food security purpose (FAO, 2006).

Food aid is usually classified into: emergency, program and project. Emergency food aid is provided in response to disaster like drought, flood etc. Project food aid is distributed to targeted beneficiary groups to support disaster prevention activities which include food for work. Some of this kind of aid may be sold or monetized to support the project. Program food aid is provided on government-to-government basis usually for sale in local markets. This type of aid is used as a resource transfer for balance of payment or budgetary support.

Food aid deliveries may be categorized as: direct transfer, local purchases and triangular purchases. Direct food aid shipment with totally sourced in the donor home markets. Local purchases that are bought in aid recipient country markets with fund obtained from donors. Triangular purchases refer to food aid procured in third countries markets with finance obtained from donors.

The USA dominates food aid assistance to Sub-Saharan Africa (SSA) accounting for 58.5 percent of total food aid. The USA was followed by European Commission (8.4 percent), the United Nation (6.5 percent), the United Kingdom (5.1 percent) and Japan (3.8 percent) (see table 2.1).

Table 2.1 Food Aid Deliveries to SSA in 2006 by Major Donors (in 000 tons-cereals in grain equivalent)

Major Donors	Sub-Saharan Africa	as % of Sub-Saharan Africa
USA	2,371,101	58.5%
EC	341,049	8.4 %
UN	263,437	6.5%
UK	206,903	5.1%
Japan	155,611	3.8%

Source: Author's calculations based on WFP (2007)

Analysis of the 2005 and 2006 food aid deliveries (Table 2.2) show that over half of all global food aid deliveries were received in SSA. In 2006 , the main food aid recipient in the region and also in the world was Ethiopia with 0.8 million tons (WFP, 2007).

Table 2.2: 2006/2005 food aid deliveries regional perspective

Region	2006 in tons (000)	% of total	2005 in tons (000)	% of total
Sub Saharan Africa	4052	60	4,586	56
Asia	1220	18	2,495	30
Latin America & Caribbean	622	9	291	7
Eastern Europe and CIS	340	5	335	4
Middle East to and North Africa	484	7	226	3

Source: WFP, 2007

2.2 Food aid procurements

There has been a progressive shift away from direct transfer to local purchases in Ethiopia (Table 2.3) although direct shipment still dominates overall sources of procurement in the country. According to world food program (WFP) data in 2006, 71.4 percent of food aid to Ethiopia was direct transfer, 25 percent through local purchases and 4 percent through triangular purchases.

Table 2.3 Cereal Aid ('000' tons) for Ethiopia

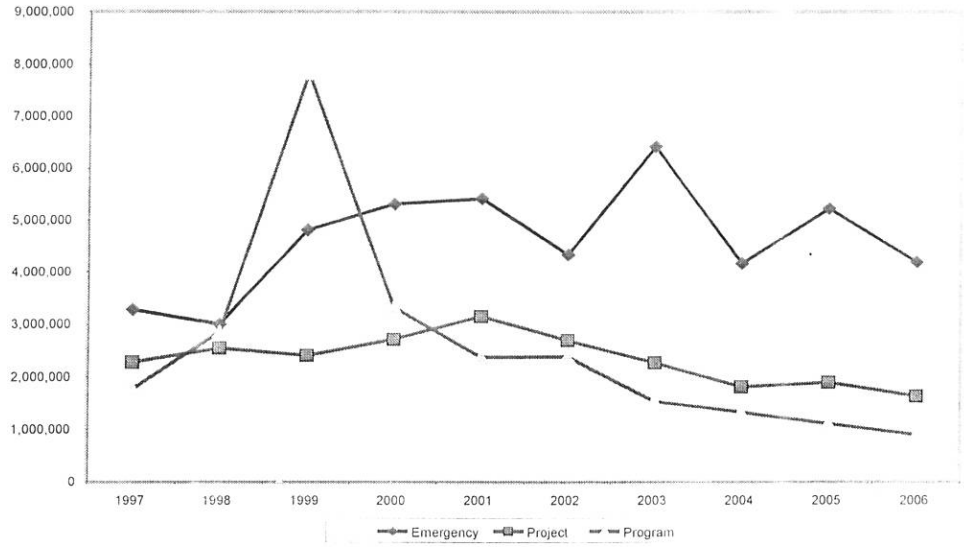
Year	1995	1996	1997	1998	1999	2000	2001
Imported	629	206	249	518	562	1017	568
Local procurement	34	109	111	58	110	206	235
Total	653	315	360	376	673	1224	803

Source: Gabre-Madhin.E and Mezgebu.T, 2006

2.3 Food aid categories

The proportions of the various types of food aid are changing. Emergency food aid now dominates global and regional flows. In particular, program food aid, which previously dominated food aid flows, is in strong decline. Recently project food aid has now exceeded program food aid deliveries while both are declining globally (Figure 2.1)

Figure 2.1 Food Aid Deliveries in 1997- 2006(in tons - cereals in grain equivalent)



Source: WFP, 2007

Food aid usually arrives in Ethiopia in two forms: Emergency and project. According to data from WFP out of the total food aid to Ethiopia in 2006, 91 percent was in the form of emergency and 9 percent was in the form of project food aid. Ethiopia was one of largest emergency food aid recipient country in the world in the year 2006(see table 2.4).

Table 2.4 Major recipient of emergency food aid in the world

Recipient	2006	
	Tons (000)	% of total
Ethiopia	730	17
Sudan	512	14
Kenya	271	6
Korea,	249	6

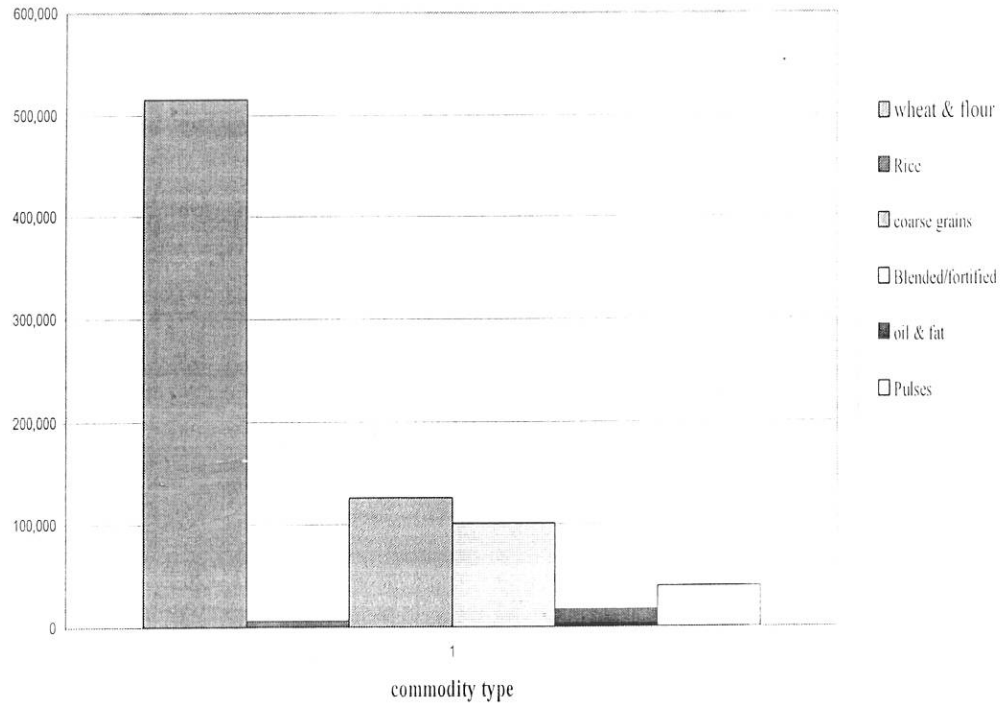
Source: WFP, 2007

2.4 Composition of food aid

The WFP report (WFP, 2007) indicated that the share of food aid delivered as cereals was 85 percent in 2006. At global level this share has slowly and not continuously-decreased in recent years, from about 88 percent in late 1990s. Africa followed the global pattern.

Food aid usually arrives in Ethiopia in-kind and mostly cereals, during the period between 1993-2003 cereals accounted for 91 percent of the total volume, with wheat the bulk of this amount (80 percent)(Gelan, 2006). The WFP report indicated that cereals accounted for 93 percent and non-cereals accounted for 7 percent of total volume of food aid (Figure 2.2) arrived in Ethiopia in 2006.

Figure 3.2 Food Aid Deliveries to Ethiopia in 2006 by Commodity type (in tons)

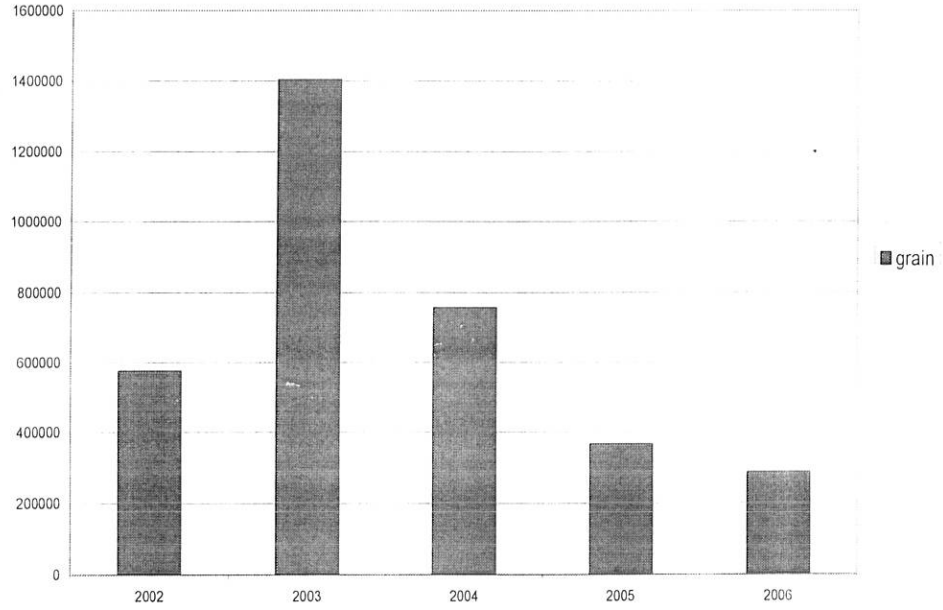


Source: WFP, 2007

2.5 Recent trends in volume of food aid

Over the past three decades, total food aid deliveries to Ethiopia averaged 700,000 metric tones per annum (EEA, 2004/05). During the period between 2002 and 2006 total grain aid peaked in 2003 at 1,404,453 million tons due to drought, but then after declined steeply to 287866.8 million tons in 2006(Figure 2.3). The increased use of cash and local purchases of food since 2005 has reduced annual food aid imports.

Figure 3.3 Grain Aid in Metric tons



Source: DPPA, 2007

CHAPTER THREE

3. SURVEY OF LITERATURE

Various studies have been conducted in different developing countries regarding food aid issues. The theoretical review part examines the impacts of food aid on production, prices and welfare which have been suggested in the literature. And it also examines the cash and in-kind aid debate. This theoretical discussion provides the context for empirical evidence.

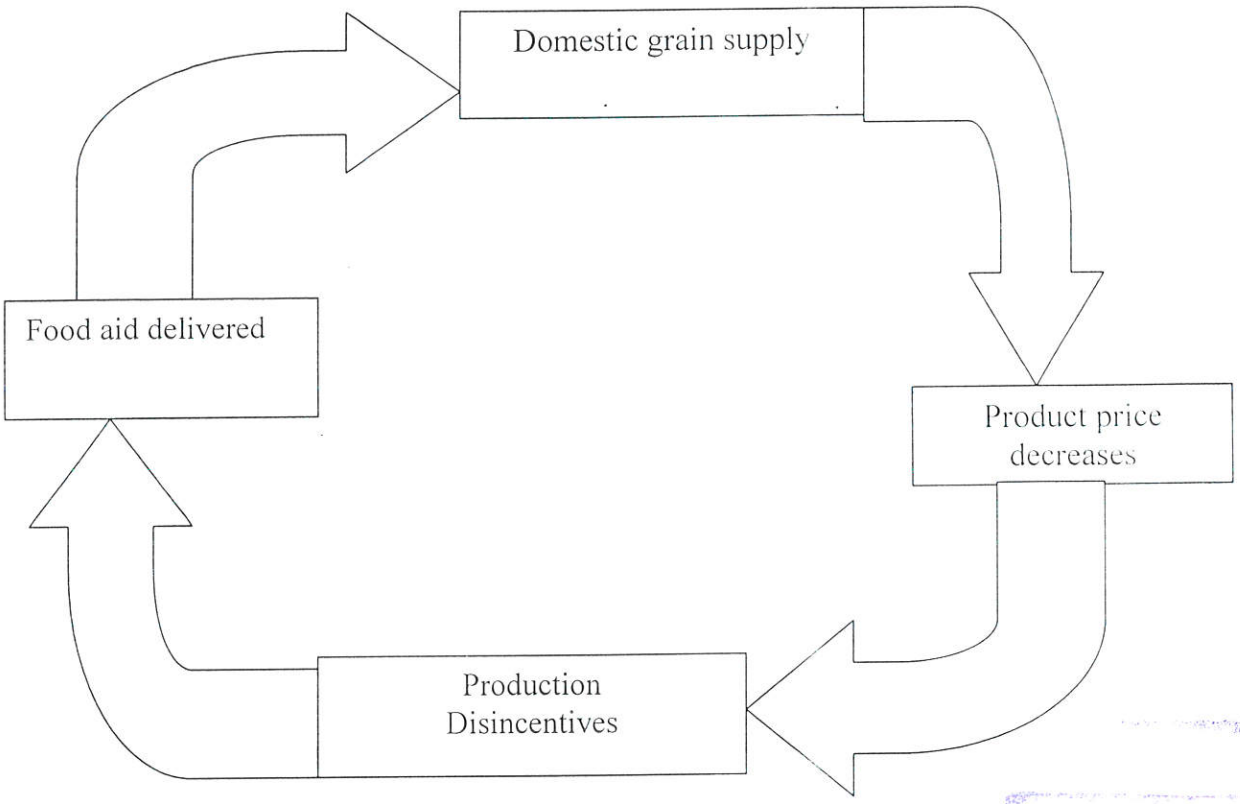
3.1 Theoretical review

3.1.1. Effects of food aid on production and price

Schultz (1960) explained production disincentive impacts of food aid as follows: Food aid will boost the aggregate supply of grain in recipient countries market, prices will decrease and this will in turn create adverse effect on domestic agricultural production. The figure below summarizes the basic hypothesis advanced by Schultz.

However, the impact of food aid on market prices can be modified according to a number of factors which adjust supply and demand (Mounder, 2006). For example, if food aid displaces commercial imports then it does not add to domestic food supplies. If there is full displacement, prices should not change and there will be no effect on incentives (Lavy, 1990).

Figure 3.1 food aid production disincentives



3.1.2 Effects of food aid on welfare

The welfare impacts of any changes in food prices induced by food aid are likely to be mixed. This can be most easily understood by thinking about the people in an area that receives food aid in terms of two criteria: whether or not they receive food aid (recipients versus non-recipients) and whether they are net sellers or net buyers of food. Food aid in kind brings commodities into an area and drives down local prices. This unambiguously benefits food aid recipients and net food

buyers through the direct transfer effect recipients enjoy, as well as through the indirect benefit that arises due to lower prices for the foods they buy. Even non-recipients benefit as long as they are net food buyers, because they can afford to buy more food when prices are lower. Net sellers of food are unambiguously worse off because the price they receive for their output is lower. This negative effect could be offset, however, if they also receive food aid or some other form of compensatory transfer. The welfare effects on net sellers who also receive aid are ambiguous, depending on how the unintended, adverse price effects balance out against the intended, positive transfer effects (FAO, 2006).

3.1.3 Cash and in-kind aid debate

The cash versus in-kind aid debate has examined the effectiveness of aid delivery, specifically focusing on the consequences of alternative mechanisms for the welfare of beneficiary or recipient households (Gelan, 2006). One of the most important decisions in designing food aid delivery is whether to provide assistance in the form of cash, in-kind or both combined.

There has been a growing interest in the potential of cash and voucher schemes to respond to both acute and chronic food emergencies. If local markets are adequately stocked and functional, proponents argue that this offers a viable and preferable option to direct food distributions (Maunder, 2006). The simplest way to avoid disincentive

effects of food aid on domestic production is to use cash rather than food aid. Moreover, aid in cash avoids high costs of international transport, as well as domestic transport of commodities from the port to the distribution center. (Dorosh et al, 2002). Importing and distributing food costs 39-46% more than cash transfers, although purchasing food from local sources is only 6-7% more than the cost of using cash (Kebede, 2006).

Indeed cash distributions would encourage rather than hinder the development of local markets in areas of chronic vulnerability. Furthermore, the injection of cash into the local economy provides positive incentives to local agricultural producers - a double benefit. Moreover, there is a long time lag between the decision to provide direct food aid and the physical delivery – which runs at an average of 5 months (Maunder, 2006). The negative impacts of late delivery are twofold. Firstly, people who need food aid become more food insecure, because they do not get the aid on the right time. Secondly, the late arrival of food aid may has impact on the local economy, increases chance that the arrival of food aid may coincide with the harvest period. In this case food aid may depress local food prices, and consequently reduce the incomes of farmers and farm workers. Cash minimizes these risks.

Barrett and Maxwell (2005) argue that as cash provides a more flexible and efficient transfer, it should be the primary response choice in

situations where the market is functioning and stocks are adequate to meet the needs of the potential beneficiaries.

Against these advantages, one must weigh the risks of cash responses. The key potential danger stems precisely from money's flexibility and fungibility: how can donors ensure that their aid is going where it is intended? Targeting can also become more difficult, since cash is of inherent value to everyone, and does not allow for self-selection. While the impact of an infusion of cash may stimulate a local economy, it may also lead to inflation and increased prices (when local markets are not robust), potentially penalizing people not included in the program (David et al, 2001).

An approach based on food supply, such as food aid is fundamentally different because it is most appropriate when an insufficient supply of food is the root cause of hunger. Cash in this case simply leads to inflation if markets are not working well or worse, if food is simply not available (FAO, 2006).

3.2 Empirical Review

3.2.1 Effects food aid on production and prices

Although several early food-aid studies found empirical evidence of production disincentive effects, the balance of recent evidence does not support the hypothesis that food aid has a substantial, negative impact on local and national agricultural production. This is due to the fact

that production in many of these countries is influenced by a number of factors that may outweigh the impact of short-term commodity price fluctuations, including natural phenomena such as weather patterns and pest loads, and the lack of productivity-enhancing investments such as fertilizers, improved seeds and water control measures (FAO, 2006).

For example, Mann (1967) analyzed the impact of food aid on prices and domestic supply of cereals in India. He found that food aid to India resulted in a significant decline in domestic production. In a subsequent study in India, Isenman and Singer (1977) found that the disincentive effect had weakened considerably in the presence of improved government food-distribution policies and lower food-aid volumes. In a comparative study of three food aid recipients in sub-Saharan Africa, Maxwell (1991) found weak support for the disincentive effects of food aid (Cited in FAO, 2006).

In contrast, recent empirical studies have found that food aid does not appear to depress local agricultural production. For example, Lavy (1990) used vector auto regression analysis techniques to investigate the relation ships between food aid and cereal production for Sub-Saharan countries between 1970 and 1987. He found that food aid had a significant positive association with increased food production. Using econometric model Bezuneh et al (2003) found statistically significant positive relationship between food aid and local production.

Lowder (2004) analyzed cross-country panel data which differentiate the analysis for program and emergency food aid between 1998 and 2001. She found neither program nor emergency food aid had no significant disincentive effect on domestic agricultural production in recipient economies.

More recently Barrett et al (2005) analyzed the relationship between food aid and local production in Sub-Saharan Africa by using Vector Auto Regression (VAR) analysis. They found that food aid does not appear to have created disincentive effect on local production.

A counter recent evidence of food aid on production happened in Malawi in the years 2002 and 2003. Food aid donors over-reacted to a projected 600,000-tons food deficit in Malawi, and sent close to 600,000 tons of food in aid. However, commercial and informal imports brought an additional 350,000-500,000 tons. As result, maize prices dropped from $250 per ton to $100 per ton in course of one year. Local production of maize, cassava, and rice fell markedly, and estimated losses to the Malawian economy were approximately $5 million (Oxfam, 2005).

Among the most important consequence of food aid is the effect on food prices. The empirical evidence shows that food prices almost invariably fall in local markets immediately after a food aid distribution (FAO, 2006).

Yamino et al (2000) used household model to examine potential effects of food aid (free distribution and food for work) on crop marketing in Ethiopia. They found that every 10kg of wheat received through food for work programs decreased market purchases of cereals by 6.9kg.

Levinsohn and McMillan (2004) estimated the supply and demand functions in Ethiopia and found that the price of wheat would be $295 per metric ton in the absence of food aid compared with an average observed price of $193 per metric ton.

Lind and Jalleta (2005) found that most farmers experienced falling of grain prices during distributions of food aid in Delanta Dawunt in Ethiopia, but prices stabilized within a few weeks. (Cited in FAO, 2006).

3.2.2 Effects of food aid on welfare

Arndt and Tarp (2003) employed general equilibrium model to examine the effects of alternative food aid distribution schemes for drought response food aid to Mozambique. They found that compared with monetization of food aid by government, direct distribution to households significantly benefits rural households. Levinson and McMillan (2004) estimated the welfare impact of the price changes associate with food aid by using partial equilibrium model. They found that households at all levels of living standard benefited from a reduction in food prices.

CHAPTER FOUR

4. METHODOLOGY AND DATA SOURCE

To assess the potential effects of food aid on production, domestic market price and welfare on the different household groups in Ethiopia and also to examine the relative impacts of cash and in-kind food aid, the author develop static food aid Computable General Equilibrium (CGE) model.

The static food aid CGE is calibrated using a Social Accounting Matrix (SAM) constructed by Tadele and Alemayehu for the year 1999/2000.

4.1 Data source and SAM description

SAM is a square matrix in which each account has its own row and column. The payments are represented in columns and the receipts listed in rows. For each account the total of the corresponding rows and columns must balance. Since SAM accounts for all income and expenditure transactions of all sectors and institutions in the economy, it serves as the underlying data framework for computable General Equilibrium modeling.

4.1.1 The structure of a schematic SAM for Ethiopia

Table 4.1 presents an aggregated schematic SAM for Ethiopia, with the rows of any one column representing expenditure items and the columns of any one row representing the receipt accounts.

There are 7 types of accounts in the SAM: 12 activities, peasant farming -Highland mixed, peasant farming lowland mixed, peasant livestock production-pastoralists, cottage handicraft and small scale manufacturing processing, large medium agro industry- public, large medium agro –industry-private, large medium other industry-private, other industry non-tradable public, other industry non-tradable-private, services public, and services private. 8 commodities: food crops, traditional agricultural exportable, non- traditional agricultural exportable, other agricultural products, agro-industrial products, other industrial products, public goods and services, and other services. 10 Institutions: household groups (farm households, wage earners and entrepreneurs), firms (private firms, public firms and peasant household farms), food for work, food aid program, Government and rest of the world. 4 factors: family labor, wage Labor, capital and land. Taxes: income tax, export tax and indirect tax. Transaction cost and capital accounts.

4.1.1.1 The production activities account

This account reflects the production activities in different sectors of the economy. Production activities use raw materials and intermediate goods and hire factors to produce commodities.

Along column (1), the activities account purchases intermediate inputs from commodities account (entry 2.1) pays for factors (entry 3.1). Along row (1), the activities account sells domestic goods to the different sectors through commodities account (entry 1.2).

4.1.1.2 The commodities account

The commodities account can be seen as representing the domestic product market buying and selling of goods and services.

Along column (2), the commodities account buys domestic goods from activities (entry 1.2) and imports from the rest of the world (entry 9.2). In the process of buying and selling goods and services, the commodity account pays export tax to government (entry 13.2), Indirect taxes to government (entry 14.2) and transaction cost (trade margins) (entry 15.2).

Along row (2), the commodities account sells the goods it buys from the activities account to all domestic users. These include sales of intermediate input to production activities (entry 2.1), sales of consumption goods to households (entry 2.4), sales of consumption goods to governments (entry 2.6), exports goods to the rest of the world (entry 2.9), sales for private investment purpose (entry 2.10), sales for public investment purpose (entry 2.11), and sales for transaction cost (entry 2.12).

4.1.1.3 Factor account

The factor of production grouped in to four: family labor, wage labor, capital and land. The factors receive wage, profit and rent from activities (entry 3.1).

4.1.1.4 The institution account

The institution account represents the various economic actors in the economy. As mentioned above the 1999/2000 SAM identified ten institutions.

4.1.1.4.1 Household account

Row (4) identifies the sources of income for households. Households income include factor income (entry 4.3), transfer coming from households (entry 4.4), transfers coming from firms (entry 4.5) transfer coming from government (entry 4.6), food aid (4.8) and transfer coming from abroad (entry 4.9). Households expenditures consists of consumption goods paid to commodities account (entry 2.4) transfer to rest of the world (entry 9.4), private investment (entry 10.4) and income tax (entry 12.4). These expenditures must equal to total income of household.

4.1.1.4.2 Firms

Firms receive factor income (entry 5.3) and spend on transfer to households (entry 4.5), private investment (entry 10.5) and direct tax (entry 12.5).

4.1.1.4.3 Government

Row (6) represents sources of government income. The government drives income from levy of direct taxes on firms and households (entry 6.12) export tax from commodities (entry 6.13) indirect taxes from commodities (entry 6.14) and the government gets transfer from abroad (entry 6.9). Income received by the government is spent on government consumption expenditures to commodities account (entry 2.6), transfer to rest of the world (entry 9.6), and public investment (entry 11.6). These expenditures must be equal to government income.

4.1.1.4.4 Rest of the world

In this account transaction between the domestic economy and the rest of the world are recorded, of which the main components are imports and exports of commodities.

Row (9) shows the import value received by the rest of the world from commodities account (entry 9.2), transfer to households (entry 9.4), and transfer to government (entry 9.6). Column (9) gives the total payment made by the rest of the world account to other accounts. It pays to exports to commodities account (entry 2.9), transfer to households (entry 4.9), and transfers to government accounts (entry 6.9).

4.1.1.5 Capital account

Row (10) and (11) give the total saving received by the capital account from various savers in the economy. These are households saving (entry 10.4), firms saving (entry 10.5) and foreign saving (entry 10.9). Both households and firms demand investment goods from commodities account. These institution pay for investment demand from their savings in the capital account. Instead of making this payment directly, therefore, the capital account pays on their behalf from their savings to the commodities account (entry 2.10) and (entry 2.11).

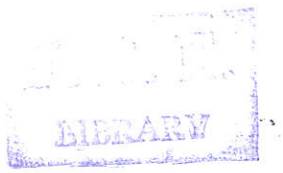


Table 4.1 Schematic Social Accounting Matrix for Ethiopia

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		ACT	COM	FCT	HHD	FRM	GOV	FFW	FAID	ROW	PRV	PBV	YTX	EXT	ITX	TRCST	TOTAL
Activities(1)	ACT		Intermediate inputs sale														Activity income
Commodities(2)	COM	Intermediate input purchase			Private consum.		Gov. Consum.			exports	Private Inves. demand	Public invest. demand					demand
Factors(3)	FCT	Wages, rents and interest															Factor income
Households(4)	HHD			Factor income	transfer	transfer	transfer		Food transfer	transfer							Households income
Firms(5)	FRM			Factor income													Firms income
Government(6)	GOV									transfer			YTX	EXT	ITX		Government income
Food-for-work(7)	FFW																Food for work
Food aid(8)	FAID																Food aid
Rest of the world (9)	ROW		imports		transfer		transfer										Foreign exchange out flow
Private investment-10	PRV				Households savings	Firms savings				Foreign saving							saving
Public investment-11	PBV						Gov. savings			Foreign savings							saving
Income tax(12)	YTX				Income tax												Income tax
Export tax (13)	ETX		Export taxes														Export tax
Indirect tax (14)	ITX		Indirect taxes														Indirect tax
Transaction cost (15)	TR-CST		Trade margins														Transaction cost
Total (16)	total	activity	Supply expenditures	Factor exp.	Households exp.	Firms Exp.	Gov. Exp.	FFW	Food aid	For.ex in flow	Private invest.	Public Invest.	YTX	ETX	ITX	TRCST	

4.1.2 An aggregated SAM for Ethiopia

Table 4.2 presents aggregated version of the 1999/2000 data framework for Ethiopia, arranged essentially the same formal as the schematic SAM in tables 4.1.

The total production in 1999/2000 in Ethiopia was Birr 88,843 million and it is shown as the sum of column (1) of table 4.2. Reading down column (1), it can be seen that this was made up of 20,685 million and 68,145 million birr paid by the production activities towards intermediate inputs and factor services respectively. Reading along row (1), we see that Birr 88,843 million represents the value of sales of production activities to the commodities account.

Column (2) shows total supply in the economy inclusive of taxes and transaction costs. From the column total we see that total supply amounted to Birr 116,882 million. This was made up of 88,843 million of domestic sales of goods and services, Birr 15,330 million of imports of goods and services, Birr 639 million of food aid, Birr 3,601 million Import tax paid to government, Birr 8300 million transaction costs and Birr 169 million export tax paid to government.

Row (2) shows total demand, with Birr 20,685 million sold to production activities as intermediate inputs, Birr 50,290 million constituting the value of consumption goods and services to households, Birr 7203 million representing the value of goods and

services sold to government, Birr 3200 million representing the value of public investment, Birr 8018 million constitute sum of export sales to rest of the world, Birr 19,185 million represents investment demand and Birr 8300 million constitute transaction cost demand .

Along row (3) we see that Birr 68,158 million constitute factor income. These factors income are then transferred to households and firms with Birr 32,771 million and Birr 35,387 million respectively.

In row (4) we see that sources of households' income. Households got Birr 32,771 million from factors Birr 20,964 million transfer from firms, Birr 393 million transfers from government, Birr 639 million from food aid, Birr 3117 million transfer from the rest of the world, Birr 1942 million of intra household transfer, giving total income of Birr 57,885 million. The entries in column (4) shows households' expenditures, birr 50,290 million used to pay for private households' consumption for commodities, Birr 95 million for transfer to the rest of the world, and Birr 2360 million was used to pay for direct tax to government. The balance of total households income after deducting various expenditure items constitute households savings. This amounted to Birr 5,140 million and is shown as being paid into the capital account.

Row (5) shows sources of firms' income. Firms derived a total of birr 35,387 million from factor income. The entries in column (5) shows that how their income was used. Firms spent birr 20,964 million to households (households transfer) birr 3196 million was used to pay for

income tax to government. The balance of total firm income after deducting various expenditure items constitutes firms saving. This amounted to birr 11,227 million and is shown as being paid into the capital account.

Row (6) represents the receipt of government which constitute birr 1,715 million from rest of the world, birr 5556 million direct tax from households and firms birr 169 million from export tax and, birr 3601 million of import tax. The various sources of government income sum up to 11040 million. Column (6) provides a statement of the various uses of government, of which birr 7203 million was used to buy good and services, birr 393 million transferred to households, birr 548 million transferred to rest of the world and birr 2,895 million spent on public investment.

Table 4.2 Aggregated Social Accounting \matrix for Ethiopia (Millions Eth. Birr)

		ACT	COM	FCT	HHD	FRM	GOV	FFW	FAID	ROW	PRV	PBV	YTX	EXT	ITX	TRCST	TOTAL
Activities	ACT		88,843														88,843
Commodities	COM	20,685			50,290		7,203			8,018	19,185	3,200					116,882
Factors	FCT	68,158															68,158
Households	HHD			32,771	1,942	20,964	393		639	3,147							59,827
Firms	FRM			35,387													35,387
Government	GOV												5,556	169	3,601		11,040
Food for work	FFW																305
Food aid	FAID		639														639
Rest of the world	ROW		15,530		95		548										15,973
Private investment	PRV				5,140	11,227											19,185
Public investment	PBV						2,895	305									3,200
Income tax	YTX				2,360	3,196											5,556
Export tax	ETX		169														169
Indirect tax	ITX		3,601														3,601
Transaction cost	TRCST		8,300														8,300
Total	TOTAL	88,843	116,882	68,158	59,827	35,387	11,040	305	639	15,973	19,185	3,200	5,556	169	3,601	8,300	

4.2 Description of CGE models

The food aid CGE model used in this study follows the structure of the SAM discussed in the preceding section. It makes use of the numerical SAM for 1999/2000 as its database. The 1999/2000 SAM represents the initial conditions that are influenced by policy scenarios postulated in the model simulation.

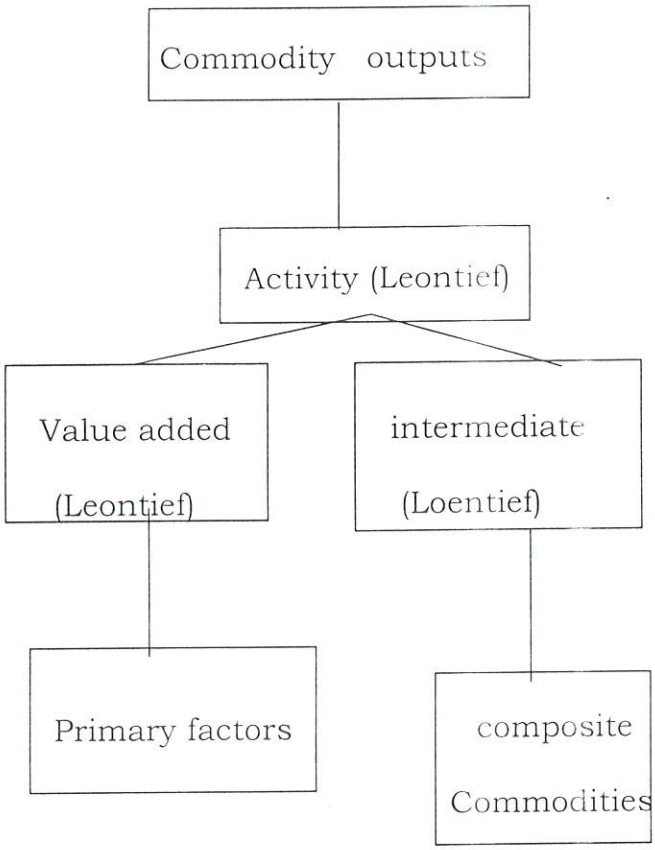
Food aid enters the model through the composite commodity market clearing conditions following Arndt and Tarp (2001) Approach. It simply increases composite commodity supply. The rest of this section presents detailed description of features of food aid CGE model.

Food aid CGE model comprises six major blocks: production block, income and saving block, demand block, foreign trade block, price block and system constraint block.

4.2.1 Production block

At the top level, domestic output is a leontief function of the quantities of value added and aggregate intermediate inputs. Value added is a leiontief function of the primary factory of production (labor and capital) and aggregate intermediate inputs is a Leontief function of disaggregated intermediate inputs (see figure 4.1).

Figure 4.1 Production Technology



Demand for aggregate value added function can be written as:

$$QVA_a = iva.QA_a \quad \ldots\ldots 1$$

Where

QVA_a = quantity of aggregate value added

QA_a = level of activity, and

iva = quantity of value added per activity unit.

Demand for aggregate intermediate input mathematically represented by:

$$QINTA_a = \text{int}\, a_a.QA_a \quad \ldots\ldots 2$$

LISTS OF FIGURES

Where

$QINTA_a$ = quantity of aggregate intermediate input, and

$\text{int}\, a_a$ = quantity of aggregate intermediate input per- activity unit.

For each activity, the demand for disaggregated intermediate input is determined via standard leontief formulation as the level of aggregate input use times a fixed intermediate input coefficient.

$$QINT_{ca} = ica_{ca}.QNTA_a \quad \ldots\ldots 3$$

Where

$QINT_{ca}$ = quantity of commodity C as intermediate input to activity a, and

ica_{ca} = quantity of C per unit of aggregate intermediate input.

4.2.2 Income and saving block

Households earn their income from production factors. They also receive transfer payment from households (intra-household transfer), government and firms. In addition, they receive aid. Therefore, the household income YH_h can be written as:

$$YH_h = \lambda L_h.RL + \sum_h THH_{hh} + \sum_f TFH_{fh} + shfd_h.TFAID + TGH_h + TRW_h.E \quad \ldots\ldots 4$$

Where

YH_h = income of household.

RL = total labor remuneration

λL_h = share of labor remuneration in the household income

THH_{hh} = household to household transfer

TFH = firms to household to households transfer

$Shfd_h$ = share of food aid in house hold income

$TLFAID$ = total food aid

TGH_h = government to households transfer

$TRWH_h$ = rest of the world to household transfer, and

E = exchange rate.

Firms earn capital income. They save income after direct tax and transfer deduction. Firms' income and saving can be written as:

$$YF_f = \lambda K_f . RK \quad \ldots\ldots 5$$

Where

YF_f = firms income

λK_f = share of capital remuneration in the firm income, and

RK = capital remuneration.

$$SF_f = YF_f - tyf_f . YF_f - \sum_h TFH_h \quad \ldots\ldots 6$$

Where

SF_f = firms saving, and

tyf_f = average rate of income tax paid by firms.

Equation 7 defines disposable income of household groups (i.e. tax imposed on gross income (with out food aid). And equation 8 defines household savings. Households assumed to save a fixed proportion of their disposable income.

$$YDH_h = (YH_h - shfd_h.TLFAID)(1 - ty_{hh}) \quad \ldots\ldots 7$$

Where

YDH_h = households disposable income, and

ty_{hh} = average rate of income tax paid by households.

$$SH_h = S_y.YDH_h \quad \ldots\ldots 8$$

Where

SH_h = households savings, and

Sy = saving rate of households.

Equation 9 defines government income. Government receives transfers from the rest of the world and collects taxes. The taxes include income tax from households and firms, import tariffs and export taxes.

$$YG = \sum_h ty_h.YH_h + \sum_f tyf.YF_f + TRWGE + \sum_m TAXM_m + \sum_e TAXE_e \quad \ldots\ldots 9$$

Where

YG = Government income

TRWG = transfer from rest of the world to government

TAXM = Import tax, and

TAXE = export tax.

The government uses this income to purchase commodities for its consumption, to transfer to households and rest of the world. Government consumption is fixed in real (quantity) terms.

Government saves the difference between government income and expenditure. The government expenditure and saving can be written as:

$$EG = PQ_c.QG_c + \sum_{yg} gov + TGRW.E \quad \ldots\ldots 10$$

Where

EG = government expenditure

PQ_c = composite price

QG_c = quantity of government demand

gov = government transfer, and

TGRW . = government transfer to the rest of the world.

$$SG = YG - EG \quad \ldots\ldots 11$$

Where

SG = Government saving.

4.2.3 Demand Block

Demand block consists of household group demand, total demand by commodity, total intermediate demand, transaction cost demand and total government demand. Total value of households consumption is the disposable income that remains after households savings, and transfer plus direct food aid.

$$CEH_h = YDH_h - SH_h - \sum_{hh} THH_{hh} - THRW.E + shfd_h.TLFALD \quad \ldots\ldots 12$$

Where

CEH_h = households consumption expeditors, and

THRW = transfer from household to rest of the world.

Equation 13 defines households' consumption demand.

$$QH_{ch} = beta_{ch}.CEH_{h} / PQ_{c} \quad \ldots\ldots\ldots\ldots 13$$

Where

PQ_c = composite price,

QH_{ch} = quantity of consumption of commodity c by household h,

$beta_{ch}$ = share of commodity c in the consumption of household h,

CEH_h = household consumption expenditure.

Government consumption demand is defined as the base year quantity multiplied by an adjustment factor. This factor also exogenous and hence, the government consumption is fixed.

$$QG_c = GADJ.\ qg_c \quad \ldots\ldots\ldots\ldots 14$$

Where

QG_c = government consumption demand for commodity,

GADJ = Government consumption adjustment factor (exogenous variable), and

qg_c = base year quantity of government demand

Equation 15 defines fixed investment demand. It is the base year quantity multiplied by adjustment factor.

$$QINV_c = IADJ.qinv_c \quad \ldots\ldots\ldots\ldots 15$$

Where

$QINV_c$ = quantity of fixed investment demand for commodity

IADJ = investment adjustment factors (exogenous variable), and

$qinv_c$ = base year quantity of fixed investment demand.

Equation 16 defines total investment demand

$$IT = \sum_f SF_f + \sum_h SH_h + FSAV.E + GS \quad \ldots\ldots 16$$

Where

IT = total investment demand, and

FSAV = foreign saving.

Transaction cost combines marketing and transportation costs. It represents cost associated with distribution of commodities from their point of production to point of consumption. Equation 17 defines total transaction costs and equation 18 transaction cost by commodity.

$$TRCOST = \sum tq_c \, (PD_c.QD_c) + PM_c.QM_c \quad \ldots\ldots 17$$

Where

TRCOST = total transaction cost

tq_c = tax rate of transaction cost

PD_c = domestic price

QD_c = domestic output

PM_c = price of import, and

QM_c = quantity of import.

$DTCOST = sh\text{-}cst.TRCOST/PQ_c$ 18

DTCOST = transaction cost demand by commodity

$sh\text{-}cst_c$ = share of transaction cost in composite demand, and

PQ_c = composite price.

4.2.4 Foreign trade block

The model assumes that foreign and domestic commodities are imperfect substitutes. The function for transforming domestic production in to exports and domestic sales is usually Constant Elasticity of Transformation (CET) function. The CET function applies to commodities that are both exported and sold domestically.

$$QX_c = a_c^t(\delta_c^t QE_c^{\rho_c^t} + (1- \delta_c^t)QD_c^{\rho_c^t})^{1/\rho_c^t} \quad \text{.....19}$$

Where

QX_c = aggregate marketed domestic output

a_c^t = a CET function shift parameter

δ_c^t = a CET function share parameter, and

ρ_c^t = a CET function share parameter exponent.

QE_c = quantity of export, and

QD_c = quantity sold domestically of domestic out put.

Maximization of producers revenues given the prices and subject to the CET function and fixed quantity of domestic out put gives optimal mix between export and domestic sales.

$$\text{MAX} \quad PX_c QX_c = PD_c . QD_c + PE_c QE_c$$

$$St \; QX_c = a_c^t (\delta_c^t QE_c^{\rho_c^t} + (1 - \delta_c^t) QD_c^{\delta_c^t})^{1 \; \rho_c^t}$$

According to this formulation the optimal ratio of domestic sales to export is the function of relative prices.

$$\frac{QE_c}{QD_c} = \left[\frac{PE_c}{PD_c} \cdot \frac{1-\delta_c^t}{\delta_c^t} \right]^{1/\rho_c^t - 1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 21$$

PX_c = aggregate producer price for commodity

PD_c = domestic price of domestic output

PE_c = export price (domestic currency)

Output Transformation for Non-exported Commodities

$$QX_c = QD_c \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 22$$

Similarly consumers consume composite goods made up of domestic outputs and imports sold domestically are captured by Constant Elasticity of Substitution (CES) aggregation function. The function often called an Armington function

$$QQ_c = a_c^q \; (\; \delta_c^q QM_c^{-q_c^q} + (1- \delta_c^q) \; QD_c^{-q_c^q})^{-1/\rho_c^q} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 23$$

Where

QQ_c = Composite output

a_c^q = an Armington function shift parameter

δ_c^q = an Armington function share parameter and

ρ_c^q = an Armington function exponent

The optimal combination between imports and domestic goods determined by the first order condition for cost minimization given the two prices and subject to the Armington function fixed quantity of composite commodity.

$$\text{Min} \quad PQ_c.QQ_c = PD_c.QD_c + PM_c.QM_c$$

$$\text{S.t} \quad QQ_c = a_c^q \left(\delta_c^q.QM_c^{-\rho_c^q} + (1- \delta_c^q) QD_c^{-\rho_c^q} \right)^{1/1+\rho_c^q}$$

According to this formulation the optimal ratio of imports to domestic sales is then influenced by relative prices.

$$\frac{QM_c}{QD_c} = \left[\frac{PD_c}{PM_c} . \frac{\delta_c^q}{1-\delta_c^q} \right]^{1/1+\rho_c^q} \quad \text{.....24}$$

Composite Supply for Non-imported Commodities

$$QQ_c = QD_c \quad \text{.....25}$$

4.2.6 Price Block

The prices of imports and exports are determined by world prices, exchange rate and taxes. Equation 26 and equation 27 define import price and export price respectively.

$$PM_c = PWM(1+txm).E \quad \text{.....26}$$

Where

PM_c = import price in local currency

PWM_c = import price in foreign currency

E = exchange rate, and

txm = tax rate on imports.

$$PE_c = PWE\ (1\text{-}txec).E \quad \ldots\ldots 27$$

Where

PE_c = export price in local currency unit,

PWE_c = world price of export, and

txe = export tax ratio.

Based on "small country" assumption world prices of imports and export are fixed

Equation 28 defines total absorption (i.e. total domestic spending on commodity at domestic demanders price). It is the sum of domestic demand price multiplied by domestic sales, import price multiplied by import quantity and food aid price multiplied by food aid quantity.

$$PQ_c.QQ_c = PD_c.QD_c + PM_c\ QM_c + PF_c.QF_c \quad \ldots\ldots 28$$

Where

QQ_c = composite supply

QD_c = quantity sold domestically of domestic output

QM_c = quantity of import of commodity

QF_c = quantity of food aid

PF_c = price of food aid

PQ_c = composite price

PD_c = domestic price, and

PM_c = import price.

Equation 29 defines total marketed output value. It is the sum of domestic demand price multiplied by domestic sales and export price multiplied by export quantity.

$$PX_c.QX_c = PD_c.QD_c + PE_c.QE_c \quad \text{.....29}$$

Where

PX_c = aggregate producer price

QX_c = aggregate marketed quantity of domestic output commodity

QE_c = quantity of exports.

Equation 30 expresses activity price. It is the sum of producers price times yields.

$$PAa = \sum_{a \in c} PX_c.\theta_{ca} \quad \text{.....30}$$

Where

PA_a = activity price

PX_{ca} = producers price of commodity

θ_{ac} =Yield of out put per unit of activity a

Equation 31 defines consumer price index.

$$CPI = \sum_{c \in C} PQ_c . \text{Cwts} \quad \ldots\ldots 31$$

Where

CPI = consumer price index, and

Cwts = weight of commodity c in the consumer price index.

4.2.6 System constraint

Factor Markets

$$\sum QF_{fa} = QFS_f \quad \ldots\ldots 32$$

Where

QF_{fa} = demand for factor f

QSF_f = supply of factors f

Composite Commodity Markets

$$QQ_c = \sum QINT_{ca} + \sum QH_{ch} + qg_c + QINV_c + DTRCOST_c \quad \ldots\ldots 33$$

Where

$QINV_c$ = quantity of investment demand

$QINT_{ca}$ = quantity of intermediate use of commodity c by activity a

Current Account Balance

$$\sum pw_c \cdot QE_c + \sum tri,row + FSAV = \sum pmw_c \cdot QM_c \quad \ldots\ldots 34$$

Where

$tr_{i,row}$ =transfer from institution rest of the world to institution i.

Savings-Investment Balance

$$\sum Sy_h \cdot (1 - ty_h) \cdot YH_h + \sum SF_f + (YG - EG) + EXR \cdot FSAV = \sum PQ_C \cdot QINV_C + WALRAS \quad \ldots\ldots 35$$

Where

WALRAS = dummy variable (zero at equilibrium)

$QINV_c$ = quantity of investment demand

CHAPTER FIVE

5 SIMULATIONS AND RESULTS

This section describes four shocks focusing on the effects of food aid policy change. In each case, the researcher concentrates on what happen to productions, prices and welfare[1] of different household groups. Moreover, the simulation experiments are used to differentiate between the effects of in-kind food aid and cash aid.

The model has the same macroeconomic closures for all simulation experiments: the numeriare is consumer price index, foreign borrowing is exogenous, and the exchange rate is flexible.

5.1 Impacts of a 20 percent decline in in-kind food aid without any cash aid equivalent (scenario-I)

The volume of food aid in-kind has declined since 2003(figure 2.3). Recent increase in cereal prices in Ethiopia has raised concern about the implications for food aid to some extent. In this experiment, 20 percent in-kind food aid cut simulated. This policy experiment addresses the question what would happen to overall economy if in-kind food aid decline by 20 percent particularly on production, domestic product prices and welfare.

[1] Private consumption is used as welfare measure in all experiments.

Table 5.1 presents price effects of the shock. The average price of food crops, the sector that encountered the policy shock, increased by 0.4 percent from the base value. This indicates an inevitable rise in the price of food crops in local markets after cut in food aid. The reason is that food aid cut decreases grain supply in local market then price increases which in turn create incentive effect to food production (Table 5.2). However, the rise in food crops price under this simulation is very small. Moreover, the price impact of food aid cut on other agricultural as well as non-agricultural commodities is negligible.

Table 5.1. Impact of a 20 percent reduction in food aid on domestic market commodities prices (percentage change over the base values)

	Base values	Scenario -I
Price effects:		
Food crops	1.0	0.40
Traditional agricultural export	1.0	0.00
Non-traditional agricultural exports	1.0	-0.30
Other agricultural exports	1.0	-0.30
Agro-industrial products	1.0	0.00
Other industrial products	1.0	0.30
Public goods services	1.0	-0.10
Other services	1.0	0.20

Source: Model simulation

With regard to commodity output effects of scenario I, we see that the outputs of most commodity groups increase from the base values, albeit very slightly (Table 5.2). This means that food aid cut would have some expansionary effects on most agricultural and non-agricultural sectors. For example, food-crop output increases by 0.44 percent because relatively higher food crops prices provide incentives for increased in food crops output.

Table 5.2. Impact of a 20 percent reduction in food aid on commodity outputs (percentage change over the base values)

	Base level	Scenario -I
Output effects:		
Food crops	15772	0.44
Traditional agricultural exports	13827	0.36
Non-traditional agricultural export	2558	0.39
Other agricultural exports	2804	0.40
Agro-industrial products	6737	-0.07
Other industrial products	15845	0.12
Public goods services	7203	0.00
Other services	24098	0.11

Source: Model simulation

In terms of households' welfare, only farm households group benefit from the shock. Wage earners and entrepreneurs experience welfare

deterioration. Private consumption of farm households increased by 1.3 percent while Private consumptions of wage earners and entrepreneurs decline by 0.03 percent and 1.25 percent respectively (Table 5.3). The reason for this is that most of farming households are net food sellers and on average they benefit from food price increase. Entrepreneurs tend to lose from the shock since most of them are net buyers of food. Moreover, farm households and wage earners generate most of their income from labor, while entrepreneurs rely on capital.

Table 5.3. private consumption by household groups

	Base values	**Scenario-I (% change over base)**
Welfare Effects:		
Farm household	31,968	0.25
Wage earners	7539	- 0.03
Entrepreneurs	5090	-1.25

Source: Model simulation

5.2 Impacts of a 20 percent decline in in-kind food aid transferred into 20 percent increase in cash transfer (scenario-II).

Recently the Ethiopian government is working on several fronts to shift away form emergency and chronic food aids to alternative methods. Productive Safety Net Program (PNSP) is one of them. PSNP provides an opportunity to begin switch from direct food aid to cash aid. This simulation explores the impact of a policy shift according to which 20 percent reduction in food aid is converted into direct cash transfer equivalent.

Table 5.4 illustrates the price effects of the shock. As expected, scenario-II results in an increase in the price of most agricultural and non-agricultural commodities in contrast to scenario-I, albeit very slightly. The reason being that direct cash transfer increases purchasing power of the beneficiaries, expenditures on food and non-food commodities increase which turn pushes up prices. This means that direct cash transfer affects the demand. For example, the price of food crops increase under scenario-II by 0.5, but by 0.4 under scenario-II.

Table 5.4. Impact of a 20 percent food aid cut converted into cash equivalent (percentage change over the base values)

	Base values	Scenario -II
Price effects:		
Food crops	1.0	0.50
Traditional agricultural exports	1.0	0.10
Non-traditional agricultural exports	1.0	-0.20
Other agricultural exports	1.0	-0.30
Agro-industrial product	1.0	0.10
Other industrial products	1.0	0.20
Public goods services	1.0	-0.10
Other services	1.0	0.20

Source: Model simulation

With regard to commodity output effects of scenario II, we see that the outputs of most commodity groups increase from the base values as well as from scenario-I, though very slightly (Table 5.5). This means that scenario-II would have better expansionary effects on most agricultural and non-agricultural sectors in contrast to scenario-I due to price effect. For example, food-crops output increase by 0.54 percent because relatively higher food crops prices provide incentives for increase in food crops output. Thus, in addition to demand side effect direct cash transfer also affect the supply side of the markets particularly food market.

Table 5.5. Impact of a 20 percent reduction in food aid converted into cash transfer on commodity outputs (percentage change over the base values)

	Base values	Scenario -II
Output effects:		
Food crops	15772	0.54
Traditional agricultural exports	13827	0.34
Non-traditional agricultural exports	2558	0.41
Other agricultural exports	2804	0.49
Agro-industrial products	6737	0.16
Other industrial products	15845	0.11
Public goods services	7203	0.00
Other services	24098	0.08

Source: Model simulation

Concerning households' welfare effects, Scenario II illustrates that farm households and wage-earners would experience improvements in their welfare from the base, entrepreneurs would encounter welfare declines but by smaller percentage points than in Scenario I. (Table 5.6). Private consumption of farm households and wage earners increased by 0.36 percent and 0.42 percent respectively, while private consumption of entrepreneurs declined by 0.24 percent.

Table 5.6 impact of 20 percent food aid cut replaced by cash transfer on private consumption by household groups

	Base values	Scenario-II (% change over base)
Welfare Effects:		
Farm household	31,968	0.36
Wage earners	7538	0.41
Entrepreneurs	5090	-0.24

Source: Model simulation

5.3 impacts of eliminating all in-kind emergency food aid (Scenario-III)

In this experiment abolition of in-kind food aid without any cash equivalent is simulated. Table 5.7 illustrates the price effects of the shock. As expected, the average price of food crops, the sector that encountered the policy shock, increased by 2.21 percent from the base value under scenario-III which is higher than the first two scenarios. With in agricultural commodities, the price of traditional agricultural exports (mainly livestock and livestock products, coffee, and chat) increased by 0.40 percent while the price of non-traditional agricultural exports (including tea, flowers, and fruits and vegetable) and other agricultural exports (forest and fisheries) decreased by 1.50 and 1.60 percent respectively.

With regard to prices of non-agricultural commodities, the prices of all products increase from the base values. Prices of agro-manufacturing products (processed food and beverages, textiles, leather products, wood products) increased by 0.1 percent, price of other industrial products (chemical products, non-metallic mineral products, metal products, electricity and water, construction, and mining and mining and quarrying) increased by 1.41 percent, public goods (education, health, public administration, and other related services) increased by 0.40 percent, and other services (primarily services, transport and communications, banking and insurance) increased by 1.10 percent

Table 5.7. Impact abolition of in-kind food aid on prices (percentage change over the base values)

	Base values	Scenario -II
Price effects:		
Food crops	1.0	2.21
Traditional agricultural exports	1.0	0.40
Non-traditional agricultural exports	1.0	-1.50
Other agricultural exports	1.0	-1.60
Agro-industrial products	1.0	0.10
Other industrial products	1.0	1.41
Public goods services	1.0	0.40
Other services	1.0	1.10

Source: Model simulation

Concerning commodity output effects of the shock, we see that the outputs of most commodity groups increase from the base value. This shows that food aid has disincentive effects to agricultural production and abolition of food aid would have expansionary effects on most agricultural as well as non-agricultural sectors. There is clear distinction in the output effects of abolition of food aid between agricultural and non-agricultural commodities. With negligible effects on the non-agricultural products but larger effects on the agricultural products. Table 5.8 reports the output effects of removal of food aid. Food-crop output increases by 2.18 percent, which is higher than the first two scenarios.

Table 5.8. Impact of removal of all in-kind emergency food aid on commodity outputs (percentage change over the base values)

	Base values	Scenario -III
Output effects:		
Food crops	15772	2.18
Traditional agricultural exports	13827	1.80
Non-traditional agricultural exports	2558	1.96
Other agricultural exports	2804	1.99
Agro-industrial products	6737	-0.34
Other industrial products	15845	0.37
Public goods services	7203	0.00
Other services	24098	0.56

Source: Model simulation

In terms of households' welfare, changes are similar to the second scenario, but the magnitudes are different. Farm households benefits more, wage earners benefit less, while entrepreneurs are more negatively affected. Private consumption increases for farm household and wage earners by 1.3 percent and 0.17 percent respectively. Entrepreneurs are badly hit (experience a decline in consumption of 6.18 percent)(Table 5.9). This justifies that entrepreneurs are the only household that benefit from in-kind food aid because they are net buyers of food.

Table 5.9 impact of abolition of all in-kind emergency food aid on private consumption by household groups

	Base values	**Scenario-III (% change over base)**
Welfare Effects:		
Farm household	31,968	1.30
Wage earners	7538	0.17
Entrepreneurs	5090	-6.18

Source: Model simulation

5.4 impact of all in-kind food aid converted into cash. (Scenario-IV)

This simulation looks at the effects of all in-kind food aid converted into cash. Table 5.10 illustrates the impacts on prices. When food aid in the form of cash appears as in scenario-IV, the effect is to increase slightly the price of food crops relative to scenario-III. The price of food crops, which rises by 2.66 percent in scenario IV, but by 2.21 percent in scenario-III. The main reason for this is that cash aid would increase demand in food markets since food crops represent larger share of household consumption expenditure.

Table 5.10 Impact of all in-kind food aid converted into cash equivalent on prices (percentage change over the base values)

	Base values	Scenario -IV
Price effects:		
Food crops	1.0	2.61
Traditional agricultural exports	1.0	0.49
Non-traditional agricultural exports	1.0	-0.60
Other agricultural exports	1.0	-1.30
Agro-industrial products	1.0	0.60
Other industrial products	1.0	1.10
Public goods services	1.0	-0.30
Other services	1.0	0.91

Source: Model simulation

Table 5.11 reports the output effects of the shock. In this case, the outputs of most commodity groups increase from the base value as well as from scenario-III. Relatively higher prices lead to increase commodities output.

Table 5.11 Impact of direct cash equivalent transfer instead of in-kind emergency food aid on commodity outputs (percentage change over the base values)

	Base values	Scenario -IV
Output effects:		
Food crops	15772	2.66
Traditional agricultural exports	13827	1.66
Non-traditional agricultural exports	2558	2.07
Other agricultural exports	2804	2.67
Agro-industrial products	6737	0.81
Other industrial products	15845	0.51
Public goods services	7203	0.00
Other services	24098	0.39

Source: Model simulation

Table 4 shows the welfare impacts of the shock. When in-kind food aid is replaced by cash aid, the welfare of all household groups improves. Farm households and Wage earners would benefit most, with their private consumption increase from the base value by 1.82

and 2.37 percent respectively. Entrepreneurs experience a welfare deterioration compare to base value but much better than scenario-III.

Table 5.12 impact direct cash equivalent transfer instead of all in-kind emergency food aid on private consumption by household groups

	Base values	Scenario-IV (% change over base)
Welfare Effects:		
Farm household	31968	1.82
Wage earners	7538	2.37
Entrepreneurs	5090	-1.09

Source: Model simulation

CHAPTER SIX

6. CONSLUSIONS AND POLICY IMPLICATIONS

Food aid has been a usual practice now for over three decades in Ethiopia. The major evens that cause the food aid responses from donors and humanitarian agencies are sever famines triggered by frequent drought. The average food aid during the last fifteen years reached about 700,000 metric tones per annum.

Food aid arrives in Ethiopia usually in-kind and takes two forms: emergency and project. Out of the total food aid to Ethiopia in 2006, 91 percent was in the form of emergency and 9 percent in the form of project food aid. But there recently there has been a switch from in-kind food aid to cash aid in Ethiopia.

There has been a progressive shift away from direct transfer to local purchases in Ethiopia although direct shipment still dominates overall sources of procurement in the country. According to world food program data in 2006, 71.4 percent of food aid to Ethiopia was direct transfer, 25 percent though local purchases and 4 percent though triangular purchases.

System wide effects of food aid acknowledged in the literatures. How ever, several studies analyzed the impacts of food aid by using partial equilibrium models.

This paper has analyzed the impact of four different food aid shocks on production, prices and welfare on different household groups in Ethiopia, using a computable general equilibrium (CGE) model and a social accounting matrix constructed for Ethiopia. The researcher simulated the impact of (i) a 20 percent decline in in-kind food aid, (ii) a 20 percent in-kind food aid cut replaced by direct cash transfer equivalent, (iii) abolishment of in-kind emergency food aid, and (iv) all in-kind emergency food aid converted into direct cash transfer equivalent.

The results suggest that food aid has weak disincentive effects on food crops production. The simulation of the partial as well as the full shift from in-kind emergency food aid to direct cash transfer equivalent has positive but not large effects on food crops price. Moreover, direct cash transfer has expansionary effects on local agricultural production.

Concerning welfare effects different distribution methods have distinct impacts on households' welfare. Compared with in-kind food aid, direct cash transfer to households benefit farm households and wage earners while entrepreneurs adversely affected. However, the combination of in-kind food aid and direct cash transfer minimizes the welfare loss by entrepreneurs.

The result indicates that government and donors coordinate. Meaning harmonize, food aid inflow- Low inflow during good harvest period and high inflow during bad harvest period. It may also indicate that the use of in-kind food aid should be limited to situations of local food shortage and/or non-functioning local food markets. In other situations, food aid should be provided in cash form, to purchase food locally or regionally. When aid is provided as direct cash transfers to recipients for the local purchase of food, it stimulates the development of local markets and enables internal trading between surplus and deficit localities. Moreover, producers get incentives to produce more.

REFERECES

Abdulai, A.,Barrett,C.B. and Hoddinott, J.(2005) Does food aid really have disincentive effects? New evidence from sub-Saharan Africa. Forthcoming in world Development.

Arndt, C. and Tarp, F. (2001). Who gets the goods? A general Equilibrium perspective on food aid in Mozambique. Food Plicy, 26:107-119.

Awokuse,T.O. (2006). Assessing the impact of food aid on recipient countries: A survey. ESA Working Paper No. 06-11.

Bandara, J.S (2002). Computable general equilibrium models for development policy analysis. Journal of Economic Survey Vol. 5 No.1.

Barrett,C.B and Maxwell,D.G(2005).Food aid after fifty years : recasting its role. New York, USA, Routleledge.

Bezuneh, M., Deaton, B., and Zuhair S. (2003) Food Aid Disincentives: the Tunisian Experience, Review of Development Economics, 7(4): 609-621.

Dorosh,P.,Shahabuddin,Q.,Abdul aziz.M and Farid.N.(2002) bumper crops, producer incentives and persistent poverty: implications for food aid programs in Bangladesh MSSD Discussion Paper No. 43.

Ethiopian Economic Association/Ethiopian Economy Policy Research Institute (EEA/EEPRI). (2005). Report on Ethiopian Economy. Vol. IV 2004/2005, Addis Ababa, Ethiopia.

Ethiopian Economic Association/Ethiopian Economy Policy Research Institute (EEA/EEPRI). (2006). Report on Ethiopian Economy Vol. V 2005/2006, Addis Ababa, Ethiopia.

FAO. (2006). The state of food and agriculture, food aid for food security. FAO series No.37.

FAO/WFP(2006). Special Report:FAO/WFP Crop and Food Supply Assessement Mission to Ethiopia. FAO Global Information and Early Warning System on Food and Agriculture and World Food Program. Available on World Wide Web; http://www.fao.org/docrep/008/j7071e/j7071e00.htm#1.

Gabre-Madhin,E. and Mezgebou,T.(2006). Price and volatility in the Ethiopian grain market, Addis Ababa, Ethiopia.

Gelan, A. (2006). Cash or food aid? A general equilibrium analysis for Ethiopia, Development Review, 24(5): 601-624.

Isenman,P.J and Singer,H.W(1977). Food aid: Disincentive effects and their policy implications . Economic Development and Cultural Change, 26:205-237.

Lavy,V.(1990). Does food aid depress food production? The disincentive dilemma in African context. Working paper No.1406. Washington, DC, World Bank.

Lowder,S.(2004). A Post-Schultzian view of food aid, trade and developing country cereal production: A panel data analysis. Ph.D. Dissertation University of Ohio.

Löfgren, H., Harris, R .L., and Robinson, S. (2002). A Standard Computable General Equilibrium (CGE) Model in GAMS', *Microcomputers in Policy Research* 5.

Mann.J.S (1967). The impact of PL 480 imports on prices and domestic supply of cereals in India. Journal of Farm Economics,49(1967):131-146.

Mahran,H.A.(1996) A computable general equilibrium model for policy analysis: calibration And application for the Sudan. Work in progress. University of Gesira, Sudan.

Maunder,N.(2006). The impact of food aid on grain markets in southern Africa: implications for tackling chronic vulnerability.

Kebede, E. (2006). Moving form Emergency Food Aid to Predictable cash Transfer: Recent Experience in Ethiopia, Development Policy Review, 24(5):579-599

Levinsohn, J. and McMilillan, M.(2004). Does Food Aid harm the Poor? Household Evidence from Ethiopia Discussion Paper No. 526 Research Seminar in International Economics.

Oxfam Briefing paper (2005) Food aid or hidden dumping? Separating wheat from chaff.

Sadoulet,E. and Janvry A.D (1992) Agricultural Trade Liberalization and Low Income Countries : A General Equilibrium – Multi-market Approach, American Journal of agricultural economics. 74(2): 268-280.

Shultz .T.W. (1960). Value of US Farm Surplus on Underdeveloped Countries, Journal of Farm Economics XLII (5): 1019-1030.

Taffesse, A.S and Ferede, T. (2004). The structure of the Ethiopian economy: A SAM-based characterization.

_____**(2004).** Quantitative framework for public investment policies in Ethiopia. Ethiopia Country Economic Memorandum. Background Paper.

Yamino,T., Jayne,T., and Strauss,J.(2000). Does Food Aid affect Crop Marketing? Evidence form Rural Ethiopia.

Von Broun,J (2003). Berlin statement on food aid. Closing statement of the conference, policies against hunger II: defining the role of food aid, 2-4 September 2003(available at http://food aid.zadi.de/index_en.html).

Declaration

I, The undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university, and that all sources of materials used for thesis have been duly acknowledged.

Declared by:

Name: Sherafudin Kedir

Signature

Date

Confirmed By Advisor

Name: Dr. Syed Hasan Qayed

Signature

Date 22-11-2007

TRACING THE IMPACT OF THE IMPACTS OF FOOD AID ON AGRICULTURE AND CONSUMERS IN ETHIOPIA: A COMPUTABLE GENERAL EQUILIBRIUM (CGE) MODEL APPROACH

BY

SHEREFEDIN KEDIR

A thesis submitted to the School of Graduate Studies of Addis Ababa University in partial fulfillment of the requirements for the Degree Of Master Of Science in Economics

(Economic Policy Analysis)

JULY, 2007

Addis Ababa