EFFECTS OF FOOD AID ON HOUSEHOLD CONSUMPTION AND MARKETED PRODUCTION: THE CASE OF MAIZE IN NORTHERN UGANDA

BY

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DECLARATION

I, OROMA LAWRENCE HEREBY DECLARE THAT THE FINDINGS OF THIS MASTER IN AGRICULTURAL AND APPLIED ECONOMICS (MAAE) THESIS WORK IS MY ORIGINAL WORK AND HAS NOT BEEN SUBMITTED FOR A DEGREE IN MAKERERE UNIVERSITY OR ANY OTHER UNIVERSITY.

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DEDICATION

To my family and all Internally Displaced Persons (IDPs) in Northern and North-Eastern Uganda who have endured deplorable living conditions for decades in their homeland.

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LIST OF ACRONYMS

ACDI/VOCA: Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance

CMAAE : Collaborative Master in Agricultural and Applied Economics

DRC : The Democratic Republic of Congo

DDP : District Development Plan

EVIs : Extremely Vulnerable Individuals

FAO : Food and Agriculture Organization of the United Nations

FAOSTAT : Statistical Database of Food and Agriculture Organization of the United Nations

FFT : Food for Training

FFW: Food for Work

GDP : Gross Domestic Product

GFD : General Food Distribution

ICRC : International Committee of the Red Cross

IDPs : Internally Displaced Persons

IHS : Inverse Hyperbolic Transformation

IMR : Inverse Mill's Ratio

INGOs : International Non-Governmental Organizations

INTERFAIS : International Food Aid Information System of the United Nation's World Food Program

IOM : International Organization for Migration

LM : Lagrange Multiplier

LRA : Lord's Resistance Army Rebel Group

MAAE : Master in Agricultural and Applied Economics

MAAIF : Ministry of Agriculture, Animal Industry and Fisheries, Government of Uganda

MCHN : Maternal, Child Health and Nutrition

MFPED : Ministry of Finance, Planning and Economic Development, Government of Uganda

MPC : Marginal Propensity to Consume

MLE : Maximum Likelihood Estimation

MOH : Ministry of Health , Government of Uganda

ODI : Overseas Development Institute

OLS : Ordinary Least squares Estimation

STATA : Statistics and Data

TASO : The Aids Support Organization

UBOS : Uganda Bureau of Statistics

UN : United Nations

UNDP : United Nations Development Program

UNHCR : United Nations High Commission for Refugees

UNICEF : United Nations Children's Fund

USAID : United States Agency for International Development

WFP : World Food Programme of the United Nations

ABSTRACT

The Northern Uganda conflict led to internal displacement which reduced agricultural production, caused food insecurity and high malnutrition. In 1997 the World Food Programme (WFP) started providing food aid to the internally displaced persons (IDPs) in Gulu, Kitgum and Pader districts of Northern Uganda. At that time there were 450,000 IDPs (Das and Nkutu, 2008). In 2007, WFP distributed food to 458,000 IDPs in 92 camps and transit sites in Gulu and Amuru districts alone, and in 2008, a total of 755,000 IDPs were still receiving monthly food assistance in Amuru, Gulu, Kitgum and Pader districts (Das and Nkutu, 2008). Maize has been one of the major grains distributed as food aid by the WFP and other agencies to the IDPs in Northern Uganda. Total food aid deliveries to Uganda more than tripled from 87,700 metric tons in 1998 to about 278,400 metric tons in 2007, with much of the deliveries going to Northern and North-Eastern Uganda. Cereals form the bulk of food aid shipments into Uganda.

Food aid has been contentious globally because of its perceived disincentive effects on agricultural development in recipient countries. Some authorities argue that food aid contributes to economic development and protects basic human rights, where the aid fills a severe food gap. While others assert that food aid undermines food production, market development, and international trade and therefore impedes economic development and human rights in recipient countries. Empirical evidence on the impact of food aid in recipient countries is lacking and is often contradictory (Barrett, 2006). There is limited empirical work done in Uganda to demonstrate the effects of food aid on household consumption and marketing, yet approximately 10% of Uganda's population depends on food aid (WFP, 2005).

Targeted project food aid interventions for food security programming are ongoing in Northern, North-Eastern and other parts of Uganda. Policy makers and development practitioners need to understand the effects of food aid on household food consumption and marketed production.

Maize is the commodity of choice in this study because it has been one of the major grains distributed as food aid to the IDPs in Northern Uganda. The objectives of this study were to examine the effects of in-kind food aid on consumption and marketed production amongst recipient households. Accordingly, the hypotheses tested with respect to the study objectives are that food aid decreases household expenditure on food and food aid has a negative effect on marketed production. 150 households were interviewed in Amuru and Gulu districts in 2008. The results indicate that an increase in the amount of food aid given to a household reduces both the likelihood of purchasing maize and the amount of money a household spends on maize consumption. In addition, households that receive food aid have higher maize consumption expenditures than households that do not receive food aid. Food aid helps vulnerable households increase consumption of much needed nutrients found in maize. However, as the amount of maize received as food aid increases, the probability that vulnerable households will sell off the 'excess' maize increases as they try to meet other household needs.

The results have implications for food assistance programs that target vulnerable households with in-kind food transfers. These programs probably need to be designed to combine in-kind food with cash or other essential household non-food items.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Uganda is a landlocked country in Eastern Africa lying 1º00´ north of the Equator and 32º00´ east of Greenwich. It is bordered by the Sudan on the north, Tanzania and Rwanda on the south, Kenya on the east, and the Democratic Republic of Congo on the west. The country has a total land area of 241,039 square kilometers, over 75% of which is arable land and 18% comprises of inland waters and wetlands (UNDP, 2007). Uganda has a very high population growth rate of 3.2% per year, higher than the Sub-Saharan Africa average of 2.4% (UNDP, 2007and UBOS, 2006). According to UNDP (2007), the midyear (2007) population projection for Uganda was 28.2 million, of which 87% are rural dwellers and 73% are engaged in agriculture. The high population growth rate is attributed to high fertility rate, low prevalence of family planning, high influx of refugees and young marriage age (18 years) for women (UNDP, 2007 and UBOS, 2006). Uganda's climate is moderated by high altitude in many parts of the country. Average temperatures range from about 16°C in the southwest to 25°C in the northwest; but often exceed 30°C in the northeast. Most parts of Uganda receive over 1,000mm of annual rainfall and have two cropping seasons in a year. Drier parts of the country receive 600mm to 900mm of annual rainfall, and are predisposed to dry spells, which occasionally disrupt agricultural activities (UNDP, 2007). The favourable climate with generally fertile soils offers enormous potential for agriculture in the country.

1.2 Uganda's Agriculture Sector

The agricultural sector accounts for 32% of gross domestic product (GDP), 73% of employment, and 85% of export earnings and provides raw materials for the agro-industries (UNDP, 2007 and UBOS, 2006). Over 70% of the agricultural sector output comes from smallholders; cultivating less than 2 hectares of land (UBOS, 2007). Sub-sectors under Uganda's agricultural sector include: food crops contributing 71% of the agricultural GDP, livestock 17%, cash crops 5%, fishing 4%, and forestry 3% (Baffoe, 2000). The major food crops are bananas, cereals, root crops, pulses, and oilseeds (sesame, groundnuts and sunflowers). Uganda's agriculture is rain fed with limited use of improved technologies, agro chemicals and fertilizers to increase production and productivity.

Domestic food production is the main source of food supplies for Uganda's population. However, food production and productivity have continued to register declining growth in the recent past and population growth rates have superseded increases in food production. The crop yields have also remained below their 1970 levels (Obwona and Ssewanyana, 2005). Opolot and Kuteesa (2006) studied the impact of policy reforms on agriculture and poverty in Uganda and reported that Uganda's agricultural productivity and share to GDP has been declining consistently. Agricultural share to GDP reduced from approximately 40% in 2001/02 down to 35% in 2004/05, as a consequence of structural adjustment and due to unreliable weather pattern. The growth rate of food crops output in 2004/05 was estimated at –0.2% (MFPED, Background to the Budget 2005/06), far below the average population growth rate of 3.2% per annum and thus food deficit. Land fragmentation compounded by limited use of technology, post harvest loses, crop pests and diseases, poor road networks, limited agricultural research and extension

services, lack of credit, inefficient markets, bad weather, decreasing soil fertility, gender inequalities, heavy human disease burden and insecurity in the North and Eastern Uganda among other factors have constrained the performance of Uganda's agricultural sector (UNDP, 2007 and UBOS, 2008).

Uganda has the potential to produce adequate food for domestic consumption and export; however, over 50% of the population does not have access to sufficient food (Opolot and Kuteesa, 2006). Food shortages have been mitigated by commercial food imports and food aid. According to the United Nation's Food and Agriculture Organization (FAO), the overall share of food aid in total food consumption for Uganda is increasing. It declined slightly from 1.8% in 1990-92 to 1.6% in 1995-97 before rising almost exponentially to 4.3% in 2003-05[1]. Recurring drought in North-Eastern Uganda and internal displacement in the north increased the need for food aid. In Uganda, food aid is meant to alleviate temporary crises and ensure safe supplies for human consumption (MOH and MAAIF, 2003). Between 2005 and 2008, the World Food Programme (WFP) projected the need for 452,508 metric tons of food aid for its protracted relief and recovery operations in Northern and North-Eastern Uganda. Before 2002, the WFP provided for 30% of the kilocalorie needs of approximately 500,000 IDPs in Northern Uganda and by 2006 the United Nations agency provided food for 1.4 million IDPs, as these IDPs had limited access to land for food production due to insecurity (USAID, 2006).

[1] See FAOSTAT

1.3 Internal Displacement in Northern Uganda

The civilian population in the Acholi sub region of Northern Uganda endured deplorable conditions of insecurity following a protracted conflict between the Lord's Resistance Army (LRA) rebels and the Government of Uganda. In 1996 the Government of Uganda set up internal displaced persons (IDP) camps near the Government military bases all over Northern Uganda to protect the civilian population of nearly two million people relocated to IDP camps (See Appendix III). By the time of this study in 2008, many IDP camps were still in place. According to Das and Nkutu (2008), in June 2007, about 63% of the IDP population in Amuru, Gulu, Kitgum and Pader districts remained in the IDP camps while 34% had moved to transit camps and 3% resettled in their original villages. In 2008, camp populations substantially reduced, with an estimated 23% of the 2005 Gulu camp residents moved out either to transit camps, nearer to their original villages or to their original villages.

Internal displacement reduced agricultural production, caused food insecurity and high malnutrition among children less than 5 years throughout Northern Uganda. According to the UNPD (2008), 88% of IDPs reported farming in 2007, with the figure rising up to 92% among the resettled communities. Many gardens cultivated were rented or borrowed. Commuting between IDP camps and gardens was a strategy used throughout the conflict period, and has become an important phenomenon during IDP return and resettlement process.

In 1997 the World Food Programmed (WFP) started providing food aid to the displaced civilian population in Gulu [Amuru], Kitgum and Pader districts of Northern Uganda. At that time there were 450,000 IDPs (Das and Nkutu, 2008). In 2007, WFP distributed food to 458,000 IDPs in 92

camps and transit sites in Gulu and Amuru districts alone, and in 2008, a total of 755,000 IDPs were still receiving monthly food assistance in Amuru, Gulu, Kitgum and Pader districts (Das and Nkutu, 2008). Total food aid deliveries to Uganda increased from 87,700 metric tons in 1998 to about 278,400 metric tons in 2007, with much of the deliveries going to northern and northeastern Uganda (WFP-INTERFAIS, 2008). The major donors of food aid to Uganda have been the US, UK, EU, Canada, Norway, Netherlands and Denmark. Cereals (maize, wheat, rice, coarse grains) form the bulk of food aid shipments to Uganda.

Traditionally, cereals, root and tubers, legumes, vegetables, fruits, meats and seasonal delicacies such as white ants make up the dietary system in Northern Uganda (Das and Nkutu, 2008). With subsequent food aid interventions by WFP and International Non-governmental organizations (INGOs) agencies; such as ACDI/VOCA, Catholic Relief Services, Save the Children, Mercy Corps and World Vision, the diet systems of the local population greatly changed from a rich and diverse diet, to calculated food rations that include mainly maize, sorghum, beans, peas and vegetable oil enriched with Vitamin A. According to Das and Nkutu (2008), until 2005 majority of food aid recipients got 70-100% rations depending on their ability to compliment the food aid with food items from their own sources. However, the rations were reduced to 40-60% for the non-extremely vulnerable individuals and kept at 98-100% for the extremely vulnerable individuals (EVIs) in Gulu and Amuru districts with effect from 2006. The recipients were expected to secure the remaining food gap from their own sources.

1.4 Trend of Food Aid Shipment into Uganda

The importation of food aid (cereals in grain equivalent) into Uganda more than tripled between 1998 and 2007, with much of the deliveries going to northern and north-eastern Uganda (WFP-INTERFAIS, 2008). Total food aid deliveries to Uganda increased from 87,700 metric tons in 1998 and peaked at 292,600 metric tons in 2005 before dropping slightly to 278,400 metric tons in 2007. The major donor of food aid to Uganda has been the US Government; other donors include the United Kingdom, European Commission, Canada, Norway, Netherlands and Denmark. The US food deliveries were at least 40% of total food aid deliveries to Uganda in 2007. United Kingdom and the European Commission food aid donations to Uganda are also considerable (WFP-INTERFAIS, 2008). Cereals (maize, wheat and rice) constitute over 80% of food aid shipments into Uganda. The non-cereals (pulses, oils and fats and meat and fish) form a smaller proportion (approximately 20 %) of food aid to Uganda (WFP INTERFAIS, 2008).

1.5 Problem Statement

Food aid has been contentious internationally because of its perceived disincentive effects on agricultural development in recipient countries. Barrett and Maxwell (2005) posit that food aid contributes to economic development and protects basic human rights, where the aid fills a severe food gap. Abdulai *et al.* (2004) assert that food aid undermines food production, market development, and international trade and therefore impedes economic development and human rights in recipient countries. Donor countries have used food aid to meet multiple objectives such as trade promotion, surplus disposal and humanitarian goals among others. These often resulted in ineffectiveness of food aid as a policy instrument (Barrett and Maxwell, 2005). The objectives

of the US food aid are to expand international trade and export markets for their food commodities, which may undermine humanitarian assistance aim (Barrett and Maxwell, 2005). Empirical evidence on the impact of food aid in recipient countries is lacking and is often contradictory (Barrett, 2006). However, previous studies used macro level approaches to examine the impacts of food aid on agricultural production in recipient countries. Findings of these studies are mixed and may not be generalized for application in country specific situations. There is limited empirical work done in Uganda to demonstrate the effects of food aid on household consumption and marketing.

The food crop sub sector of the agricultural sector is vital in ensuring national food security and foreign exchange earnings for Uganda's economy. According to the United Nation's Food and Agriculture Organization (FAO), the overall share of food aid in total food consumption for Uganda is increasing. It declined slightly from 1.8% in 1990-92 to 1.6% in 1995-97 before rising almost exponentially to 4.3% in 2003-05[2] and approximately 10% of Uganda's population depend on food aid (WFP, 2005). Targeted project food aid interventions for food security programming are ongoing in northern and north-eastern Uganda. Policy makers and development practitioners need to understand the effects of food aid on household food consumption and marketed production. This study examines these effects in Amuru and Gulu districts of Northern Uganda. The issues to be addressed include the fact that there is a need to balance the aid in the form of in-kind food transfers and non-food items to supplement food aid.

[2] See FAOSTAT

1.6 General Objective

The general objective of the study is to assess the effects of food aid on household consumption and marketed production in Northern Uganda.

1.6.1 Specific Objectives

Specifically the study addresses the following objectives:

i. To assess the influence of food aid on household consumption expenditure on food

ii. To assess the influence of food aid on marketed production

1.7 Hypotheses Tested

Accordingly, the following hypotheses were tested with respect to the above two specific objectives:

i. Food aid decreases household expenditure on food

ii. Food aid has a negative effect on marketed production

1.8 Outline of the Thesis

The thesis consists of five chapters. The first chapter gives general background information on Uganda. It also describes the agricultural sector, internal displacement in northern Uganda, trend of food aid shipment into Uganda and defines the problem statement, study objectives, hypotheses to be tested, methodology, scope and justification of the study. The second chapter reviews the literature on origin, definition and types of food aid, impacts of food aid on consumption and market-commodity prices and sales. Chapter three presents the field and analytical methodology used to analyze the effects of food aid on household food consumption

and marketed surplus in northern Uganda including a description of the study area, sampling, data collection and analysis techniques. The results of the study, and associated interpretations, discussions and implications are provided in chapter four. Chapter five presents the conclusion and recommendations of the study and finally, data collection tools used in this study, STATA regression outputs and maps of study districts are provided in the appendices.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Origin of Food Aid

Contemporary food aid originated in the 1950s when agricultural surpluses from the developed countries, mainly United States of America and Canada were disposed to meet food security objectives of recipient countries in developing countries (Schultz, 1960).

2.2 Definitions of Food Aid

Several definitions of food aid have been put forward. Barrett and Maxwell (2005) defined food aid as foreign assistance involving international sourcing of concessional (either free or at a cost lower than the market price of the food commodity in question) resources in the form or for the provision of food. Murphy and McAfee (2005) in their review of the US food aid, stress that food aid must cross at least one international border, thus food assistance by a government or private organization to local citizens does not constitute food aid. They further argue that food aid must be provided to the recipients on concessional terms and that food aid can either be in form of food, cash or alternative commodities to be exchanged for food.

Food and Agriculture Organization (FAO) of the United Nations asserts that food aid involves international transactions that result in provision of aid in form of food commodity in a country deemed in need of receiving such aid. Food aid interventions therefore involve procurement, balance of payment issue and distribution. According to the Overseas Development Institute (ODI) (2000), food aid may be defined as "commodity aid that is used either to support food assistance actions or to fund development more generally, by providing balance of payments

support in substituting for commercial imports, or budgetary support through the counterpart funds generated from sales revenue".

Food aid may be categorized by use as emergency, project and program aid. The FAO's definition has been adopted for the purpose of this study because of its appropriateness to food aid programming in Uganda.

2.3 Types and Uses of Food Aid

According to Barret (2005), food aid may be categorized by use as emergency, project and program aid. Emergency food aid is provided free to people in crises resulting from conflicts, droughts or floods etc. Project food aid is provided on a grant basis, mostly to address food security, maternal child health and nutrition related activities. Project food aid is mainly delivered through multilateral agencies (mainly WFP and others include United Nations High Commission for Refugees (UNHCR), United Nations Children's Fund (UNIICEF), International Organization for Migration (IOM) and International Committee of the Red Cross (ICRC)) or through international non-government organizations (INGOs). Program food aid refers to the transfer of food commodities from one government to another as a form of economic support. Originally program food aid was designed and used to dispose-off commodity surpluses in donor countries that could not find a commercial market. In 2007, emergency aid accounted for over 86.4% of all food aid activities in Uganda. Emergency food aid needs in Uganda grew between 1999 and 2007 (USAID, 2006). In 2007, according to WFP (2008), project food aid accounted for 13.5% of total food aid that year. Uganda received 132 metric tons of program food aid, accounting for 0.05% of all food aid receipts the same year (WFP INTERFAIS, 2008).

Generally food aid is used in humanitarian emergencies to protect human life, nutritional status, safety nets and protect livelihood assets. In this case general food distribution (GFD) is conducted over a defined period for targeted recipient households. Food aid is often used to address development objectives (food aid for development). Food aid is used in supplemental feeding for maternal and child health (supplementary feeding) programs. In food for education programs (FFE) food aid is used in food insecure communities to protect nutritional status of targeted children, enhance learning and cognitive development and to create and maintain incentives for children to attend classes through the provision of food rations to school children. Food for work (FFW) activities harnesses the labour of targeted households to build or maintain production assets by creating public employment. Food for training (FFT) is the use of food aid as incentive to induce targeted beneficiaries to participate in agricultural training etc.

2.4 Effects of Food Aid on Consumption

Among others, food aid can play a critical role in increasing food consumption (Dayton and Hoddinott, 2004). Bezuneh and Deaton (1997) studied the impacts of food aid on safety nets in developing and less developed countries. The study reported significant increase in total household food consumption in the Rift Valley Province of Kenya, where households participating in food for work activities consumed 16% more protein, 26% more calories and 42% more fat than the non-participating households. At the farm level they observed significant nutritional gains experienced by households participating in food for work activities and attributed these nutritional gains to additional household income generated through food for work that is directed into additional consumption. Bezuneh and Deaton (1997) posit that the income elasticity of demand for food among the food for work participants is higher when

income is provided in form of food. They found that more food received as wages through food for work was consumed compared to the quantity of purchased food that would have been consumed. The analysis of food for work in Kenya's Rift Valley Province found income elasticity of demand for protein of 0.239 and 0.137 for participants and non-participants respectively.

Gilligan and Hoddinott (2006) investigated whether food aid transfers play a safety net role by reducing vulnerability and protecting productive assets by assessing the impacts of food for work and free food distribution programs in Ethiopia. The study finds a significant effect of food for work on growth in consumption and food consumption (in per adult equivalent terms) and a significant reduction in perceived famine risks by food for work beneficiaries, while famine risks increased for non-beneficiaries. The free food distribution program also had a significant average impact on growth in food consumption, but a negative impact on famine risks. Barrett *et al* (2001) reported that elders in Northern Kenya perceive that recipient households consume 50-80% of grain food aid as food; the 20-50% balance is used as seed, animal feed or for local brew.

Del Ninno and Dorosh (2002) examined the impact of wheat transfers (through food for education, vulnerable group development, and vulnerable group feeding) and cash incomes on wheat consumption and wheat markets in Bangladesh. Using propensity score-matching techniques, they find that total average marginal propensity to consume (MPC) for wheat is 0.33, ranging from zero for food for work to 0.51 for food for education. Their study indicates that the MPC for small wheat transfers to poor households is approximately 0.25, while the MPC for

wheat out of cash income is near zero. This increase in demand for wheat reduces the potential price effect of food aid involving small rations by about 30%.

According to Barrett (2006) in a background paper for FAO's State of Food and Agriculture, one of the motivating factors of delivering food aid by donors is to stimulate demand for foods which recipients are not familiar to and or which represent small share of recipient diet system. This is part of a bigger export promotion plan, which involves changing consumer preferences by introducing new food commodities. Delivery of food aid into the Sahel Region of West Africa during the food crises of 1970s and 1980s were believed to stimulate a shift in consumer demand from indigenous millet and sorghum to wheat and rice. However, some of these efforts produce unintended results as reported by Barrett (2006) that food aid that is relatively inappropriate to local uses can distort consumption patterns. The introduction of maize to pastoralists with a strong preference for meat and milk in Western Kenya resulted into increased consumption of local brew made from grain food aid, which increased availability of distilling raw materials cheaply.

2.5 Effect of Food Aid on Prices

Barrett and Maxwell (2005) refer to Mozambique, Russia and Somalia experiences where food aid shipments into these countries caused domestic food prices to decrease below ex ante prices. They argue that the extent of price decrease is determined by proper targeting. Correspondingly, Gabre-Mahdin *et al.* (2003) studied the technological change and price effects in agriculture in Africa and Asia and concluded that food aid usually exerts negative pressure on food prices, with that pressure greatest in food aid interventions where targeting is poor. A study by Tschirley *et al*

(1996) in Mozambique revealed the negative price effects of maize delivered as program food aid on domestically produced maize.

Levisohn and McMillan (2004), using constant-elasticity demand and supply functions, estimated supply and demand for wheat for 1999 in Ethiopia to assess the impact of an increase in the price of wheat that would result if there were no food aid. They 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. Winahyu and Acaye (2005) showed that the price impacts of the post tsunami emergency food aid in Ache were short-term and restricted. Lind and Jalleta (2005) reported that grain prices fell during distributions of food aid in Ethiopia, but stabilized to pre-distribution levels within a few weeks.

Maunder (2006) reviewed the impact of food aid on grain markets in Southern Africa. The study argues that price control instruments are fundamental for protecting food access and welfare for the poor who are the primary beneficiaries of lower food prices. This is because a dilemma exists between maintaining price incentives for food producers and making food for consumption affordable to the poor who are net food buyers. The review argues that timing of food aid shipments and the quantity of food aid delivered are vital factors in food aid programming. Delayed food aid deliveries, as a result of lag in response time and transportation of aid commodities from donor countries to recipient countries, often cause price decreases (Maunder, 2006).

2.6 Effect of Food Aid on Food Imports

Lowder (2004) examined food aid data provided by the World Food Programme, per capita cereal production and import data provided by Food and Agriculture Organization for 64 countries; covering 12 years (1988–2000) using a vector auto regression, studied the relationships among targeted food aid, program food aid, imports and production. The study finds that food aid (both targeted and program food aid) result in import displacement in recipient countries and the degree of import displacement is greater for program food aid compared to targeted food aid.

Barrett (1999) applied vector auto regression methods to data from 18 countries over 34 years period (1961-1995) to study the dynamic effects of food aid and found that food aid has a pronounced J-curve effect on recipient country per capita commercial food imports, but only negligible negative effects on recipient country per capita food production. Abbott *et al* (1983) assessed potential welfare losses due to tied food aid and report that food aid recipients incur cost to meet donor conditions, which can exceed the primary aid benefit. They posit that the likelihood that welfare losses can occur is determined by the extent to which consumption, production or importation is driven from optimality, the magnitude of the grant component of food aid and the extent of distribution of food aid to food producers relative to their loss in marketed surplus.

2.7 Effects of Food Aid on Household Food Sale

Yamano *et al* (2000) used household models to examine the effects of free distribution and food for work programs on crop marketing behavior in Ethiopia. They estimated gross sales and

purchases of wheat and other crops with instrumental variable models to determine the effects of food aid on crop marketing empirically. The findings show that households who participate in food for work reduced purchases of wheat from the market. Receiving 10kgs of cereals after participating in food for work activities decreases wheat purchases by 6.9kgs among households who purchase some wheat (Yamano *et al,* 2000). The effects are smaller for free food aid programs and no significant effects of free distribution and food for work on sales of wheat and other cereals are revealed. The effects of food aid in emergency situations are often localized and transitory.

Food aid adds to food availability in recipient countries therefore reducing the gap between food demand and supply from domestic production, stocks and imports. Abdulai *et al* (2004) assessed the use of food aid for market development in Sub-Saharan Africa and posit that because food aid expands local food availability (supply), it needs to be well targeted to mitigate short-term capital and transport constraints to develop downstream marketing services (processing and distribution) in recipient countries.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Field Methods

3.1.1 Study Area

The criteria that influenced the choice of Amuru and Gulu districts (See Appendix II) for the study over other areas with ongoing food aid interventions in Uganda include continued food aid intervention alongside food security interventions by the governments and non-governmental organizations. Several social protection interventions supported by the Government of Uganda, multilateral agencies, and INGOs are ongoing in the two districts. The Government of Uganda is implementing the Northern Uganda Social Action Fund (NUSAF) and the Peace Recovery and Development Program (PRDP) in Northern Uganda. United Nation's FAO and the WFP are implementing various projects in Amuru and Gulu districts. The WFP is providing food aid through general food distribution, school feeding, maternal and child health and HIV/AIDS supplementary feeding. The objectives of the WFP's interventions are to contribute to household food security and maintain the minimum nutritional and dietary standard by providing food assistance to people in IDP camps in Northern Uganda, protect lives by providing humanitarian food assistance to IDPs to meet net food gap and safeguard the fundamental right to food for targeted IDPs with special emphasis on women and children, vulnerable persons (Das and Nkutu, 2008).

Located about 332 kilometers from Kampala city on coordinates: 02°45′N32°00′E, Gulu district is at the center of Northern Uganda. It is bordered by Amuru district in the west and north, Pader district in the east, Kitgum district in the north-east, Lira and Apac districts in the south-east. The

district covers an area of 3,449.08 square kilometers with a projected 2007 population of 343,100 people; 52% of whom are females and 48% males. Approximately 76% of the district's population lives in rural areas (Gulu DDP, 2007; Rwabogo and Kiribwije, 2005; Uganda Communication Commission, 2003). The district receives on average 1,500mm of rainfall per annum. The wet seasons begin in April through October with peaks in May, August to October. Over 90% of the population derives their livelihoods from agriculture, with emphasis on the production of finger millet, sorghum maize, upland rice, cassava, sweet potatoes, beans, groundnuts, sesame, pigeon peas, and cowpeas for food and tobacco, cotton, upland rice, sugar cane and sunflower for cash. However, the protracted insurgency in northern Uganda retarded social and economic development in the district. Over 60% of the people live in IDP camps by 2007, with minimal agricultural activities in the vicinity of the camps (Gulu DDP, 2007).

Amuru district is located 377 kilometers from Kampala via Gulu town on coordinates: 02°48′36″N31°56′24″. It is bordered by the Sudan in the north, Gulu district in the east, Kitgum district in the north-east, Masindi district in the south, Oyam district in the south-east, Adjumani district in the north-west, Nebbi district in the south-west and Arua district in the west (Uganda Communications Commission, 2008). The district has enormous potential for cross border trade with the Democratic Republic of Congo and Southern Sudan because of the great north road to Juba in Southern Sudan, the Karuma-Pakwach-Nebbi-Paidha- Democratic Republic of Congo road and the Karuma-Pakwach-Nebbi-Arua-DRC road, which pass through the Amuru district.

Amuru district covers an area of 9,022.28 square kilometers of very fertile arable land that makes approximately 90% of the total land area (Amuru DDP, 2007 and Uganda Communications

Commission, 2008). However, less than 1% of the land is utilized annually. The limited utilization of arable land in the district is partly attributed to the Northern Uganda conflict. Amuru district lies at an altitude of between 1,000m and 1,200m above sea level with an average annual rainfall of 1,500mm per annum and average maximum temperatures of 30^{o}C (Amuru DDP, 2007). The rainy season is April to October, with peaks in May and August to October. Agriculture is the main economic activity in the district with emphasis on the production of maize, finger millet, sorghum sweet potatoes, cassava, groundnuts, simsim, beans, peas and sunflowers for food and income generation (Amuru DDP, 2007). Agriculture crop production employs about 98% of the district population. It is estimated that 20% of farm families have been unable to produce due to displacement and the average household food production have therefore reduced during the last 20 years. The traditional cash crops are cotton and tobacco, but due to decreasing prices and limited access to markets, their production has declined rapidly in the last 25 years due to protracted war that resulted in massive internal displacement throughout Northern Uganda. (Amuru DDP, 2007 and Uganda Communications Commission, 2008)

3.1.2 Sampling

Two sub-counties, one each from Amuru and Gulu districts with corresponding parishes and villages where food aid programs are operational were selected purposively. For each parish or village the corresponding number of households was determined to constitute the sampling frame. Selection of households within the villages was done using lists provided by the camp leaders. Random sampling was done for households in each district that are non-recipients of food aid. Purposive sampling was done for food aid recipients and then followed by a random sample drawn for each district. A total sample size of 150 farmers was obtained with 75

respondents from each of the two districts of Amuru and Gulu. Seventy-five (75) of the respondents were non-recipients of food aid and the other 75 were those receiving food aid from the two districts.

3.1.3 Data Requirements and Data Collection

The study used both primary and secondary data sources. Household questionnaires were administered to collect primary data from sampled households. Key informant interviews and focus group discussions were also conducted to gather qualitative data to triangulate and enrich the quantitative household data. The primary data were on household demographic characteristics such as age, sex, level of education of household head, household size, land holding, use of variable inputs (such as seeds, tools and fertilizers); fixed inputs (land); and prices (for production inputs, wages and consumption), food aid. The study drew secondary data from INTERFAIS (International Food Aid Information System) of the WFP, FAOSTAT and reports, which contain data on food aid shipment and interventions in Uganda.

3.2 Analytical Methods

In this study maize is commodity of choice to be studied because it (maize) has been one of the major grains distributed as food aid by the WFP and other agencies to the IDPs in Northern Uganda.

3.2.1 Theoretical Estimation of Maize Consumption Expenditure Model

Maize is the commodity of choice in this study because it has been one of the major grains distributed as food aid to the IDPs in Northern Uganda. As in most expenditure data which is cross-sectional, zero consumption expenditure is one modeling issue that has to be addressed,

this is because for a given expenditure item the data collected includes individuals that did not purchase the item and thus have zero consumption expenditures. Due to the presence of sample observations with zero consumption expenditure, limited dependent techniques are used to estimate the consumption expenditure models. It has been argued that the determinants of the decision whether or not to spend on consumption of a food item are not necessarily the same as the determinants of how much to spend on consumption of a food item, in particular when we refer to a specific food, such as maize (Haines, Guilkey, and Popkin, 1988).

So ignoring this two-step decision process would lead to missing out on the true behavioral patterns, leading to erroneous results in the estimation process (Lanfranco, Ames and Huang, 2001). To address this problem several two-step decision models have been suggested and utilized, however, for most consumption studies the hurdle model or sometimes referred to as the double hurdle approach, originally formulated by Cragg (1971), has been used. In this approach it is assumed that the household must pass two hurdles before being observed with a positive level of consumption expenditure. The first being the participation decision – decision of whether to spend on consumption of the food item and the second being the expenditure decision on how much to spend. The precise form of the hurdle approach adopted then depends on the assumptions underlying the model which are, firstly, the assumption of the degree of independence or dependence between the error terms in the participation decision and expenditure decision equation, and secondly, the issue of dominance i.e. whether the decision of participation dominates the decision of expenditure (Jones, 1989; Madden, 2006). Following Jones (1989) the bivariate double hurdle model can be represents as follows:

Observed Expenditure $y = d.y^{**}$ (1)

Participation Equation $w = \mathbf{z}'\alpha + v$ (2)

$$d = \begin{cases} 1, \text{if } w > 0 \\ 0, \text{if } w \le 0 \end{cases}$$

Consumption Equation $y^* = \mathbf{x}'\beta + \mu$ (3)

$$y^{**} = \begin{cases} y^*, \text{if } y^* > 0 \\ 0, \text{ if } y^* \le 0 \end{cases}$$

where both hurdles d and y^{**} are assumed to linear in parameters (α, β) with the additive disturbance terms u and v randomly distributed with a bivariate normal distribution, and where $\mathbf{z}$ and $\mathbf{x}$ are the regressors that influence participation and expenditure. The likelihood function for the full double hurdle model with dependence between u and v, for the sample likelihood for the observed expenditure is

$$\begin{aligned} L0 &= \prod_0 [1 - p(d=1)\,p(y^* > 0 | d=1)] \prod_+ p(d=1)\,p(y^* > 0 | d=1)\,g(y^* | y^* > 0, d=1) \\ &= \prod_0 [1 - p(v > -\mathbf{z}'\alpha)\,p(\mu > -\mathbf{x}'\beta | v > -\mathbf{z}'\alpha)] \prod_+ p(v > -\mathbf{z}'\alpha)\,p(\mu > -\mathbf{x}'\beta | v > -\mathbf{z}'\alpha)\,g(y | \mu > -\mathbf{x}'\beta, | v > -\mathbf{z}'\alpha) \end{aligned}$$

(4)

where the sample is divided into those with zero expenditure (denoted 0) and those with positive expenditure (denoted +). The above expression involves the density and cumulative distribution functions of the truncated bivariate normal distribution and maximization of the likelihood. By placing restrictions on the joint distribution of u and v it is possible to decompose the likelihood function into models which are well established in the literature. Assuming that the u and v are independent the double hurdle model decomposes into the Cragg model (Cragg, 1971) with the likelihood function as

$$L1 = \prod_{0}[1 - p(v > -\mathbf{z}'\alpha)\,p(\mu > -\mathbf{x}'\beta)]\prod_{+} p(v > -\mathbf{z}'\alpha)\,p(\mu > -\mathbf{x}'\beta)g(y|\mu > -\mathbf{x}'\beta)$$
$$= \prod_{0}[1 - \Phi(\{\mathbf{z}'\alpha\}/\sigma_{v})\Phi(\{\mathbf{x}'\beta\}/\sigma_{u})]\prod_{+}\Phi(\{\mathbf{z}'\alpha\}/\sigma_{v})\Phi(\{\mathbf{x}'\beta\}/\sigma_{u})\prod_{+}[(1/\sigma_{u})\phi(\{y - \mathbf{x}'\beta\}/\sigma_{u})/\Phi(\{\mathbf{x}'\beta\}/\sigma_{u})])$$
(5)

where $\phi(.)$ and $\Phi(.)$ are the standard normal density and cumulative distribution functions. The third component of $L1$ is the truncated likelihood. An identical term appears in the likelihood of the standard Tobit model (Amemiya, 1986). This means that the Cragg model has the probit and truncated regression components, in other words, the standard Tobit model is nested within the Cragg model.

An alternative to the independence assumption is the assumption of first hurdle stochastic dominance. Here we assume that the participation decision dominates the expenditure decision, which implies that no individual is observed at a standard corner solution, and once the first hurdle has been passed the standard Tobit censoring is no longer relevant (which means the second hurdle y^{**} is no longer relevant). This has important implications in that unlike the Cragg model, individuals observed with zero expenditure provide no restrictions on the parameters of the Engel curve as none of the zeros are generated by the second hurdle y^{**}, which is the expenditure decision. First hurdle dominance implies that $p(y^{*} > 0 \mid d = 1) = 1$ and $g(y^{*} \mid y^{*} > 0, d = 1) = g(y^{*} \mid d = 1)$, and the likelihood under dominance is,

$$L2 = \prod_{0}[1 - p(v > -\mathbf{z}'\alpha)]\prod_{+} p(v > -\mathbf{z}'\alpha)g(y|\mu > -\mathbf{x}'\beta) \qquad (6)$$

This likelihood corresponds to the generalized Tobit or Heckman's sample selection model. Given first hurdle dominance and if we allow for dependence between u and v, the double hurdle model decomposes into the Heckit or Heckman sample selection model (Heckman, 1979) or the

Type-2-tobit model (Amemiya, 1985). The double hurdle model can then be even simplified further if we assume that both dominance and independence hold together (complete dominance). In this case the double hurdle reduces to a Probit model for participation and ordinary least squares for the consumption equation, which is commonly referred to as the Two-part model (Cameron and Trivedi, 2005). Both the Heckit and Two-Part Model can be generally described within the following set of relationships:

Participation equation $$w = \mathbf{z}'\alpha + v \qquad (7)$$

$$d = \begin{cases} 1, \text{if } w > 0 \\ 0, \text{if } w \le 0 \end{cases}$$

Expenditure equation $$y^* = \mathbf{x}'\beta + \mu \qquad (8)$$

$$y = \begin{cases} y^* = \mathbf{x}'\beta + \mu, \text{if } d > 0 \\ 0 \qquad\qquad\quad , \text{if } d \le 0 \end{cases}$$

Assuming that (u, v) has a bivariate normal distribution

$\begin{pmatrix} \mu \\ v \end{pmatrix} \sim N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_u^2 & \rho\sigma_u \\ \rho\sigma_u & \sigma_v^2 \end{pmatrix} \right]$ where ρ is the correlation between u and v.

The conditional equation providing the expenditure part of the Heckit model can be written as follows:

$$E(y \mid d = 1) = \mathbf{x}'\beta + \rho\sigma_u \left[\frac{\phi(\mathbf{z}'\alpha)}{\Phi(\mathbf{z}'\alpha)} \right] = \mathbf{x}'\beta + \rho\sigma_u\lambda \qquad (9)$$

where $\lambda = \left[\frac{\phi(\mathbf{z}'\alpha)}{\Phi(\mathbf{z}'\alpha)} \right]$ is the Inverse Mill's Ratio (IMR) that denotes the non selection hazard

When the Heckit model is estimated and the estimate of $\hat{\lambda}$ is significant, the $H_0 : \rho = 0$ can be rejected, which means that there is selection bias. This means that the Heckit model is reduced to

the two-part model, also referred to as the hurdle or complete dominance model. In the estimation of the Engle curve for Maize consumption expenditure we assume that dominance applies to our data and we estimate the dominance models (selection model and the two part model), whereby we assume that the household first makes the decision to spend first (first hurdle dominance) and then makes the decision of how much to spend thereafter, instead of making the decision to spend and how much to spend simultaneously (double hurdle model). So then the question is, is there are relationship between the decision to spend and the decision on how much to spend (selection model) or are these two decisions made independently of each other (two-part model). We estimate the two-part model, selection model and the double model and compare them.

In estimating the relationship between food aid and maize consumption expenditure, the transformation of the dependent variables has implications on the interpretation of the results, if we estimate a level in level model, we assumed that the slope coefficient is constant over the entire sample, if we estimate a semi log model we assume that the effect of food aid on maize consumption expenditure is a linear function maize consumption expenditure, if we estimate a log linear model we obtain elasticities from the coefficients, which is constant over the entire sample.

So based on this explanation the most suitable models are the semi log and log linear models, where the dependent variable is transformed using the log transformation. In addition, estimation of the econometric model with cross-sectional data, it is expected that regression errors are likely

to be heteroskedastic and non-normal. Indeed, the conditional moments tests performed on errors generated by Tobit regressions rejected the null hypothesis of normality of errors, the test for homoskedasticity were also rejected and, this was also found to be the case for the two part and selection models.

Several techniques have been used to correct for heteroskedasticity and the normality assumption for the error terms. To correct the normality of the error terms, some studies propose the use of Box-Cox transformations (Lankford and Wyckoff, 1991) and the use of the Inverse Hyperbolic Sine (IHS) transformation (Reynolds and Shonkwiler, 1991; Yen and Jones, 1997). In estimating the Box-Cox transformed dependent variables, results indicated that the transformation parameter λ is significantly different from 0 (which is the semi-log transformation), the estimated value of transformation for the dependent variable is 0.272. However, the results of Box-Cox transformed models are similar to those of the semi-log model, but with fewer significant variables. In addition, the Box-Cox transformation is scale variant, which means that the empirical results may vary with the Box-Cox transformation parameter and also if the Box-Cox transformation parameter is not 0 (semi-log) then the random variable cannot strictly be normal and this causes the parameter estimates to be inconsistent (Amemiya and Powell, 1981; Yen and Jensen, 1995).

The Inverse Hyperbolic Sine transformation (IHS) is known to accommodate zero, negative and positive values of the random variable and is also known to better handle extreme values than the Box-Cox transformation (Yen and Jones, 1997). Results for the IHS transformation model are similar in signs, magnitude and significance of coefficients to the semi-log models. Because of

the complex nature in terms of interpretation of the coefficients and standard errors in both the Box-Cox and IHS transformation models, this study uses the semi-log model with simpler interpretation of the coefficients and other parameters.

Heteroskedasticity is controlled for by use of robust standard error estimation. Based on the assumption of stochastic dominance, both the two-part and selection models are estimated. In the estimation of first hurdle dominance we use the Heckman two-step selection model, which can also be used to test whether self-selection biases exists by inclusion of the inverse Mill's ratio in the second step of the estimation procedure (the consumption expenditure model).

However, one major concern in the Heckman selection model is the exclusion restriction, which is that at least one variable in the first step is excluded from the second step estimation. As economic theory provides no guidance or justification for exclusion of variables in the choice of regressors to explain the first and second step estimation, the same set of variables was used in both the participation and consumption expenditure equations and the coefficients in the second step are then identified by the nonlinearity of the inverse Mills ratio.

The problem with the use of the same regressors in the first and second step is that the inverse Mill's ratio is often linear which leads to weak identification of the estimators where by the standard errors in the second step are inflated due to collinearity issues, leading to unreliable estimates. This collinearity issue has been suggested as the main criteria of choosing between the

two-part model and the sample selection models, because the presence of collinearity between the inverse Mill's ratio and the regressors limits the power of the t-test statistics due to the inflated standard errors (Madden, 2006; Vella, 1998). There are several methods for testing for collinearity between regressors; Leung and Yu (1996) propose using the condition number, which is the square root of the ratio of the largest and smallest eigenvalues, for the regressors including the inverse Mill's ratio in the second step equation. The condition number test is used in this study; if it exceeds 100 then problems may arise, suggesting that the two-part model is more robust (Cameron and Trivedi, 2005).

3.2.2 Theoretical Estimation of the Maize Marketed Production Model

In the case of the decision to participate in the market and the amount of maize sold in the market, this study does not assume stochastic dominance. A one-tailed Tobit model is used to estimate the effect of food aid on maize sales to the market. In this case the dependent variable is the amount of maize marketed by the household, where zero sales reported by some households are included. The censoring is at zero after normalizing the values of the dependent variable. Following Greene (2003) the stochastic model underlying the Tobit can be expressed as

$$y_i^* = X_i\beta + \varepsilon_i, i = 1,2,\ldots,n \qquad (10)$$

where y_i^* is a latent response variable, X_i is an observed 1 × *k* vector of explanatory variables,

and ε_i ~ i.i.d. $N(0,\sigma^2)$ and is independent of X_i . Instead of observing y_i^*, we observe y_i:

$$y_i = \begin{cases} y_i^*, \text{if } y_i^* > 0 \\ 0, \text{ if } y_i^* \le 0 \end{cases} \qquad (11)$$

The likelihood function for the Tobit is given as

$$\log L = \sum_{y_i>0} -\frac{1}{2}\left[\log(2\pi) + \log\sigma^2 + \frac{(y_i - \beta'\mathbf{x}_i)^2}{\sigma^2}\right] + \sum_{y_i=0}\log\left[1-\Phi\left(\frac{\beta'\mathbf{x}_i}{\sigma}\right)\right] \qquad (12)$$

The first part in equation (12) corresponds to the classical regression for the non-limit observations and the second part adjusts for the limit observations. The expected value of *y* in the Tobit model (Tobin, 1958; McDonald and Moffit, 1980) is given by

$$E(y) = \mathbf{X}\beta F(z) + \sigma f(z) \qquad (13)$$

where $z = \mathbf{X}\beta/\sigma$, $f(z)$ is the unit normal density, and $F(z)$ is the cumulative normal distribution function. Sigma σ is the standard deviation of the error term that is reported in the Tobit results. The expected value of *y* for observations above the limit, y^*, (Amemiya ,1973; McDonald and Moffitt, 1980) is given by

$$E(y^*) = \mathbf{X}\beta + \sigma\, f(z)/F(z) \qquad (14)$$

From equation (14) and (15), it can be shown that

$$E(y) = F(z)E(y^*) \qquad (15)$$

Following McDonald and Moffitt (1980), it can be shown that the effect of an independent variable on the expected value of the dependent variable for all observations can be decomposed into two parts. The first part is the change in *y* of those observations above the limit, weighted by the probability of being above the limit; and the second part is the change in the probability of being above the limit, weighted by the expected value of *y* if above.

$$\frac{\partial E(y)}{\partial \mathbf{X}_i} = F(z) * \frac{\partial E(y^*)}{\partial \mathbf{X}_i} + E(y^*) * \frac{\partial F(z)}{\partial \mathbf{X}_i} \qquad (16)$$

$$\frac{\partial E(y^*)}{\partial \mathbf{X}_i} = \beta_i + \frac{\sigma}{F(z)} * \frac{f(z)}{\partial \mathbf{X}_i} - \frac{\sigma f(z)}{F(z)^2} * \frac{\partial F(z)}{\partial \mathbf{X}_i}$$

$$\frac{\partial E(y^*)}{\partial \mathbf{X}_i} = \beta_i \left[1 - \frac{zf(z)}{F(z)} - \frac{f(z)^2}{F(z)^2} \right] \qquad (17)$$

$$\frac{\partial F(z)}{\partial \mathbf{X}_i} = \frac{f(z)\beta_i}{\sigma} \qquad (18)$$

Substituting (17) and (18) into (16) gives

$$\frac{\partial E(y)}{\partial \mathbf{X}_i} = F(z) * \beta_i \qquad (19)$$

In (16), (17), (18) and (19) z, is the z-score for the area under the normal curve, $f(z)$, is the standard normal density function and $F(z)$, is the cumulative standard normal density function.

3.2.3 Variables in the Empirical Models

The variables in the empirical models for estimating maize consumption expenditure and marketed production are given as follows. Dependent variables are *MZEXP* is the household maize expenditure in Uganda Shillings; *MS* is maize marketed by household in kilograms. The explanatory variables include *EXPENDITURE* taken as the total household expenditure in Uganda Shillings. This is used to proxy household income (endogeneity of expenditure is catered for by use of the *control function* method as shown in the Appendix below following Wooldridge (1997, 2003)); *MAIZE FOODAID* is a dummy variable that takes a value of 1 if the household received maize food aid and a value of 0 if it did not; *LN MAIZE FOODAID* is the logarithm of the amount of maize food aid the household received in kilograms; *FAMILYSIZE* is the number of people in the household; *AGEHH* is the age of the household head in years; *MARITAL STATUS* is a dummy that takes a value of 1 when household head is married and 0 otherwise;

SEX is a dummy that takes a value of 1 if the household head is male and 0 if female; *EDUCATION* is the highest level of education attained by the household head in years; *OCCUPATION* is a dummy that takes a value of 1 for the main occupation of the household head as farming and 0 otherwise; *LIVESTOCK* is a dummy that takes 1 if the household owns livestock and 0 otherwise; *VALUE ASSET* is the value of total household assets in Ugandan Shillings (only includes assets obtained in 2007 and at the beginning of 2008); *LAND* is a dummy that takes 1 if the household owns more than 2 acres of land and 0 otherwise and only includes assets obtained in 2007 and at the beginning of 2008; *MAIZE PRICE* is the output price of maize in Uganda Shillings per kilogram (the price received in the previous season); *MAIZE YIELD* is the yield of maize in kilograms per acre (yield obtained in the previous season).

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This chapter presents the results of the study. The results are summarized in tables as mean, standard deviations, standard errors, coefficients, and test statistics. The chapter is divided into three subsections, the first subsection looks at the socio demographic and socio economic characteristics of the households in the study area, the second sub section presents results on the effects of food aid on maize household expenditure, and the last sub section presents results on the effects of food aid on maize marketed production.

4.1 Socio Demographic and Economic Characteristics of Households in the Study Area

The results of the socio demographic characteristics of the households in the study area are presented in Table 4.1. The results show that 84% of the sampled households are male headed, this is the same for households that receive food aid and those that do not. Likewise, for 85% of the households sampled, the household head had a spouse and this was also the same for households that received food aid and those that did not. The average age of the household head for the sampled households is 39.64 years; however, the average age of household heads for households that receive food aid (43.44 years) is significantly higher than for non-food aid households (36.79 years). The average educational level attained for the sampled households is about 7 years. Though, the average educational level attained of food aid households (6.92 years) is lower than that for households that did not receive food aid (7.49 years) there is no significant difference in the average educational level attained.

More than three quarters (81%) of the household heads have their main occupation as farming, this is the same for households that receive food and households that do not. However, the farming experience of household heads for households that receive food aid (21.35 years) is significantly higher than that for household heads in households that do not receive food aid (16.19 years). The average farming experience is 18.39 years.

The average household size for the sample was 6 people, and this was the same for households that received food aid and households that did not receive food aid. The household composition was categorized into dependents and adults, where dependents in the households were categorized into those aged 12 and below and, those aged 13 to 17 years. Adults were categorized into that age between 18 and 59 years. The results show that the numbers of household members in households that receive food aid and households that do not receive food aid was more or less the same with no significant differences. However, across the household composition categories the numbers were higher for dependents in the category age 12 and below, and least in the age category age 13 to 17 years. The household composition in terms of percent in the household also reveals no significant differences for household that receive food aid and households that do not. Furthermore, the results reveal that for both household categories, there is a higher percentage of household members aged 12 below and least aged 13 to 17 years.

Table 4.1: Social Demographic Characteristics of Households in the Study Area

VARIABLES	ENTIRE SAMPLE	FOOD AID HOUSEHOLDS	NON FOOD AID HOUSEHOLDS	T- VALUE
SEX OF HOUSEHOLD HEAD	0.84 (0.37) N=149	0.84 (0.37) N=64	0.84 (0.37) N=85	-0.138
MARITAL STATUS	0.85 (0.36) N=149	0.84 (0.37) N=64	0.86 (0.35) N=85	0.255
AGE OF HOUSEHOLD HEAD	39.64 (11.12) N=149	43.44 (13.05) N=64	36.79 (8.43) N=85	-3.769***
EDUCATION	7.27 (2.63) N=132	6.92 (2.51) N=51	7.49 (2.69) N=81	1.221
OCUPATIION	0.81 (0.39) N=149	0.84 (0.37) N=64	0.79 (0.41) N=85	-0.855
FARMING EXPERIENCE	18.39 (10.15) N=148	21.35 (11.93) N=63	16.19 (8.00) N=85	-3.148***
HOUSEOHLD SIZE	6.39 (2.25) N=149	6.44 (2.33) N=64	6.35 (2.21) N=85	-0.226
NUMBER IN HOUSEHOLD AGED 12 & BELOW	3.07 (1.40) N=132	3.13 (1.42) N=56	3.03 (1.40) N=76	-0.398
NUMBER IN HOUSEHOLD AGED 13 TO 17	1.54 (0.58) N=95	1.51 (0.60) N=41	1.56 (0.57) N=54	0.359
NUMBER IN HOUSEHOLD AGED 18 TO 59	2.49 (1.11) N=146	2.48 (1.18) N=61	2.49 (1.06) N=85	0.100
PERCENT IN HOUSEHOLD AGED 12 & BELOW	46.14 (15.34) N=132	45.75 (15.95) N=56	46.42 (14.97) N=76	0.247
PERCENT IN HOUSEHOLD AGED 13 TO 17	22.17 (9.51) N=95	21.98 (11.51) N=41	22.31 (7.78) N=54	0.163
PERCENT IN HOUSEHOLD AGED 18 TO 59	41.47 (18.56) N=146	40.84 (19.50) N=61	41.92 (17.96) N=85	0.345

***, **, * indicate coefficients significant at the 1% level, 5% level and 10% level respectively
Figures in parenthesis are Standard Deviations

The socio economic characteristics of the sampled households are presented in Table 4.2 below. Forty percent of the sampled households owned land with the percentage households that receive food aid and owned land (28%) significantly lower than the percentage of households that did not receive food and owned land (49%). The average amount of land owned by sampled households that owned land is 2.43 acres. Households that receive food aid and own land, own significantly less land (1.75 acres) than households that do not receive food aid and own land (2.73 acres).

The average amount of land under maize for the sampled households is 1.62 acres, with no significant differences for households that receive food aid and households that do not receive food aid. On the contrary, the average amount of maize harvested is significantly lower for households that receive food aid (215.78 kilograms) than for households that do not receive food aid (353.71 kilograms). The average amount of maize harvested for the sampled households is 260.37 kilograms. Consequently, the average maize yield is significantly lower for households that receive food aid (207.24 kilograms per acre) than for households that do not receive food aid (294.65 kilograms per acre). In addition, the amount of maize consumed from own production, is significantly lower for households that receive food aid (118.40 kilograms) than for households that do not receive food aid (161.55 kilograms).

The average amount of maize sold for the sampled households that sold maize is 227.98 kilograms, though; there are no significant differences in the amount of maize sold. Households that received food aid and sold maize sold lower amounts of maize (180 kilograms) than households that did not receive food aid and sold maize (249.19 kilograms). The average price received for maize sold for the households that sold maize is 296.09 Uganda shillings per kilogram, with no significant differences in the price of maize received for households that received food aid and households that did not.

The average total household expenditure, which is a proxy for income, for sampled households, is 1,994,724.00 Uganda shillings. Households that receive food aid have significantly lower total household expenditures (1,517,748.00 Uganda shillings) than households that do not receive food aid (2,353,860.00 Uganda shillings). Also maize household expenditure is significantly

lower for households that receive food aid (205,558.30 Uganda shillings) than for households that do not receive food aid (205,558.30 Uganda shillings), with average household maize expenditures for the sampled households that purchase maize being 255,869.80 Uganda shillings. Conversely, maze expenditure shares for households that receive food aid are higher (0.17 or 17%) than for households that do not receive food aid (0.13 or 13%), though with no significant differences. The average maize expenditure share for the sampled households is 0.15 or 15% of the total household expenditure.

Less than a quarter (0.19 or 19%) of the sample households own livestock, with a lower percentage of households that receive food aid (0.17 or 17%) owning livestock than households that do not receive food aid (0.21 or 21%), though, with no significant differences in the proportions of live stock owned. The value of household assets for the sampled households is 319,548.00 Uganda shillings, with no significant differences in the values of households assets owned for households that receive food aid and households that do not. Less than ten percent of (0.09 or 9%) of the sampled households received credit, with no significant differences in the percentage of households that received credit for households that received food aid and households that do not. Similarly, only six percent of the sampled households received remittances, with no significant differences for households that received food aid and households that did not.

Membership to farmers' association or farmers group was reported by only 17% of the sampled households, with no significant differences for household that received food aid and households that did not. Participation in agricultural training programs was reported by only 19% of the

sample households, with households that received food aid (0.13 or 13%) having a significantly lower percentage of households that have participated in agricultural training programs than households that did not receive food aid (0.24 or 24%).

The results of the socio demographic and socio economic characteristics of the household suggest that households that do not receive food aid are wealthier than households that receive food aid based on economic or wealth indicators like ownership of land; amount of land owned and total household expenditure which is a proxy for household income. In addition, they produce more maize and therefore can sustain their consumption of maize.

Table 4.2: Social Economic Characteristics of Households in the Study Area

VARIABLES	ENTIRE SAMPLE	FOOD AID HOUSEHOLDS	NON FOOD AID HOUSEHOLDS	T- VALUE
OWN LAND	0.40 (0.49) N=149	0.28 (0.45) N=64	0.49 (0.50) N=85	2.667***
AMOUNT OF LAND OWNED	2.43 (2.01) N=60	1.75 (0.88) N=18	2.73 (2.28) N=42	1.753*
MAIZE ACREAGE	1.64 (3.04) N=107	1.63 (3.79) N=42	1.64 (2.47) N=65	0.012
MAIZE HARVEST	299.62 (299.47) N=102	215.78 (242.92) N=40	353.71 (321.21) N=62	2.320**
MAIZE YIELDS	260.37 (198.71) N=102	207.24 (148.31) N=40	294.65 (219.70) N=62	2.210**
AMOUNT OF MAIZE CONSUMED	144.63 (101.63) N=102	118.40 (95.25) N=40	161.55 (102.76) N=62	2.130**
AMOUNT OF MAIZE SOLD	227.98 (280.70) N=62	180.00 (220.66) N=19	249.19 (303.42) N=43	0.893
PRICE OF MAIZE	296.09 (208.93) N=62	290.26 (191.27) N=19	298.66 (218.40) N=43	0.145
TOTAL HOUSEHOLD EXPENDITURE	1,994,724.00 (2,393,067.00) N=149	1,517,748.00 (1,889,180.00) N=64	2,353,860.00 (2,666,350.00) N=85	2.136**
MAIZE HOUSEHOLD EXPENDITURE	255,869.80 (271,616.70) N=86	205,558.30 (235,472.70) N=36	292,094.00 (291,846.10) N=50	1.467
MAIZE EXPENDITURE SHARE	0.15 (0.14) N=86	0.17 (0.15) N=36	0.13 (0.13) N=50	-1.348
OWN LIVESTOCK	0.19 (0.40) N=149	0.17 (0.38) N=64	0.21 (0.41) N=85	0.605
VALUE OF HOUSEHOLD ASSETS	319,548.00 (999,353.70) N=149	353,159.40 (1,487,662.00) N=64	294,240.60 (313,473.30) N=85	-0.355
RECEIVED CREDIT	0.09 (0.28) N=149	0.06 (0.24) N=64	0.11 (0.31) N=85	0.925
RECEIVED REMITTANCE	0.06 (0.24) N=149	0.03 (0.18) N=64	0.08 (0.28) N=85	1.295
MEMBERSHIP TO ORGANIZATONS	0.17 (0.37) N=149	0.16 (0.37) N=64	0.18 (0.38) N=85	0.325
RECEIVED TRAINING	0.19 (0.39) N=149	0.13 (0.33) N=64	0.24 (0.43) N=85	1.711*

***, **, * indicate coefficients significant at the 1% level, 5% level and 10% level respectively
Figures in parenthesis are Standard Deviations

4.2 Effects of Food Aid on Maize Household Consumption Expenditure

Collinearity was tested for in the Heckman two step selection model to determine whether there is high collinearity between the Mill's ratio and the regressors in the consumption expenditure model. Using the condition number test, results show that the condition number of the second stage is quite high, whereby it tripled from 93 to 306 upon inclusion of the inverse Mill's ratio, suggesting that the two-part model would be a better choice due to the high collinearity between the inverse Mill's ratio and the regressors in the Heckman selection two step model. Maximum likelihood ratio tests were also performed to test the assumptions that (i) the Two-part model is nested within the Sample selection model; (ii) the Double Hurdle-I (Double hurdle with independent error) model is nested within the Double Hurdle-D with dependent errors; (iii) the Two-part is nested within the Double Hurdle-I. Results are presented in Appendix VI. In, other words, we assume that the models on the left hand side (Table 4.3) are the unrestricted models and the ones on the right hand side are the one restricted (Tsekeris and Dimitriou, 2008; Cameron and Trivedi, 2005).

The maximum likelihood ratio test for Selection versus Two-Part fails to reject the null hypothesis that there is zero correlation between the error terms in the Selection model. This means that the decision to spend on maize (participation decision) does not affect the decision of how much to spend (consumption expenditure decision). The Two-Part model is an alternative to the selection model, where the decision to spend influences the decision on how much to spend. These results show that the estimates from the selection model are unreliable and the Two-part model would appear to give more robust results (Madden, 2006; Jones, 1989).

Likewise the likelihood ratio test for the Double Hurdle-D versus Double Hurdle-I also fails to reject that the hypothesis there is zero correlation between the error terms in the Double Hurdle-D. This means that the Double Hurdle-I is an alternative to the Double Hurdle-D. Further, the likelihood ratio test was conducted for the Double Hurdle-I versus Two-Part, and this study failed to reject the null hypothesis that the Two Part model is an alternative to the Double Hurdle-I model. These results imply that the Two-part model gives more robust results compared to all the other three models, suggesting complete dominance which reinforces our assumption of dominance. (Tsekeris and Dimitriou, 2008; Madden, 2006; Jones, 1989).

Table 4.3: ML Ratio Test for Maize Consumption Expenditure Equations

Model Comparison	Maximum Likelihood Ratio Test
Sample Selection versus Two-Part Model	$\chi^2(1) = 0.13,\ p > \chi^2 = 0.715$
Double Hurdle D versus Double Hurdle I	$\chi^2(1) = 0.13,\ p > \chi^2 = 0.715$
Double Hurdle I versus Two-Part	$\chi^2(1) = 0.00,\ p > \chi^2 = 1.000$

$\chi^2(1)_{0.5} = 3.841$, under the Null hypothesis the model on the right is nested within the model on the left

In addition, the inverse Mill's ratio coefficients in both the selection two-step OLS model and selection MLE model are not statistically significant, ruling out self-selection biases. The results of the participation equations (probit equations) in the Two-part, selection and double hurdle models are presented in Table 4.4. Increasing the amount of food aid given to a household in the form of maize is associated with a lower likelihood of spending on maize for consumption. Family size is associated with a higher likelihood of spending on maize for consumption. Households with older household heads are associated with a lower likelihood of spending on maize for consumption.

Table 4.4: Participation Equations: Likelihood of Spending on Maize (Probit)

EXPLANATORY VARIABLES	TWO PART	SELECTION TWO-STEP	SELECTION MLE	DOUBLE HURDLE-I	DOUBLE HURDLE-D
LN EXPENDITURE	-0.531	-0.531	-0.577	-0.531	-0.577
	(0.352)	(0.352)	(0.380)	(0.333)	(0.380)
LN EXPENDITURE. RESIDUAL	1.019***	1.019***	1.069***	1.019***	1.069***
	(0.398)	(0.398)	(0.429)	(0.379)	(0.429)
DUMMY FOOD AID	1.263	1.263	1.175	1.263	1.175
	(0.903)	(0.903)	(0.960)	(0.888)	(0.960)
LOG AMT FOOD AID	-0.507*	-0.507*	-0.482	-0.507*	-0.482
	(0.275)	(0.275)	(0.293)	(0.272)	(0.293)
FAMILY SIZE	0.114*	0.114*	0.114**	0.114**	0.114**
	(0.059)	(0.059)	(0.052)	(0.053)	(0.052)
LN AGEHH	-0.923*	-0.923*	-0.952**	-0.923**	-0.952**
	(0.486)	(0.486)	(0.475)	(0.457)	(0.475)
MARITAL STATUS	0.304	0.304	0.310	0.304	0.310
	(0.394)	(0.394)	(0.408)	(0.412)	(0.408)
SEX	-0.337	-0.337	-0.352	-0.337	-0.352
	(0.374)	(0.374)	(0.379)	(0.378)	(0.379)
EDUCATION	0.027	0.027	0.030	0.027	0.030
	(0.044)	(0.044)	(0.044)	(0.043)	(0.044)
OCCUPATION	0.380	0.380	0.385	0.380	0.385
	(0.307)	(0.307)	(0.295)	(0.293)	(0.295)
LIVESTOCK	0.286	0.286	0.292	0.286	0.292
	(0.319)	(0.319)	(0.325)	(0.329)	(0.325)
LAND	0.492	0.492	0.500	0.492	0.500
	(0.351)	(0.351)	(0.368)	(0.370)	(0.368)
INTERCEPT	9.491*	9.491*	10.228*	9.491*	10.228*
	(5.608)	(5.608)	(6.014)	(5.246)	(6.014)

***, **, * indicate coefficients significant at the 1% level, 5% level and 10% level respectively
Figures in parenthesis are Robust Standard Errors

The results of the consumption expenditure equations are shown in Table 4.5. A major factor that positively affects maize consumption expenditure in both the participation and consumption equations is total household expenditure (a proxy for income). Households that received food aid spent a higher amount of money on buying maize for home consumption than households that did not receive food aid. The non-food aid households are relatively wealthier and maize consumption does not seem to matter very much. These results imply that those households that receive food aid are more vulnerable and that maize is an important source of food and nutrition. In addition, increasing the amount of food aid given to a household in the form of maize reduces

the amount of money spent on maize consumption. The money saved by getting free maize in the form of food aid could be used to purchase other necessities other than maize.

Family size is found to increase maize consumption expenditure. Households that own livestock have lower maize consumption expenditures than household that do not own livestock. The wealthier households spend less on maize consumption and diversify to other normal goods. Maize is an inferior good to them. The 2SLS results are comparable to those found in Table 4.5 below and can be found in the Appendix VI.

Table 4.5: Maize Consumption Expenditure Equations (OLS)

EXPLANATORY VARIABLES	TWO PART	TWO PART	SELECTION TWO STEP	SELECTION MLE	DOUBLE HURDLE-I	DOUBLE HURDLE-D
	OLS	*MLE*	*OLS*	*MLE*	*TRUNCREG*	***TRUNCREG***
LN EXPENDITURE	**1.140*** **	**1.140*** **	**0.842**	**1.056*** **	**1.140*** **	**1.056*** **
	(0.344)	**(0.318)**	**(0.853)**	**(0.324)**	**(0.317)**	**(0.324)**
LN EXPENDITURE RESIDUAL	**-0.164**	-0.164	0.419	0.006	-0.164	0.006
	(0.367)	(0.339)	(1.551)	(0.371)	(0.339)	(0.371)
DUMMY FOODAID	**1.727***	**1.727****	**2.514**	**1.981****	**1.727****	**1.981****
	(0.935)	**(0.865)**	**(2.212)**	**(0.939)**	**(0.863)**	**(0.939)**
LOG AMT OF FOOD AID	**-0.487***	**-0.487***	**-0.804**	**-0.589***	**-0.487***	**-0.589***
	(0.291)	**(0.269)**	**(0.858)**	**(0.305)**	**(0.268)**	**(0.305)**
FAMILY SIZE	**0.063**	0.063*	0.130	0.083**	0.063*	0.083**
	(0.039)	(0.036)	(0.181)	(0.040)	(0.036)	(0.040)
LN AGEHH	**0.103**	0.103	-0.461	-0.063	0.103	-0.063
	(0.541)	(0.501)	(1.552)	(0.537)	(0.500)	(0.537)
MARITAL STATUS	**-0.900****	**-0.900*****	**-0.716**	**-0.847****	**-0.900*****	**-0.847****
	(0.360)	**(0.334)**	**(0.652)**	**(0.337)**	**(0.333)**	**(0.337)**
SEX	**-0.269**	-0.269	-0.449	-0.322	-0.269	-0.322
	(0.310)	(0.287)	(0.614)	(0.288)	(0.286)	(0.288)
EDUCATION	**-0.009**	-0.009	0.005	-0.005	-0.009	-0.005
	(0.036)	(0.033)	(0.059)	(0.034)	(0.033)	(0.034)
OCCUPATION	**-0.249**	-0.249	-0.022	-0.181	-0.249	-0.181
	(0.309)	(0.286)	(0.686)	(0.304)	(0.285)	(0.304)
LIVESTOCK DUMMY	**-0.764***	**-0.764****	**-0.589**	**-0.710***	**-0.764****	**-0.710***
	(0.391)	**(0.362)**	**(0.571)**	**(0.363)**	**(0.361)**	**(0.363)**
LAND	**-0.350**	-0.350	-0.046	-0.258	-0.350	-0.258
	(0.352)	(0.326)	(0.875)	(0.333)	(0.325)	(0.333)
INTERCEPT	**-3.511**	-3.511	1.019	-2.246	-3.511	-2.246
	(5.347)	(4.950)	(13.155)	(5.104)	(4.938)	(5.104)
RHO			0.928	0.372		0.372
SIGMA			1.216	0.931	0.895	0.931
LAMDA			1.129	0.347		0.347
			(2.823)	(0.647)		(0.392)
LOG LIKELIHOOD	-199.965	-199.965		-199.899	-199.965	-199.899
OBSERVATIONS	147	147	147	147	147	147

***, **, * indicate coefficients significant at the 1% level, 5% level and 10% level respectively. Figures in parenthesis are Robust Standard Errors. MLE- Maximum Likelihood Estimation

4.3 Effects of Food Aid on Household Marketed Production

The results of maize marketed production are presented in Table 4.6 below. Younger household heads are associated with a higher likelihood of selling maize, but as the age of the household head increases, the likelihood of selling maize declines. As the price received for the marketed maize crop increases, the likelihood of selling maize increases; households faced with the expectations of higher maize prices are more likely to sell their maize. In addition, higher maize yields are associated with a higher likelihood of selling maize.

Most importantly, households that received food aid and grow maize are associated with a lower likelihood of selling maize compared to households that did not receive food aid; however, increasing the amount of food aid given to a household that grows maize is associated with a higher likelihood of selling the maize. This implies that for household that supplement food aid received with own maize production, a certain threshold exists where food aid received increases the likelihood of selling off the excess maize at a point of inflexion. Those households that own land have a higher likelihood of marketing their maize. Following McDonald and Moffit (1980), the elasticities of the Tobit are decomposed into three parts. The third column of the Table 4.6 shows the marginal effects of the probability of being above zero or being uncensored; the fourth column indicates the marginal effects of the expected value of the dependent variable conditional on being uncensored or above zero; the last column shows the marginal effects of the unconditional expected value of the dependent variable.

Table 4.6: Maize Marketed Production Equation (Tobit)

EXPLANATORY VARIABLES	NORMALIZED COEFFICIENTS (Standard Error)	CALCULATED DERIVATIVES		
		$\frac{\partial F(z)}{\partial \mathbf{X}_i}$	$\frac{\partial E(y^*)}{\partial \mathbf{X}_i}$	$\frac{\partial E(y)}{\partial \mathbf{X}_i}$
% OF HOUSEHOLD AGED 12 AND BELOW	-0.116*** (0.036)	-0.015	-0.057	-0.081
% OF HOUSEHOLD AGED 13 AND 17	-0.147*** (0.044)	-0.019	-0.072	-0.102
% OF HOUSEHOLD AGED 18 AND 59	-0.121*** (0.042)	-0.016	-0.059	-0.084
FAMILY SIZE	-0.086 (0.143)	-0.011	-0.042	-0.060
AGEHHH	0.337 (0.208)	0.044	0.165	0.235
SQUARE AGEHHH	-0.004* (0.002)	-0.001	-0.002	-0.003
SEX	-0.029 (1.107)	-0.004	-0.014	-0.020
MARITAL STATUS	-0.880 (0.945)	-0.108	-0.457	-0.644
EDUCATION	-0.084 (0.133)	-0.011	-0.041	-0.059
OCCUPATION	-0.783 (0.773)	-0.096	-0.404	-0.570
LN OUTPUT PRICE OF MAIZE	**1.399*** (0.321)**	**0.182**	**0.684**	**0.973**
LN MAIZE YIELD	**2.344*** (0.621)**	**0.305**	**1.146**	**1.629**
DUMMY FOOD AID	**-6.241* (3.644)**	**-0.738**	**-2.778**	**-3.645**
LOG AMT OF FOODAID	**1.836* (1.043)**	**0.239**	**0.898**	**1.276**
OWNS LAND	**1.759*** (0.666)**	**0.227**	**0.861**	**1.215**
LIVESTOCK	0.401 (0.794)	0.051	0.201	0.285
INTERCEPT	-10.576 (6.621)			
SIGMA	2.688*** (0.288)			
NUMBER OF OBS	107			
LOGLIKELIHOOD	-176.605			

***, **, * indicate coefficients significant at the 1% level, 5% level and 10% level respectively. Figure in brackets are Standard Errors

The results show that a unit increase in the percentage of dependants aged 12 and below in the household reduces the likelihood of sale by 1.5%; reduces the amount of maize sold (for the households that sell maize) by 5.7%; and reduces the amount of maize sold across all households that grow maize by 8.1%. For the dependants aged between 13 and 17 years, a unit increase in their percentage in the household reduces the likelihood of sale by 1.9%, reduces the amount of marketed maize for the household that sale maize by 7.2%, and reduces the amount of maize sold across all households that grow maize by 10.2%. Results show that for households that own land the likelihood of sale is [{exp (-0.227)-1}*100] = -20.30] 20.30% higher than that of households that do not own land.

A 1% increase in the price of maize increases the likelihood of making a sale by 0.182%; increases the amount of maize sold (for the households that sell maize) by 0.684%; and increases the amount of maize sold across all households that grow maize by 0.973%. A 1% increase in maize yield increases the probability making a sale by 0.305%; increases the amount of maize marketed (for the households that sell maize) by 1.146%; and increases the amount of maize sold across all households that grow maize by 1.629%.

Results also show that for households that receive food aid, the likelihood of making a maize sale is [{exp(-0.738)-1}*100]= -52.19] 52.19% lower than that of households that do not receive food aid; among households that sell maize, the amount of maize marketed by households that receive food aid is 93.78% lower than that of households that do not receive food aid; and the amount of maize sold by households that receive food aid is 97.34% lower than that amount sold by households that do not receive food, across all households that grow maize. An increase by

one percent of the amount of in-kind food aid given to a household increases the likelihood of making a sale by 0.239%; it increases the amount of maize sold (for the households that sell maize) by 0.898%; and it increases the amount of maize sold across all households that grow maize by 1.276%.

These results show that households that *grow maize and receive food aid* are less likely to sell their maize compared to households that grow maize and do not receive food aid. Those *households that receive food aid* also *market less maize* amongst households that sell maize; and across all households that grow maize compared to household that do not receive food aid. However, the likelihood of selling maize increases with an increase in the amount of in-kind maize food aid received.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

The descriptive statistics show that households that did not receive food aid were wealthier than those that received food aid, based on indicators such as ownership of land; amount of land owned, total household expenditure, etc. In addition, they produce more maize and sell more maize. Some of the vulnerable households in the affected areas where the survey was carried out also produced some limited amount of maize of their own but this was inadequate for their needs. The results have implications for food aid programs that target vulnerable households with in-kind aid. These programs probably need to go hand in hand with transfers of non-food items. It has been shown that receiving food aid helps the vulnerable households increase consumption of much needed nutrients found in maize. However, as the maize received as in-kind food aid increases, somewhere at a point of inflexion, the probability that these vulnerable households will sell off the 'excess' maize increases as they try to meet other household needs. This could be dietary diversification or making purchases of essential non-food items as has been shown by other empirical studies elsewhere.

Therefore the level of in-kind maize food aid given to vulnerable households, in general, should be evaluated based on the household socio-demographics, market conditions and thus balanced or mixed with cash transfers. This will help improve the livelihoods of these households in terms of meeting both their nutritional and essential non-food needs. These results have important implications for targeting of food aid programs, suggesting that household that are selected to receive food aid and also grow their own food should be selected based on intra household characteristics like household composition, household head characteristics,

households wealth indicators, marketed related factors like commodity prices and productivity of the food aid crop in the given targeted area.

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APPENDIX I: Questionnaire

FACULTY OF AGRICULTURE, DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSINESS, MAKERERE UNIVERSITY.

Household survey on the effects of food aid on household food productivity, consumption and marketable surplus in northern and eastern Uganda

1.0. HOUSEHOLD IDENTIFICATION

1.1 . District: ……
1.2. Sub County: ……..
1.3. Parish: ……
1.4. Village: ……

1.5. Location: (1). Urban (2). Rural
1.6. Distance from town (Km):…….
1.7. Do you live in an IDP Camp? (1). Yes (2). No
1.8. How long lived in IDP camp? (years)……

2. 0. HOUSEHOLD CHARACTERISTICS

2.1. Name of respondent:……..

2.2. Name of household head:……..

2.3. Marital status of household head: (1). Married (2). Divorced (3).Widowed (4). Single

2.4. Total farming experience of household head (in years): ……..

2.5. Experience of household head in producing maize and beans (in years): …….

2.6. How many people live in this household?……..

2.7. Please list the name and provide the particulars of all your household members, starting with the household head followed by the spouse, children and other household members in the table below.

Ask the following questions about all household members, starting with the household head followed by the spouse, children and all other household members

ID	Name	Sex	Relation to household head	Age of household members (years)	Number of schooling years completed	Can member read & write? (Yes/No)	Main occupation
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Major occupation codes: *(1). Farming, (2). Formal/informal employment, (3). Market vendor, (4). Beekeeping/fishing, (5). Charcoal/firewood/timber, (6). Sand mining/quarrying, (7). Local brewing/bar/restaurant, (8). Others (specify):…….*

3. 0. HOUSEHOLD ACCESS TO LAND, CROP PRODUCTION AND MARKETING:

3.1. Did your household access land for farming in 2007? (1). Yes (2). No

3.2. What type of land did your household accessed for farming in 2007?

ID	Type of land accessed	Yes/No	
1	Customary	1. Yes	2. No
2	Private	1. Yes	2. No
3	Borrowed	1. Yes	2. No
4	Rented	1. Yes	2. No
5	Don't know	1. Yes	2. No

3.3. How did you utilize land in 2007?

Season 1 (March-June) of 2007				Season 2 (July-November) of 2007			
Own land (Acres)	Land rented-in (Acres)	Land rented-out (Acres)	Total land cultivated (Acres)	Own land (Acres)	Land rented-in (Acres)	Land rented-out (Acres)	Total land cultivated (Acres)

3.4. How did you allocate land by crop in 2007?

Season 1 (March-June) of 2007					Season 2 (July-November) of 2007				
Crops	Own land (Acres)	Borrowed land (Acres)	Hired land (Acres)	Cultivated area by crop (Acres)	Crops	Own land (Acres)	Borrowed land (Acres)	Hired land (Acres)	Cultivated area by crop (Acres)
Maize					Maize				
Beans					Beans				
Others					Others				

3.5. What were your (household) output and utilization (consumption, sales and donations and losses) of maize and beans in season 1 of 2007?

Crop	Area harvested (Acres)	Quantity harvested (Kgs)	Quantity consumed (Kgs)	Quantity sold (Kgs)	Price/Kg (UShs.)	Quantity donated (Kgs)	Quantity reserved for seed (Kgs)
Maize							
Beans							

3.6. What were your (household) output and utilization (consumption, sales and donations and losses) of maize and beans in season 2 of 2007?

Crop	Area harvested (Acres)	Quantity harvested (Kgs)	Quantity consumed (Kgs)	Quantity sold (Kgs)	Price/Kg (UShs.)	Quantity donated (Kgs)	Quantity reserved for seed (Kgs)
Maize							
Beans							

3.7. Why do you grow and sell maize and beans?

……
……
……
……

4.0. HOUSEHOLD FARM IMPLEMENTS AND ASSETS

4.1. Please indicate the number and value of farm implements and other assets currently owned by this household

Implements/asset	Number owned	Total value (Ushs.)	Implement/asset	Number owned	Total value (UShs.)
Hand hoes			Mobile phones		
Ox plough			Radio		
Rakes			Watches		
Slashers			Chairs		
Sprayers			Tables		
Knives			Beds		

Gunny bags			Mosquito nets		
Bicycle			Sewing Machine		
Motorcycle			Other (specify)		

5.0. HOUSEHOLD USE OF PRODUCTION TECHNOLOGIES

5.1. Did you use any of the following technology in seasons 1 and 2 of 2007 in maize and beans production?

Technology	Yes/No	
Improved seed	1.Yes	2.No
Crop rotation	1.Yes	2.No
Row cropping	1.Yes	2.No
Fertilizers	1.Yes	2.No
Pesticides	1.Yes	2.No
Herbicides	1.Yes	2.No
Other (specify)	1.Yes	2.No

5.2. Which factors influenced your decision for using/not using the technology(ies) above?

(i). Use: ……

(ii). Do not use: ……

5.3. If used improved seeds, fertilizers, and pesticides, how did you access it/them?

(1). Stockist (2). NGO/Govt.Dept. (3). Produce trader (4). Another farmer (5). Other (specify)……

5.4. How did you allocate the following technologies by crop during season 1 of 2007?

Crop	Improved seed		Fertilizers		Pesticides		Herbicides	
	Quantity (Kgs)	Total value (UShs.)	Quantity (Kgs)	Total value (UShs.)	Quantity (Kgs)	Total value (UShs.)	Quantity (Kgs)	Total value (UShs.)
Maize								
Beans								

5.5. How did you allocate the following technologies by crop during season 2 of 2007?

Crop	Improved seed		Fertilizers		Pesticides		Herbicides	
	Quantity (Kgs)	Total value (UShs.)	Quantity (Kgs)	Total value (UShs.)	Quantity (Kgs)	Total value (UShs.)	Quantity (Kgs)	Total value (UShs.)
Maize								
Beans								

6.0. HOUSEHOLD LABOUR USE IN FOOD PRODUCTION

6.1. What is the main source of labour for your farming activity?
(1).Family labour only (2). Hired labour only (3). Family and hired labour (4). Family and shared labour

6.2. Please provide information on use of animal traction, tractor and labour by your household for maize production in seasons 1 and 2 of 2007

Activity	**Animal traction**		**Tractor**		**Male family labour**			**Female family labour**			**Child family labour**			**Total cost of hired labour paid in cash (Ushs)**	**Total cost of hired labour paid in kind (Ushs)**
	Own-Animal Hours	Total Hired animal cost (Ushs)	Own-Tractor Hours	Total Hired Tractor cost (Ushs)	Number of men	Hours/day	Days	Number of women	Hours/day	Days	Number of children	Hours/day	Days		

E.g. activity: *(1). Clearing of fields, (2). Ploughing, (3). Crop planting, (4). Weeding, (5). Fertilizer/manure application, (6). Weed, pests and disease control, (7). Harvesting, (8). Transporting harvest from garden to homestead,(9). Drying, (10). Threshing, (11). Packaging/storage, (12). Other (specify)…….* ***(No. of animals * No. of hours/day* No. of days, No. of tractors * No. of hours/day* No. of days)***

6.2. Please provide information on use of animal traction, tractor and labour by your household for beans production in seasons 1 and 2 of 2007

Activity	Animal traction		Tractor		Male family labour			Female family labour			Child family labour			Total cost of hired labour paid in cash (Ushs)	Total cost of hired labour paid in kind (Ushs)
	Own-Animal Hours	Total Hired animal cost (Ushs)	Own-Tractor Hours	Total Hired Tractor cost (Ushs)	Number of men	Hours/day	days	Number of women	Hours/day	days	Number of children	Hours/day	days		

E.g. activity: *(1). Clearing of fields, (2). Ploughing, (3). Crop planting, (4). Weeding, (5). Fertilizer/manure application, (6). Weed, pests and disease control, (7). Harvesting, (8). Transporting harvest from garden to homestead,(9). Drying, (10). Threshing, (11). Packaging/storage, (12). Other (specify)……* ***(No. of animals * No. of hours/day* No. of days, No. of tractors * No. of hours/day* No. of days)***

7.0. HOUSEHOLD LIVESTOCK PRODUCTION

7.1. Did your household own any livestock or beehives in the last 12 months? (1). Yes (2). No

7.2. Please provide information on types of livestock and beehives kept in the last 12 months

Livestock	**Number by April 2007**	**Changes in livestock numbers between April 2007 and March 2008**							
		Purchased	Received	Born	Sold	Consumed	Given out	Died	Stolen
Cows/calves									
Oxen									
Goats									
Sheep									
Pigs									
Donkeys									
Rabbits									
Chicken									
Ducks									
Turkeys									
Pigeons									
Bee Hives									

7.3. Did your household produce any livestock products in the last 12 months? (1). Yes (2). No

7.4. Please provide information on types of livestock products by your household in the last 12 months

Livestock product produced	**Number of production months in the last 12 months**	**Average production per month during production months**		**Average sales per month during production months**			**Average consumption per month during production months**	
		Quantity	Production unit 1. Kgs 2. Litres 3. Trays	Quantity	Production unit 1. Kgs 2. Litres 3. Trays	Average price received in Ushs per unit	Quantity	Production unit 1. Kgs 2. Litres 3. Trays
Milk								
Meat								
Hides and skins								
Ghee								
Eggs								
Honey								

7.5. Did you experience constraints related to livestock production in the last 12 months? (1). Yes, (2). No

7.6. Identify the constraints to livestock production and how they were addressed.

Constraints (See e.g.)	**Livestock type most affected**	**Effect on livestock production (See e.g.)**	**One main solution/ How was it addressed?**

E.g. of constraints: *(1).Poor breeds, (2). Pests and diseases, (3). Inadequate labour, (4). Poor pasture/feeds, (5). Insufficient water, (7). Lack of support services, e.g. veterinary services, (8). Insecurity, (9).Other (specify)*

E.g. of effect on livestock production and productivity: *(1). Mild, (2). Severe, (3). Very severe*

8.0. HOUSEHOLD EXPENDITURE ON FOOD AND NON-FOOD ITEMS:

8.1. Please list all household expenditure in the last 6 months on the food and non food items listed in the table below:

Purchased items	**Number of times purchased**	**Frequency: (1). Daily (2). Weekly (3). Monthly (4). 2-5 months (5). Six months**	**Expenditure per purchase (Ushs.)**	**Purchased items**	**Number of times purchased**	**Frequency: (1). Daily (2). Weekly (3). Monthly (4). 2-5 months (5). Six months**	**Expenditure per purchase (Ushs.)**
Maize grain				Soft drinks			
Maize meal/flour				Alcohol			
Millet				Tobacco/cigarettes			
Sorghum				**NON-FOOD ITEMS**			
Wheat flour				Farm equipment, seed & tools			
Rice				Hiring labour			
Bread				School fees, books, pens			
Cassava (Fresh)				Clothing, shoes			
Cassava (Processed)				Medical care			
Sweet potatoes				Lighting fuel (e.g., paraffin)			
Irish potatoes				Cooking fuel (e.g., firewood, charcoal)			
Matooke				Soap/washing products			
Beans				Transportation			
Peas							
Groundnuts							
Simsim							
Vegetables							
Fruits							
Meats							

Fish							
Chicken							
Eggs							
Milk							
Salt							
Cooking oil/fats							
Sugar							
Tea/coffee							

9.0. HOUSEHOLD RESPONSE TO SHOCKS AND COPING MECHANISIMS

9.1. Did your household give food assistance to others (e.g., those in need, relatives, and friends) in the last 12 months? (1).Yes, (2). No

9.2. Did you or any other member of your household receive food assistance or food donations in the last 12 months? (1).Yes, (2). No

9.3. In the last 12 months, was your household not able to consume adequate food of the right quantity and quality you would have preferred because you did not produce sufficient or had no/little money to purchase adequate food from the market? (1).Yes, (2). No

9.4. Were you worried that your household food stock would run out before you could produce more for yourselves in the last 12 months? (1). Yes, (2). No

9.5. Were you worried that your household food stock would run out before you could get enough money to buy more food in the last 12 months,? (1). Yes, (2). No

9.6. If yes, to any of the three questions above, please check and rank (1-5) the 5 major causes of the above-mentioned problems in order of importance

Tick applicable	Causes of problem	Rank	Tick applicable	Problem Causes	Rank
	Prolonged dry spell			Low production	
	Floods			High food prices	
	Crop pests and diseases			Loss of employment	
	Livestock diseases			Lack of employment	
	High cost of seeds and tools			Illness of household member	
	Lack of seeds and tools			Death of household member	
	Loss of productive assets			Insecurity/violence	
	Lack of labour			Other (specify)……	

9.7. For the five (5) most important causes of problems ranked above, please complete the following table using the codes provided below for coping mechanism.

Five (5) major causes problem	Problem resulted in a decrease or loss of: (1). Income (2). Assets (e.g. livestock) (3). Income and assets (4). No change	Problem resulted in a decrease in household's ability to have adequate food for a period of time (1). Yes (2). No (3). Don't Know	What did the household do to cope with or resolve the problems caused by this cause (See e.g. below)	Has the household recovered from the inability to have enough food? (1).Fully recovered (2). Partially recovered (3). Not recovered

Codes for coping mechanisms: *1. Hired labour for cash to buy food, 2. Hired labour for food 3. Spent savings, 4. Borrowed food, 5.Borrowed money, 6. Purchased food on credit, 7. Consumed more wild foods or hunted, 8. Consumed seed stock held for next season, 9. Reduced the proportions of the meals, 10. Reduced number of meals per day, 11. Some household members migrated temporarily, 12. Some household members migrated permanently, 13. Sold agricultural seeds/ tools etc, 14. Sold building materials, 15 Sold household furniture, 16. Sold poultry- chickens, ducks, and turkeys etc, 17. Sold small livestock – goats, sheep, pigs, 18. Sold large livestock – oxen, cow, bulls, 19. Rented out land, 20. Rented out land, 21. Reduced expenditure on non-food items, 22. Sold charcoal/firewood*

10.0. HOUSEHOLD FOOD ACCESS AND CONSUMPTION:

10.1. Please rank the contribution of each of the following food sources to your household food consumption in the last 12 months

Food source	Rank (1-6)	% contribution to household food consumption
1. Own food production		
2. Food purchases from market/shop		
3. Fishing/gathering/hunting		
4. Food donation from relatives/friends		
5. Food assistance by WFP/NGOs/GoU		
6. Borrowing food from relatives/friends		

10.2. If yes for (5) above how long have your household been receiving food assistance? Years:…… Months:……..

10.3. Indicate source, type, quantity and beneficiaries of food assistance in this household in the last 12 months

Type of food assistance	Source of food assistance	Type of food	Quantity of food assistance received monthly (Kgs)	Number of Beneficiaries in the household
General food distribution (GFD)				
Food for Work (FFW)				
School feeding (FFE)				
HIV/AIDS				
Supplementary feeding (MCH)				
Other (specify)…….				

E.g. of sources of food assistance: *OPM (GoU), WFP, UNICEF, NGO (ACDI/VOCA, World Vision, Save the Children, Red Cross, Caritas/CRS etc).* ***E.g. of food types:*** *Posho, Rice, beans, unimix, CSB etc*

10.4. Please estimate the number and quantity of meals consumed by this household per day without and with food assistance

Household consumption	Number of meals consumed	Quantity of meals consumed (Kgs)
Meals per day without food assistance		
Meals per day with food assistance		

10.5. Please list the type of foodstuffs that resident members of the household consumed within the last 7 days and the sources of foodstuffs.

Food type	Food source	Number of times consumed in last 7 days
Maize		
Rice		
Millet, sorghum		
Bread, chapatti		
Beans, peas		
Groundnuts, simsim		
Cassava, sweet potatoes		
Matooke		
Sugars/honey		
Fruits		
Vegetables		
Meat		
Fish		
Milk and milk products		
Chicken, duck, turkey		
Eggs		
Oils/fats		

Food sources: *(1). Own production, (2). Purchases, (3). Donation by relative/friend, (4). Donation by NGO, (5). Exchange for labour, (6). Borrowing, (7). Fishing/gathering/hunting, (8). Other (specify)……..*

11.0. PARTICIPATION IN AGRICULTURAL TRAINING AND EXTENSION PROGRAMS

11.1. Did any of the household members participate in any agricultural training programs with emphasis on maize and beans in the last 2 years? (1). Yes, (2). No

11.2. If yes please, list the names of the household members and respond to the following questions

Name of household member	Training provider of	Type/areas of training	Number of times trained in the past 2 years	Did this person apply the knowledge or skill acquired? Yes/No	Is this person still using knowledge or skill acquired? Yes/No

E.g. of type/areas of raining: (*1). Improved maize/beans varieties, (2). Fertilizer/ manure application, (3). Soil & water conservation, (4).Pest & disease control, (5). Other (specify)*

12.0. MEMBERSHIP IN FARMERS'ORGANIZATIONS AND ACCESS TO CREDIT

12.1. Did any of the household members belong to any farmers' group through which farmers come together to address issues of mutual support e.g. input supply, produce marketing, extension service etc in the last 2 years? (1). Yes, (2). No

12.2. List the names of the household members and their respective groups/organizations

Name of household member in a group	Name of group	Type of group	Hours spent by H/hold member in group activities monthly	Purpose for which the group was formed

E.g. for type of group: *(1). Farmers' group, (2). Women's group, (3).Youths' group, (4).Savings and credit group, (5) Mutual support group, (6). Others (specify)*

E.g. of group activity: (*1). providing mutual support to bereaved group members, (2). Income generation for group members, (3). Produce marketing, (4). Mobilizing savings and credit for group members, (5). Promotion of improved farming practices, (6). Other (specify)……..*

12.3. Did any of the household members receive cash or in-kind credit in the last 12 months? (1). Yes, (2). No

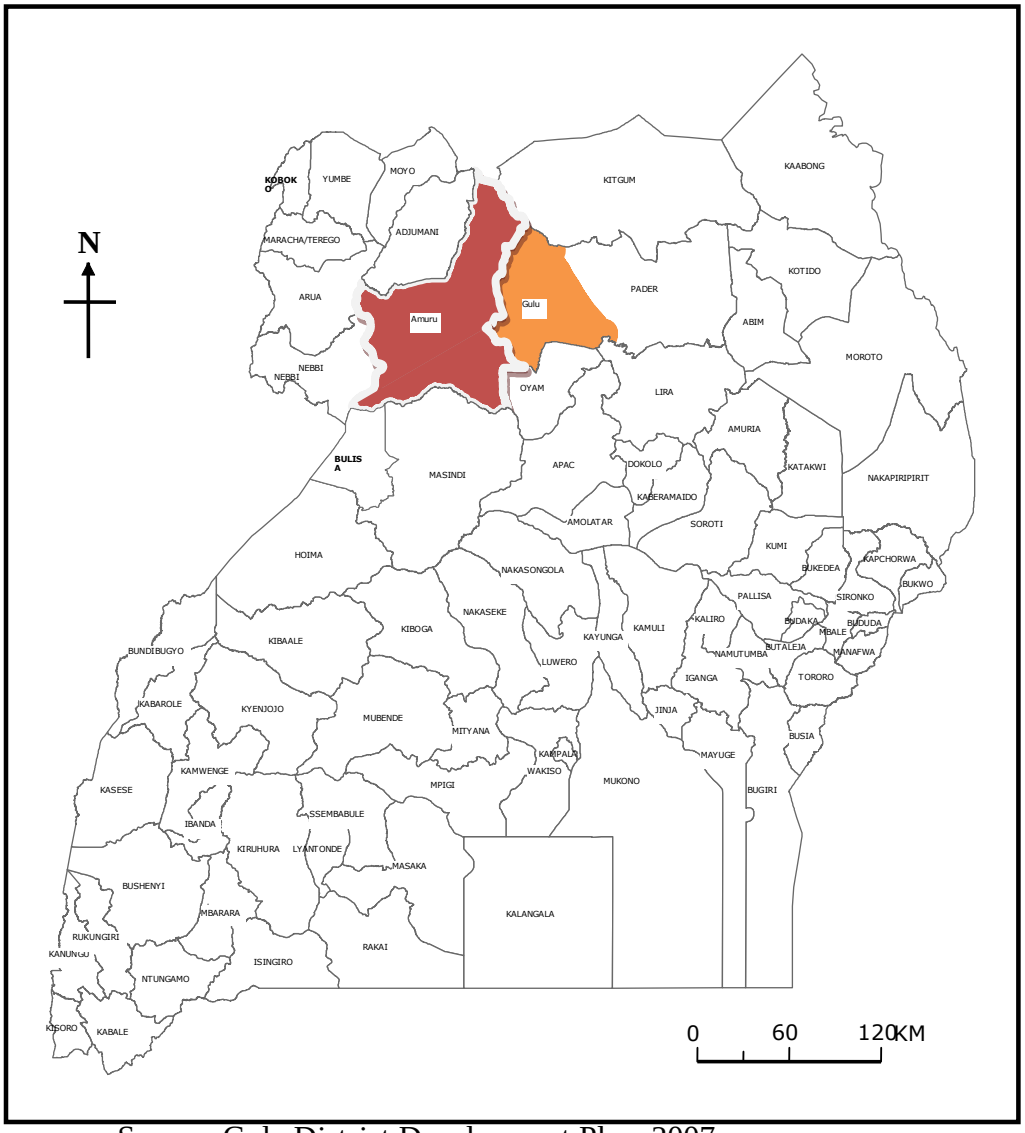
12.4. List the names of the household members and ask the following questions about the credit received

Name of household member who received credit (cash, in-kind)	Name of organization that provided credit/in-kind assistance	Credit source (1). NGO, (2). MFI (4). Relatives/friends (5). Other (specify)	Amount of cash credit received in the last 12 months? (Ushs)	Value of kind credit received in the last 12 months? (Ushs)

12.5. Did household receive any remittance in the last 12 months (March 2007- April 2008)? (1).Yes, (2). No

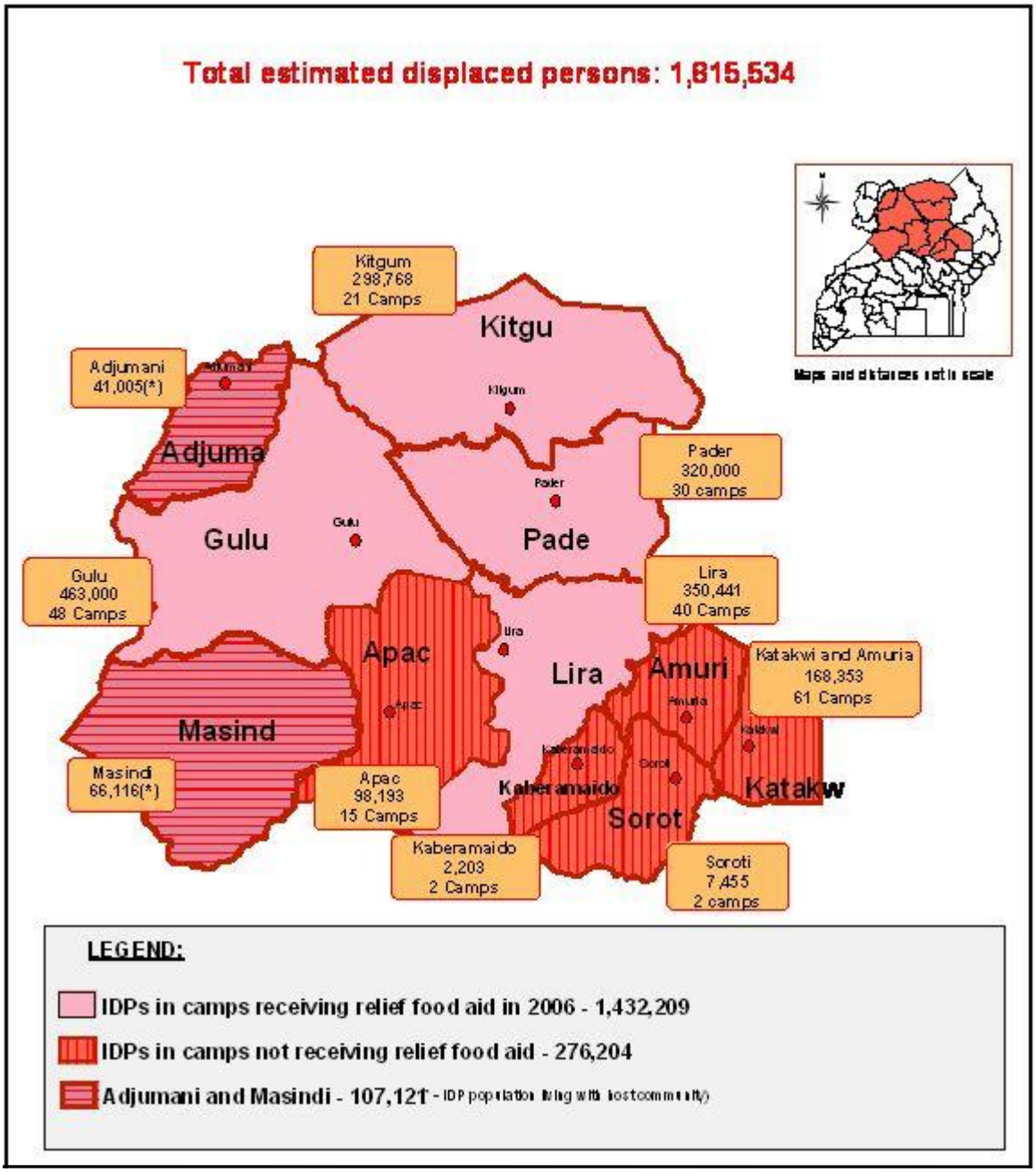
12.6. If yes, how much (Ushs)?.....

APPENDIX II: Map of Uganda Showing the Location of Amuru and Gulu Districts



Source: Gulu District Development Plan, 2007

APPENDIX III: IDP Population in Northern Uganda, May 2006



Source: UNOCHA

APPENDIX IV: Controlled Function Approach

Following Wooldridge (1997, 2003), the control function approach relies on the same kinds of identification conditions as used in the 2SLS or the GMM. Denote y_1 as the response variable, y_2 as the endogenous explanatory variable and **Z** is a 1 x K vector of exogenous variables (where $z_1 = 1$). Consider the case

$$y_1 = \mathbf{z}_1\boldsymbol{\theta}_1 + \alpha_1 y_2 + u_1 \qquad (1)$$

where $\mathbf{z}_1$ is a 1 x K_1 strict sub-vector of **Z**. The exogeneity assumption in the above case is

$$E[\mathbf{Z}'u_1] = \mathbf{0}. \qquad (2)$$

The endogenous function for y_2 in reduced form is

$$y_2 = \mathbf{Z}\boldsymbol{\beta}_2 + v_2; \quad E[\mathbf{Z}'v_2] = \mathbf{0}. \qquad (3)$$

where $\boldsymbol{\beta}_2$ is K x 1 vector of parameter estimates. We have u_1 related to v_2 in the form

$$u_1 = \rho_1 v_2 + e_1 \text{ ; where } \rho_1 = E[v_2u_1]/E[v^2_2],\ E[v_2e_1] = 0 \text{ and } E[\mathbf{Z}'e_1] = \mathbf{0}. \qquad (4)$$

Substituting (4) into (1) we get

$$y_1 = \mathbf{z}_1\boldsymbol{\theta}_1 + \alpha_1 y_2 + \rho_1 v_2 + e_1 \qquad (5)$$

where v_2 is an explanatory variable. Controlling for v_2 implies the error, e_1 is not correlated with y_2, v_2 and **z**. The two step procedure used on the total household expenditure variable (in this case denoted as y_2) is first to regress y_2 on **z** as shown in (3). The residuals obtained are v_2. Then regress y_1 on $\mathbf{z}_1$, y_2 and v_2 as shown in (5). The OLS estimates are control function estimates and are identical to the 2SLS estimates obtained in (1).

APPENDIX V: Households Characteristics in the Study Area

Table 1A: Socio-demographic Characteristics of Households

VARIABLES	ENTIRE SAMPLE	FOOD AID HOUSEHOLDS	NON-FOOD AID HOUSEHOLDS	t - value
SEX OF HOUSEHOLD HEAD	0.84 (0.37) N=149	0.84 (0.37) N=64	0.84 (0.37) N=85	-0.138
MARITAL STATUS	0.85 (0.36) N=149	0.84 (0.37) N=64	0.86 (0.35) N=85	0.255
AGE OF HOUSEHOLD HEAD	39.64 (11.12) N=149	43.44 (13.05) N=64	36.79 (8.43) N=85	-3.769***
EDUCATION	7.27 (2.63) N=132	6.92 (2.51) N=51	7.49 (2.69) N=81	1.221
OCUPATIION	0.81 (0.39) N=149	0.84 (0.37) N=64	0.79 (0.41) N=85	-0.855
FARMING EXPERIENCE	18.39 (10.15) N=148	21.35 (11.93) N=63	16.19 (8.00) N=85	-3.148***
HOUSEOHLD SIZE	6.39 (2.25) N=149	6.44 (2.33) N=64	6.35 (2.21) N=85	-0.226
NUMBER IN HOUSEHOLD AGED 12 & BELOW	3.07 (1.40) N=132	3.13 (1.42) N=56	3.03 (1.40) N=76	-0.398
NUMBER IN HOUSEHOLD AGED 13 TO 17	1.54 (0.58) N=95	1.51 (0.60) N=41	1.56 (0.57) N=54	0.359
NUMBER IN HOUSEHOLD AGED 18 TO 59	2.49 (1.11) N=146	2.48 (1.18) N=61	2.49 (1.06) N=85	0.100
PERCENT IN HOUSEHOLD AGED 12 & BELOW	46.14 (15.34) N=132	45.75 (15.95) N=56	46.42 (14.97) N=76	0.247
PERCENT IN HOUSEHOLD AGED 13 TO 17	22.17 (9.51) N=95	21.98 (11.51) N=41	22.31 (7.78) N=54	0.163
PERCENT IN HOUSEHOLD AGED 18 TO 59	41.47 (18.56) N=146	40.84 (19.50) N=61	41.92 (17.96) N=85	0.345

Source: Survey data

***, **, * indicate coefficients significant at the 1% level, 5% level and 10% level respectively

Figures in parenthesis are Standard Deviations. **Exchange Rate is US$ 1.00 = Shs 1,850**.

Table 1B: Other Characteristics of Households in the Study Area

VARIABLES	ENTIRE SAMPLE	FOOD AID HOUSEHOLDS	NON FOOD AID HOUSEHOLDS	t-value
OWN LAND	0.40 (0.49) N=149	0.28 (0.45) N=64	0.49 (0.50) N=85	2.667***
AMOUNT OF LAND OWNED	2.43 (2.01) N=60	1.75 (0.88) N=18	2.73 (2.28) N=42	1.753*
MAIZE ACREAGE	1.64 (3.04) N=107	1.63 (3.79) N=42	1.64 (2.47) N=65	0.012
MAIZE HARVEST	299.62 (299.47) N=102	215.78 (242.92) N=40	353.71 (321.21) N=62	2.320**
MAIZE YIELDS	260.37 (198.71) N=102	207.24 (148.31) N=40	294.65 (219.70) N=62	2.210**
AMOUNT OF MAIZE CONSUMED	144.63 (101.63) N=102	118.40 (95.25) N=40	161.55 (102.76) N=62	2.130**
AMOUNT OF MAIZE SOLD	227.98 (280.70) N=62	180.00 (220.66) N=19	249.19 (303.42) N=43	0.893
PRICE OF MAIZE	296.09 (208.93) N=62	290.26 (191.27) N=19	298.66 (218.40) N=43	0.145
TOTAL HOUSEHOLD EXPENDITURE	1,994,724.00 (2,393,067.00) N=149	1,517,748.00 (1,889,180.00) N=64	2,353,860.00 (2,666,350.00) N=85	2.136**
MAIZE HOUSEHOLD EXPENDITURE	255,869.80 (271,616.70) N=86	205,558.30 (235,472.70) N=36	292,094.00 (291,846.10) N=50	1.467
MAIZE EXPENDITURE SHARE	0.15 (0.14) N=86	0.17 (0.15) N=36	0.13 (0.13) N=50	-1.348
OWN LIVESTOCK	0.19 (0.40) N=149	0.17 (0.38) N=64	0.21 (0.41) N=85	0.605
VALUE OF HOUSEHOLD ASSETS	319,548.00 (999,353.70) N=149	353,159.40 (1,487,662.00) N=64	294,240.60 (313,473.30) N=85	-0.355
RECEIVED CREDIT	0.09 (0.28) N=149	0.06 (0.24) N=64	0.11 (0.31) N=85	0.925
RECEIVED REMITTANCE	0.06 (0.24) N=149	0.03 (0.18) N=64	0.08 (0.28) N=85	1.295
MEMBERSHIP TO ORGANIZATONS	0.17 (0.37) N=149	0.16 (0.37) N=64	0.18 (0.38) N=85	0.325
RECEIVED TRAINING	0.19 (0.39) N=149	0.13 (0.33) N=64	0.24 (0.43) N=85	1.711*

Survey data

***, **, * indicate coefficients significant at the 1% level, 5% level and 10% level respectively

Figures in parenthesis are Standard Deviations. **Exchange Rate is US$ 1.00 = Shs 1,850**.

APPENDIX VI: Expenditure Function, Participation and Consumption Equations

Expenditure Function: Dependent variable = Total HH Expenditure

EXPLANATORY VARIABLES	
FAMILY SIZE	0.044
	(0.030)
LN AGEHH	-0.463**
	(0.223)
SEX	-0.061
	(0.209)
MARITAL STATUS	0.266
	(0.213)
OCCUPATION	-0.034
	(0.170)
EDUCATION	0.004
	(0.024)
NON FOOD IAD	0.285**
	(0.135)
REMITTANCE	-0.301
	(0.275)
LN VALUE ASSET	0.285***
	(0.052)
LIVESTOCK	0.098
	(0.173)
LAND	0.376*
	(0.199)
INTERCEPT	11.498***
	(1.070)
OBSERVATIONS	147
F-VALUE	7.557***
LOG LIKELIHOOD	-159.436

Participation Equations (Using Predicted Expenditure as Regressor)

EXPLANATORY VARIABLES	TWO PART	SELECTION TWO-STEP	SELECTION MLE	DOUBLE HURDLE-I	DOUBLE HURDLE-D
LN EXPENDITURE PREDICTED	-0.531	-0.531	-0.577	-0.531	-0.577
	(0.352)	(0.352)	(0.380)	(0.333)	(0.380)
LN EXPENDITURE RESIDUAL	0.488***	0.488***	0.492***	0.488***	0.492***
	(0.163)	(0.163)	(0.161)	(0.162)	(0.161)
MAIZE FOOD AID	1.263	1.263	1.175	1.263	1.175
	(0.903)	(0.903)	(0.960)	(0.888)	(0.960)
LN MAIZE FOOD AID	-0.507*	-0.507*	-0.482	-0.507*	-0.482
	(0.275)	(0.275)	(0.293)	(0.272)	(0.293)
FAMILY SIZE	0.114*	0.114*	0.114**	0.114**	0.114**
	(0.059)	(0.059)	(0.052)	(0.053)	(0.052)
LN AGEHH	-0.923*	-0.923*	-0.952**	-0.923**	-0.952**
	(0.486)	(0.486)	(0.475)	(0.457)	(0.475)
MARITAL STATUS	0.304	0.304	0.310	0.304	0.310
	(0.394)	(0.394)	(0.408)	(0.412)	(0.408)
SEX	-0.337	-0.337	-0.352	-0.337	-0.352
	(0.374)	(0.374)	(0.379)	(0.378)	(0.379)
EDUCATION	0.027	0.027	0.030	0.027	0.030
	(0.044)	(0.044)	(0.044)	(0.043)	(0.044)
OCCUPATION	0.380	0.380	0.385	0.380	0.385
	(0.307)	(0.307)	(0.295)	(0.293)	(0.295)
LIVESTOCK	0.286	0.286	0.292	0.286	0.292
	(0.319)	(0.319)	(0.325)	(0.329)	(0.325)
LAND	0.492	0.492	0.500	0.492	0.500
	(0.351)	(0.351)	(0.368)	(0.370)	(0.368)
INTERCEPT	9.491*	9.491*	10.228*	9.491*	10.228*
	(5.608)	(5.608)	(6.014)	(5.246)	(6.014)

Consumption Equations (Using Predicted Expenditure as Regressor)

EXPLANATORY VARIABLES	TWO PART	TWO PART	SELECTION TWO STEP	SELECTION MLE	DOUBLE HURDLE-I	DOUBLE HURDLE-D
	OLS	*MLE*	*OLS*	*MLE*	*TRUNCREG*	***TRUNCREG***
LN EXPENDITURE PREDICTED	1.140***	1.140***	0.842	1.056***	1.140***	1.056***
	(0.344)	(0.318)	(0.853)	(0.324)	(0.317)	(0.324)
LN EXPENDITURE RESIDUAL	0.975***	0.975***	1.260*	1.062***	0.975***	1.062***
	(0.132)	(0.122)	(0.747)	(0.157)	(0.121)	(0.157)
MAIZE FOOD AID	1.727*	1.727**	2.514	1.981**	1.727**	1.981**
	(0.935)	(0.865)	(2.212)	(0.939)	(0.863)	(0.939)
LN MAIZE FOOD AID	-0.487*	-0.487*	-0.804	-0.589*	-0.487*	-0.589*
	(0.291)	(0.269)	(0.858)	(0.305)	(0.268)	(0.305)
FAMILY SIZE	0.063	0.063	0.130	0.083**	0.063*	0.083**
	(0.039)	(0.036)	(0.181)	(0.040)	(0.036)	(0.040)
LN AGEHH	0.103	0.103	-0.461	-0.063	0.103	-0.063
	(0.541)	(0.501)	(1.552)	(0.537)	(0.500)	(0.537)
MARITAL STATUS	-0.900**	-0.900***	-0.716	-0.847**	-0.900***	-0.847**
	(0.360)	(0.334)	(0.652)	(0.337)	(0.333)	(0.337)
SEX	-0.269	-0.269	-0.449	-0.322	-0.269	-0.322
	(0.310)	(0.287)	(0.614)	(0.288)	(0.286)	(0.288)
EDUCATION	-0.009	-0.009	0.005	-0.005	-0.009	-0.005
	(0.036)	(0.033)	(0.059)	(0.034)	(0.033)	(0.034)
OCCUPATION	-0.249	-0.249	-0.022	-0.181	-0.249	-0.181
	(0.309)	(0.286)	(0.686)	(0.304)	(0.285)	(0.304)
LIVESTOCK	-0.764*	-0.764**	-0.589	-0.710*	-0.764**	-0.710*
	(0.391)	(0.362)	(0.571)	(0.363)	(0.361)	(0.363)
LAND	-0.350	-0.350	-0.046	-0.258	-0.350	-0.258
	(0.352)	(0.326)	(0.875)	(0.333)	(0.325)	(0.333)
INTERCEPT	-3.511	-3.511	1.019	-2.246	-3.511	-2.246
	(5.347)	(4.950)	(13.155)	(5.104)	(4.938)	(5.104)
RHO			0.928	0.372		0.372
SIGMA			1.216	0.931	0.895	0.931
LAMDA			1.129	0.347		0.347
			(2.823)	(0.647)		(0.392)
LOG LIKELIHOOD	-199.96549	-199.96549		-199.899	-199.965	-199.899
OBSERVATIONS	147	147	147	147	147	147