Poverty Alleviation and Sector Development:

A SAM multiplier analysis applied to Uganda:

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SLU, Department of Economics *Thesis No.512*
Masters Thesis in Economics *Uppsala 2008*
D-level, 30 ECTS credits
Version: Final

ISSN 1401-4084
ISRN SLU-EKON-EX-512-SE

Poverty Alleviation and Sector Development:

A SAM multiplier analysis applied to Uganda:

Fattigdomsbekämpning och sectors utveckling:

Analys med socialräkenskapsmatris för Uganda

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ISSN 1401-4084
ISRN SLU-EKON-EX-No. 512–SE

Tryck: SLU, Institutionen för ekonomi, Uppsala, 2008

Acknowledgments:

I would like to express my thanks to those who made it possible for me to complete this thesis. I am deeply indebted to my supervisor Professor Yves Surry SLU, Department of Economics whose help, suggestions and encouragement helped me in all the time of research for and writing of this thesis, Dr. Clas Eriksson also from the same department who suggested Professor Yves Surry as a suitable supervisor, Erik Pelling who proof-reads the thesis and my son Andrew who looked at the final version for English grammar, both correcting and offering suggestions for improvement. I dedicate this study to my late parents and sister, Irene.

Abstract/Summary:

The study analyses the linkage between an increase in a sector's growth of output and poverty alleviation. A multiplier decomposition method shows the linkages through which a productions sector's output contributes to poverty alleviation. The empirical data of the thesis is based on a socioeconomic system represented by the 1999 Social accounting Matrix (SAM) for Uganda. It is shown that a multiplier can be broken down into two multiplicative effects. Firstly, the distributional effects where the impact of a sector's output on poverty alleviation can be direct through incomes to the poor households from their labor or land to the sector's grow of output. Secondly, the interdependency effects which results from the indirect effects operating through the interdependence of economic activities sometimes called the closed loop effect. The decomposition method shows that growth in agriculture alleviates poverty among poor households, followed then by the services sector and the industry sectors. The policy implication is that the process of industrialization involves moving the bulk of the labor force from the agricultural sector to the industry sector and this can be enhanced by education and training.

Keywords: Social accounting matrix, poverty measures, multiplier decomposition, Industrialization, labor force.

Sammanfattning:

I den här uppsatsen analyseras kopplingen mellan en ökning av en sektors produktions utveckling och fattigdomsbekämpning. En multiplikator dekomponerings metod visar de återkopplings effekter som gör att en sektors produktion kan bidra till fattigdoms bekämpning. Uppsatsens empiriska data är baserat på ett socioekonomiskt system representerat av en social räkenskapes matris för Uganda 1999, en så kallad social accounting matrix eller SAM. Uppsatsen visar att en multiplikatorn kan bli nedbruten i två separata multiplikatoreffekter, dels en fördelningeffekt och dels en interdependenseffekt . Fördelnings effekten som är direkt visar hur produktionen i en viss sektor bidrar till fattigdoms bekämpning genom de inkomster fattiga hushåll får för sitt arbete eller sin mark. Interdependens effekten är indirekt och är resultatet av det ömsesidiga beroende som är inbyggt i de ekonomiska aktiviteterna. Dekomponerings metoden visar att tillväxten i jordbruks sektorn bäst lindrar fattigdomen bland de fattiga hushållen, följt av tjänste sektorn och industri sektorn. Det intressanta ur ett policy perspektiv är att industrialiseringen inbegriper flyttandet av huvuddelen av arbeteskraften från lantbruks sektorn till industri sektorn och att denna process kan främjas genom satsningar på utbildning.

Nyckelord: Social räkenskapsmatris, fattigdomsmått, multiplikator dekomponering, industrialisering, arbetskraft.

Abbreviations:

AIDS	Acquired Immune Deficiency Syndrome.
CIF	Cost, Insurance, and Freight.
CPAE	Consumption per Adult Equivalent.
CPRC	Chronic Poverty Research Centre
DRC	Democratic Republic of Congo.
FGT	Foster, Greer and Thorbecke.
FOB	Free on board.
GDP	Gross Domestic Product.
IFPRI	International Food Research Institute.
ILO	International Labor Organization.
LDC	Least Developed Countries
MDG	Millennium Development Goals.
MFPED	Ministry of Planning and Economic Development.
NRM	National Resistance Movement.
PEAP	Poverty Eradication Action Plan.
SAM	Social Accounting Matrix.
UN	United Nations.
UBOS	Uganda Bureau of Statistics.
UNFPA	United Nations Population Fund.
UNHS	Uganda National Housing Survey.
UPE	Uganda Primary Education.
Ushs	Uganda Shillings.
WHO	World Health Organization.

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1. Introduction:

Poverty alleviation is a main policy debate in the development literature. Many researchers of development economics, for example Emwanu et al. (1995), have argued that the fight against poverty is a necessary condition for growth. The elaboration of policies for poverty alleviation requires a thorough knowledge of the poverty phenomenon as well as an understanding of the efficiency of implemented programs.

Poverty is spread evenly among regions of the developing world, among countries within those regions and among localities within those countries. Nearly half of the world's poor live in south Asia, a region that accounts for about 30 percent of the world's population. People in sub-Saharan Africa, along with those in south Asia, are among the poorest in the world, both in real incomes and in access to social services. The World Bank reports that about 45 percent of the approximately 590 million people in sub-Saharan Africa live below the national poverty lines. (World Bank 1990)

In view of the above, the United Nation Millennium Summit endorsed the Millennium Development Goals (MDGs) in September 2000 and was called the Millennium declaration. The main objective of the Summit was to set measurable and time set goals to end hunger, poverty and disease found in mainly developing countries. The MDGs have since then been a part of international and national discussions and policy formulation in developing countries. The MDGs are made of eight goals listed below, that were agreed upon by 180 member states of the United Nations (UN).

Goal 1: Eradicate extreme poverty and hunger.
Goal 2: Achieve universal primary education.
Goal 3: Promote gender equality and empower women.
Goal 4: Reduce child mortality.
Goal 5: Improve maternal health.
Goal 6: Combat HIV/AIDS, malaria, and other diseases.
Goal 7: Ensure environmental sustainability.
Goal 8: Develop a global partnership for development.

This study will be focused on goal 1. A less developed economy characterized by persistent poverty among its people is selected for the study. The economy in question is that of Uganda. The period 1971-85 witnessed the Ugandan economy and society collapsing. By 1986, when the National Resistance Movement (NRM) took over power, Uganda had suffered the mismanagement of previous governments, including civil wars and mass emigration of the skilled workers. The performance of this country's economy needs to be reviewed against this background, keeping in mind that Uganda has been and still is recovering from an extended period of instability and disastrous economic policies. (World Bank, 2000)

Uganda is a country that shares many of the structural factors that are generally quoted as responsible for low growth in an African context. For example, it is ethnically diverse, subject to tropical diseases such as malaria, does not have direct access to the ocean, and

had to cope with a large onslaught of AIDS since the late 1980s and a high rate of population growth rate of 3.4 percent (UNFPA, 2005). These obstacles not withstanding, it has over the past decade, managed to achieve some of the highest growth rates in Africa (Deininger and Okidi 2002). Analysis of the factors underlying this performance can help to better understand growth and poverty reduction in an African context.

Given the above context, Uganda's economic performance has been impressive. In the 1990s, GDP grew steadily by more than 6 percent per annum from a low rate of 3 percent in the 1980s (MFPED, 2004) and the proportion of the population living under the poverty line declined from 56 percent in 1993 to 35 percent in 2000 (Appleton, 2001).

It is now widely accepted that economic growth is at least a necessary condition for poverty reduction in Africa (Kanbur, 2001).The high economic growth in the 1990s of Uganda's economy has translated into substantial increases in the living standards of Uganda's poor. (Okidi and McKay, 2003). As noted in the Poverty Eradication Action Plan (PEAP), the country's framework on economic management, governance, security, incomes of the poor, and social services, it is confirmed that there was a clear and impressive decline in the poverty headcount index of over 20 percent over the seven-year period from 1992, and has brought the country closer to reaching the MDGs. (MFPED, 2004). PEAP further reports that average real household income has risen by 17 percent over the period and expenditures of the bottom 10 percent have risen even more by 29 percent.

Despite the substantial progress made in the 1990s, poverty remains a major issue in Uganda. The incidence of poverty increased on average from 35 percent in 1999/2000 to 38 percent in 2002/2003 with the largest increment occurring in eastern Uganda (Appleton and Sewanyana, 2003). This is a threat to the government's PEAP goal of reducing poverty to a 28 percent level by 2014(MFPED, 2004)

1.1 Aim.

The aim of the study is to apply a multiplier decomposition technique developed by Thorbecke and Jung (1994) to the 1999 Uganda SAM, which focuses on poverty alleviation by considering both the direct and indirect effects. To derive the total poverty alleviation effects, the Foster, Greer and Thorbecke (FGT) (1984) P_α class of additively decomposable poverty measures that includes the head count ratio (for $\alpha = 0$), the poverty gap ($\alpha = 1$) and a distributionally-sensitive measure ($\alpha = 2$) are adopted for the study.

It will be shown that poverty alleviation depends on the magnitude of the poverty sensitivity effects, and specifically, poverty elasticities with respect to the mean incomes in the household groups and poverty shares represented as mean income levels. It will further be shown that poverty alleviation effects are highest from agricultural production activities followed by service and industry sectors, respectively.

The study consists of eight sections. **Section two** discusses similar studies on the topic of poverty in developing countries. **Section three** presents an overview of poverty. **Section**

four discusses the theory behind this study. **Section five** reviews the 1999 Uganda SAM as a source of data for multiplier analysis and a source for the analysis of Uganda's 1999 economy and poverty indicators and zonal variations. In addition, as the agricultural sector is a main supplier of resources to the other sectors and remains the backbone of Uganda's economy and presents a great opportunity for poverty eradication, the concept of agricultural surplus is also discussed in this section basing on the Uganda SAM. **Section six** describes the methodology to assess poverty alleviation in Uganda through a decomposition of the SAM multipliers. Whereas **sections seven** and **eight** are devoted to results and conclusion, respectively. References are listed at the end of the thesis.

2. Previous studies:

The origins of the SAM is believed to be found in the by pioneering work of Sir Richard Stone in 1960s which was based on the United Kingdom and other industrialized countries (Pyatt, 2001). His ideas were further developed and used on poverty and income distribution issues in developing countries by Pyatt, Thorbecke and others from early 1970s onwards (Pyatt and Thorbecke, 1976).

SAM-based studies have since followed. Round and Pyatt (1979) applied fixed price multipliers and multiplier decomposition on the SAM for Sri Lanka economy and found that the income multiplier was lower for estate households, (the poorest household) with high incidences of poverty, than for urban or rural household, except when the injection were in the tea or rubber sectors (e.g. an increase in export of tea or rubber). This meant that the indirect effects could not be relied on to alleviate poverty in for the poorest sector and that they needed to be targeted directly. A second observation was that the input-output multipliers were lower than the between –account multipliers. This suggested that more emphasis needed to be placed tracing the income generated to factors and the transmission of this income to household, rather than estimating inter-industry linkages, as the latter are weak.

Powell and Round (2000) applied the SAM multiplier and multiplier decomposition on a 1993 SAM for Ghana. They found out that an exogenous injection of income into the cocoa sector lead to an additional incomes increase more for the urban than the rural household but the increase was much less as compared to the mining sector due to the reduced effects on the mixed income category of factor incomes.

In the case of Indonesia, Thorbecke and Jung (1994) found that agriculture and service sectors could contribute more to poverty alleviation than growth of the industrial sectors. The study also revealed that differences in the contribution of different sectors to poverty alleviation were due to two distributional effects. The direct distributional effects and intersectoral production activity linkages.

Khan (1999) found in the South African case that agriculture, mining and services are sectors where growth would benefit the poor, especially in the rural districts of Platteland and the Reserves. The low impact of some of the manufacturing sectors on poverty alleviation stems from their distributional effects. In particular, they have little direct linkages to the poor South African households. Thus the problem of providing the poor with skills must be addressed directly in the form of education and training.

3. Overview of Poverty.

What is poverty? Poverty is hunger. Poverty is lack of shelter. Poverty is being sick and not being able to see a doctor. Poverty is not having access to school and not knowing how to read. Poverty is not having a job, is fear for the future, living one day at a time. Poverty is loosing a child to illness brought about by unclean water. Poverty is powerlessness, lack of representation and freedom. Most often, poverty is a situation people want to escape. So poverty is a concern for the poor and the wealthy alike. A call to change the world so that many more may have enough to eat, adequate shelter, access to education and health, protection from violence, and a voice in what happens in their communities. To know what helps to reduce poverty, what works and what does not, what changes over time, poverty has to be defined, measured. As poverty has many dimensions, it has to be looked at through a variety of indicators levels of income and consumption, social indicators, and indicators of vulnerability to risks and of socio/political access. (World Bank, Poverty net.)

Poverty has many faces, changing from place to place and across time, and has been described in many ways:

Poverty is humiliation, the sense of being dependent on them, and of being forced to accept rudeness, insults, and indifference when we seek help. – Poor woman, Latvia

Don't ask me what poverty is because you have met it outside my house. Look at the house and count the number of holes. Look at the utensils and the clothes I am wearing. Look at everything and write what you see. Write what is poverty. – Poor man, Kenya

We face a calamity when my husband falls ill. Our life comes to a halt until he recovers and goes back to work. – Poor woman, Egypt (Lyn 2001)

According to the World Bank (2000), poverty is the deprivation in well-being and it views well-being in two ways. The first one is to think of ones well-being as the command over commodities in general, so people are better off if they have a greater command over resources. In this view, the main focus is on whether households or individuals have enough resources to meet their needs. Typically poverty is then measured by comparing an individual's income or consumption with some defined threshold below which they are considered to be poor. This is the most conventional view poverty is seen largely in monetary terms.

The second view to well-being is whether people are able to obtain a specific type of consumption good: do they have enough food or shelter or health care or education? In this view, one would need to go beyond the more traditional monetary measures of poverty: nutritional poverty might be measured by examining whether children are stunted or wasted; and educational poverty might be measured by asking whether someone is illiterate, or by the amount of formal schooling they have received.

Perhaps the broadest approach to well-being and poverty is the one articulated by Sen (1987), who argues that well-being comes from a capability to function in society. Thus poverty arises when people lack key capabilities, and so have inadequate incomes or education, or poor health, or insecurity, or low self confidence, or a sense of powerlessness, or the absence of rights such as freedom of speech. Viewed in this way, poverty is a multi-dimensional phenomenon, and can not be solved by simple solutions. So, for instance, while higher average incomes will certainly help reduce poverty, these may need to be accompanied by measures to empower the poor, or insure them against risks, or to address specific weaknesses such as inadequate availability of schools or a corrupt health service.

3.1 Why measure poverty?

Gathering survey data directly from households takes time, energy and money to measure poverty. There are at least four good reasons for all the effort. (Poverty Manual, 2005)

a. ***To keep the poor on the agenda*****.**

Measuring poverty is a great tool for focusing the attention of policy makers on the living conditions of the poor. Thus it is easy to include the poor on the political and economic agenda.

b. ***To target national and international interventions***.

The poor have to be known who they are before any poverty intervention is carried out. This is the purpose of a poverty profile which details out the major facts on poverty and then examines the pattern of poverty, to see how it varies by geography (by region, urban/rural, mountain/plain, etc.), by community characteristics (e.g. in communities with and without a school, etc.), and by household characteristics (e.g. by education of household head, by size of household). Thus poverty profile supports efforts to target development resources towards poorer areas. A good poverty profile also makes employment targeting possible. The ability of the majority of households to escape poverty will depend on their earnings from employment. The relationship between poverty and education is important because of the key role played by education in raising economic growth and reducing poverty. The better educated have higher incomes and thus are much less likely to be poor.

Targeting is also important at international level. Institutions, such as the World Bank and aid agencies, would like to know how best to use resources in order to combat poverty. For this, they need to know where in the world the poor are located, and this in turn requires information on poverty in every country. However, successful efforts to target policies and programs to help the poor also require an understanding of why they are poor. For instance, does a tax on beans exports help the poor? It will favor urban residents who eat beans and will hurt beans farmers, but more information is needed before we can conclude that the policy would help the poor. Questions such as these cannot be answered adequately without information that measures poverty.

c. ***To monitor and evaluate projects and policy interventions meant for the poor***.

To be able to predict the effects of policies and programs meant to help the poor, it is necessary to monitor the effects and evaluate the outcomes in comparison with a control group. Analysis of this kind is needed both to improve the design of projects and programs, and to weed out ones that are not working. Information on poverty is also helpful in understanding the politics of many government policies. By collecting information on households and their economic status, one can assess who uses public services and who gains from government subsidies. If programs are cut or there is retrenchment of the public sector, poverty data help inform us of the effects of these plans on the poor. Using information on poverty, one can simulate the impact of different policies. The identification of the gainers and losers goes a long way towards determining who will support, or oppose, a given policy.

d. ***To evaluate the effectiveness of institutions whose goal is to help the poor.***

One cannot tell if a government is doing a good job of combating poverty unless there is good information on poverty. This does not only apply to governments. Our dream is a world free of poverty, writes the World Bank. The institutions success in pursuing this goal can only be judged if there are adequate measures of poverty.

4. Theoretical background.

4.1 Measuring poverty

Coudouel et al (2002) identify three components needed in measuring poverty. First, one has to choose the relevant dimension and indicator of well-being or welfare that is defining the standard of living. Second, one has to select a poverty line, that is, a threshold below which a given household or individual will be classified as poor. Finally, one has to select a poverty measure to be used for reporting for the population as a whole or for a population subgroup only. Kanbur (2001) refers to the first two components as the “identification problem" or which individuals are poor, and how poor they are. The third is called the "aggregation problem" or how much poverty there is (Ravallion 1992)

According to Coudouel et al. (2002), when estimating poverty one may use monetary or non-monetary indicator of poverty as an indicator of well being. When using monetary measures, one may have a choice between using income or consumption. The more detailed the information on consumption obtained from household surveys, the better it is as an indicator of poverty measurement than income. Poverty is also associated with non monetary indicators with respect to health, nutrition, literacy, deficient social relations, insecurity, low esteem and powerlessness. The study is based on income per capita as indicator of poverty.

Once the welfare measure is defined at the household or individual level, the next step is to define one or more poverty lines which are cut of points separating the poor from the non poor. Coudouel et al. (2002) indicate two ways of setting a poverty line:
-Relative poverty lines are defined in relation to the overall distribution of income or consumption in a country.
-Absolute poverty lines are set to some standard of what households should be able to count on in order to meet their basic needs. For monetary measures, these absolute poverty lines are often based on estimates of the cost of basic food needs, that is, the cost of a nutritional basket considered minimal for the health of a typical family, to which a provision is added for nonfood needs.

Considering that large parts of the populations of developing countries survive with the bare minimum or less, the absolute rather than the relative poverty line often proves to be more relevant. The study is based on absolute poverty lines.

Given information on a welfare measure such as per capita income or consumption, and a poverty line, then the only remaining problem is deciding on an appropriate measure of aggregate poverty.

A class of additively decomposable measures proposed by Foster, Greer and Thorbecke (FGT) (1984) are adopted for the study. They are the headcount index, the poverty gap

index and the distribution sensitive index. The headcount index, which simply measures the proportion of the population that is counted as poor, often denoted by P_o. Formally,

$$P_o = \frac{n_p}{n} \tag{1}$$

Where n_p is the number of poor. That is the population for whom income or consumption y is less than the poverty line z. n is the total population (or sample). Equation (1) can also be written as

$$P_o = \frac{1}{n}\sum_{i=1}^{n} I(y_i < z) \tag{2}$$

Here, I is an indicator function that takes on a value of one if the bracketed expression is true and zero otherwise. So if (y_i) is less than the poverty line (z), then I equals to 1 and the household would be counted as poor. This is a good measure of poverty for it is easy to understand and communicate. It is also adequate for assessing overall progress in reducing poverty. However, for some purposes, such as analyses of the impacts on the poor of specific policies, the headcount index is inadequate (Ravallion, 1992).

The poverty gap index adds up the extent to which individuals on average fall (depth) below the poverty line and expresses it as a percentage of the poverty line. More specifically, the poverty gap G_i is the poverty line (z) less actual income (y_i) for poor individuals; the gap is considered to be zero for everyone not poor. Using the index function I (.) we have

$$G_i = (z - y_i) I(y_i < z) \tag{3}$$

Then the poverty gap index (P_1) may be written as

$$P_1 = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{z - y_i}{z}\right) \tag{4}$$

It is the sum over all individuals of the shortfall of their real private consumption per adult equivalent and the poverty line divided by the poverty line. As will be shown in section 5.3, this measure can be taken as the cost of eliminating poverty (relative to the poverty line), because it shows how much would have to be transferred to the poor to bring their incomes or expenditures up to the poverty line (as a proportion of the poverty line). The minimum cost of eliminating poverty using targeted transfers is simply the sum of all the poverty gaps in a population.

The poverty gap measure is an indicator of the potential saving to the poverty alleviation budget from targeting. The smaller the poverty gap index, the greater the potential economies for poverty alleviation budget from identifying the characteristics of the poor, using survey or other information, so as to target benefits and programs.

However, it is limited because it is insensitive to how income or consumption is distributed between the poor or severity of poverty. If money is transferred from the very poor to the marginally poor, we might expect this to show up as a decrease in poverty but it does not on the P_1 measure. To satisfy this condition, we need the P_2 measure or the distribution sensitive index.

Formally,

$$P_2 = \frac{1}{n}\sum_{t=1}^{n}\left[\frac{z - y_i}{z}\right]^2 \tag{5}$$

The P_2 indicator also sometimes called the 'squared poverty gap' is the sum over all individuals of the square of the short fall of their real consumption per adult equivalent and the poverty line divided by the poverty line. The reason to square the short fall is to give greater weight to those who are living far below the line.

While this measure has clear advantages for some purposes, such as comparing policies which are aiming to reach the poorest, it is not easy to interpret. For poverty comparisons, however, the key point is that a ranking of dates, places, or policies in terms of P_2 should reflect well their ranking in terms of the severity of poverty. It is the ability of the measure to order distributions in a better way than the alternatives that makes it useful, not the precise numbers obtained.

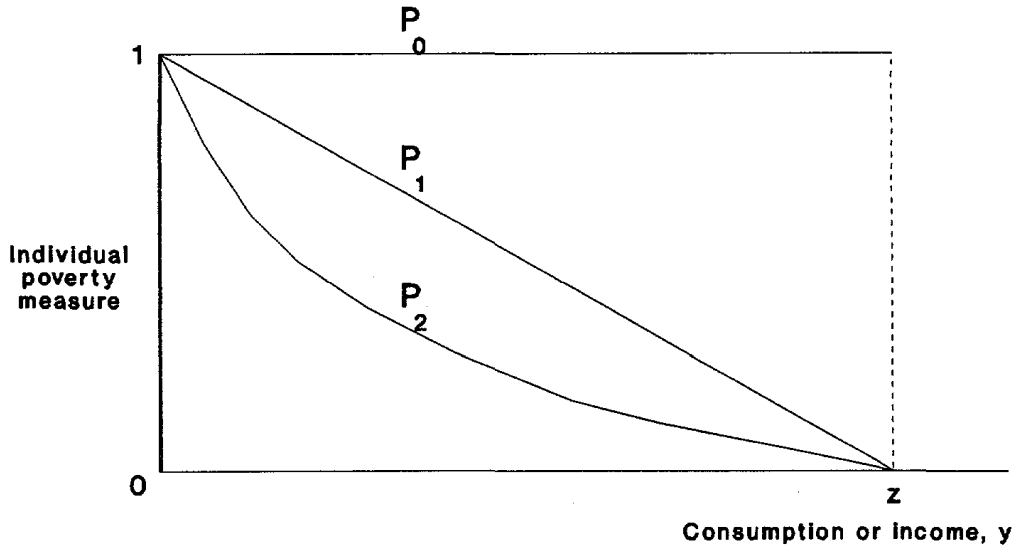
On comparing the above formulae for the three measures a common structure is evident. This suggests a generic class of additive measures:

$$P_\alpha = \frac{1}{n}\sum_{t=1}^{n}\left[\frac{z - y_i}{z}\right]^a, \ \alpha \geq 0 \tag{6}$$

Where α is a measure of the sensitivity of the index to poverty. When parameter α = 0, P_0 is simply the head-count index. When α=1, the index is the poverty gap index P_1, and when α is set equal to 2, P_2 is the distribution sensitive index.

Figure 1 shows how the relationship between individual poverty and standard of living varies across the different values of α. The higher the value of α the more sensitive the measure is to the well being of the poorest person. As α approaches infinity the measure collapses to one which only reflects the poverty of the poorest person.

Figure 1: Individual poverty measures



Source: Ravillion (1992)

5. Data

5.1. The 1999 Uganda Social Accounting Matrices. (SAM)

What is a SAM? A SAM is a representation of the macro and micro economics of a socio-economic system, which shows the transactions and transfers between all economic agents in the system (Reinert and Roland-Holst, 1997).

Like other economic accounting systems it records transactions taking place during an accounting period, usually one year. The main features of a SAM are three- fold: Firstly, the accounts are represented as a square matrix; where the incoming and outgoings for each account are shown as a corresponding row and column of the matrix. The transactions are shown in the cells, so the matrix displays the interconnections between accounts in an explicit way. Secondly, it is comprehensive in that it shows all the economic activities of the system i.e. consumption, production accumulation and distribution and finally, it is flexible in the degree of desegregation and in the emphasis placed on different parts of economic system despite the fact that it is usually set up in a standard, basic framework. As it is an accounting framework, not only is the SAM square but the corresponding row and column totals be must equal. (Table 1).The main feature of a SAM is that households are at the heart of the accounting framework. Only if there is some detail on the distributional features of the household sector can the framework earn its name 'social' accounting matrix. (Round, 2003).

Figure 2 describes the flow of incomes from commodity markets through factor payments to households and back to commodity markets through expenditures on final goods. Additionally, income flows involving enterprises, government, rest of the world, and the capital (saving and investment) account are mentioned.

The 1999 Uganda SAM was developed at IFPRI and constructed using data on macro-economic aggregates, external trade flows and value added by sector from 1999, the 1999/2000 Uganda National Household Survey, and the 1992 input-output table.1999 was chosen as the base year for the Uganda SAM since the last national household expenditure survey was conducted in that year. (Dorosh and Moataz, 2004).

The macro SAM (table 1) reflects the following relationships and income flows among the various accounts.

Activity or production accounts.
This account is used to buy raw materials and intermediate goods (e g veterinary services, animal and chicken feed, electricity and postage /communication) and hire factors to produce commodities. The receipts come from sales in the domestic market. The SAM distinguishes between consumption out of own production by households (about 11 percent of total household expenditures in1999) and marketed consumption.

Commodity accounts.
The commodity account records imports and domestic- produced commodities including services from the trade sector which are represented as marketing margins and pay indirect tax and tariffs on imports. In the process of marketing domestic output, the marketing margins represent the cost of moving the commodity from the producer to the domestic market. For imports, it represents the cost of moving the commodity from the border (adding the CIF) to the domestic market while for exports, it shows the cost of moving the commodity from the producer to the border (reducing the FOB). Marketing margins constitute of the total supply.

Marketing margins play an important role in determining the price of a commodity. How a change in the market price will affect consumer and producer prices in a given region will depend on the size of the margins. As the size of the margin increases, a smaller amount of the changes in market prices are transmitted to consumers. In addition, larger margins will emphasize changes in producer price because a larger producer price change is required to achieve the same consumer price change. Increase in marketing margins also means that households will have an excess of own consumption and less to market.

The receipts proceeds from sales on the domestic market of intermediate products to activities, marketing margins, final goods to households and government for consumption, investment goods to the saving-investment account, and finally the export of commodities to the rest of the world .

Factors.
Factors include labor, capital and land. They receive payments from the sale of their services to activities in the from of wages and rent. Likewise factor account pays all its earnings to wages and salaries to households.

Households.
Households incomes consist of factor incomes described above, transfers from the government (social security and subsidies), and transfers from abroad from the rest of the world account (e.g. remittances, grants). This income is allocated as follows: consumption out of own production, household consumption, direct taxes and the rest is household savings.

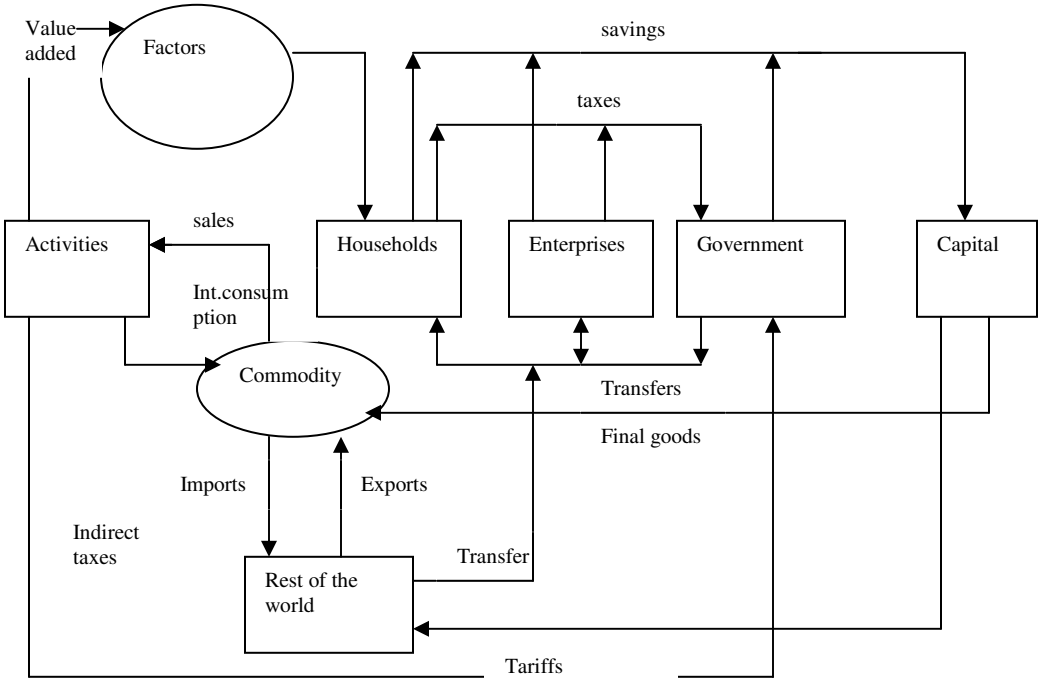
Government.
As described above, the government receives revenue as taxes levied on various accounts in the economy. The SAM includes the following taxes: institutional tax, import tax and commodity tax. The government also receives income as transfers from abroad in the form of grants. The revenue from these taxes is spent on goods and services provided by the activity account, transfers to the household accounts in the form of social security and grants and the remaining as investment-saving.

Table 1. 1999 Uganda Macro SAM, (billions Ushs)

	Activity	Commodity	Factors	Households	Government	Rest of the world	Saving Investment	Institutional tax	Import tax	Commodity tax	Total
Activity		Domestic Market **11,780.48**		Own consumption **985.5**							Domestic production **12,765.98**
Commodity	Intermediate inputs **4,427.07**	Marketing margins **1,404.43**		Household consumption **7,038.39**	Government consumption **1,025.7**	Export **1,064.16**	Investment **1,562.01**				Domestic demand **16,521.82**
Factors	Wage/rent **8,338.91**										Gross national product at factor cost **8338.91**
Households			Income **8,338.9**		Transfer **39.04**	Transfers **619.54**					Household incomes **8,997.50**
Government						Transfers **505.32**		Direct tax **227.81**	Tariff **464.37**	Indirect tax **278.82**	Government Income **1,476.3**
Rest of the world		Import **2,593.72**									Imports **2,593.72**
Saving-Investment				Household savings **745.80**	Savings **411.51**	Capital transfers **404.7**					Savings **1,562.01**
Institution tax				Direct tax **227.81**							Government Income **227.81**
Import tax		Tariff **464.37**									Government Income **464.37**
Commodity tax		Indirect tax **278.82**									Government Income **278.82**
Total	Cost of production **12,765.98**	Domestic supply **16,521.82**	Factor outlay **8338.91**	Household expenditure **8,997.50**	Government Expenditure **1,476.3**	Foreign exchange earnings **2,593.72**	Investment **1,562.01**	Institution Tax **227.81**	Import tax **464.37**	Commodity tax **278.82**	

Source: 1999 Uganda SAM. Dorosh and Moataz (2004)

Figure 2. The circular flow of income.



Source: Adapted from Chung-.I li (2002)
Note: Arrows show the direction of payments

The rest of the world.
The total foreign exchange earnings in the Uganda SAM come from: export of goods and services (foreign payments to the commodity account), foreign remittances to the household account, and transfers from abroad to the government account and capital transfers to the saving-investment account. The expenses of this account constitute entirely of import purchases (foreign expenses to the commodity account).

Saving-investment.
Total investment expenditure of the economy comprises entirely of private sector investment, i.e. an earning to the commodity account. The account collects savings from both the government and households and net foreign net transfers (foreign savings) from the rest of the world account which constitute total savings of the economy.

Institutional tax, import tax, commodity tax.
These are taxes paid to the government, described above. Institutional tax is paid by households account, import and commodity taxes are paid by the commodity accounts. Three accounts are necessary because the economic interpretation of some payments may otherwise not be clear.

5.2 Structure of the 1999 Ugandan Economy.

The micro SAM reflects the structure of the 1999 Ugandan economy.[1] Table 2 describes the accounts in the 1999 Uganda SAM. A total of 26 commodities are specified, including one, agricultural chemicals, for which the total supply comes from imports. The SAM includes 81 activities, each producing a single commodity. In agriculture (with a total of 69 activities), most commodities are produced by activities that are disaggregated into six rural, agro climatic zones, listed at the bottom of table 2. Outside agriculture, a single activity produces each commodity (except for the non-produced import).

Table 2. Accounts in the 1999 Uganda SAM

Commodities (26)
Agriculture **(12)**
Coffee, Other Cash Crops (tea, cotton, sugar, and tobacco), Maize, Sorghum/Millet, Cassava, Sweet Potatoes, Matooke, Horticulture, Other agriculture, Livestock, Forestry, Fishing
Industry **(7)**
Meat and dairy processing, Coffee processing, Grain milling, other beverages, Textiles and leather, Manufacturing Agric chemicals, Petroleum and other chemicals
Services **(6)**
Utilities, Construction, Commerce, Transport, Private services, Public services
Activities (81): Same as commodities with the following modifications: (i) for agriculture, activities are disaggregated by zone; (ii) no activity corresponds to Agricultural chemicals, an import without domestic production
Factors of production (9)
Capital, skilled labor, unskilled labor, Land (agriculture by zone)
Households (9)
Urban poor, urban non poor, Farmers by zone, non farm rural.
Farmers, (by zone)
Other institutions (2)
Government, Rest of the world

Source: Dorosh and Moataz (2004)

Factors and households related to agriculture are also disaggregated by zone. Households are divided into urban and rural households. Urban households are further split into poor and non-poor. Rural households are divided into rural farm households (which are disaggregated by zone) and non-farm rural households.

The reading of the micro SAM shows the following features of the 1999 Ugandan economy summarized in Table 3.

a. *Sectoral structure of domestic production and value added.*

Uganda's economy in 1999 was characterized as both an agricultural and service production base. Agriculture represents 32.5 percent, the service sector 47.7 percent and the industry sector 19.73 percent of domestic production. Agriculture contributes 45.79 percent, the service sector 44.23 and the industry 9.98 percent of GDP at factor cost .The two largest sectors in the economy come from the service sector; i.e. private sector with 13.94 percent of GDP and Trade with 12.24 percent. The biggest agricultural sector was

[1] Micro SAM is available on IFPRI website at 'http: //www.ifpri.org/data/uganda04.htm.'

livestock at 7.34 percent of GDP followed by horticulture at 6.89 percent.

b. *Sectoral difference in income generation.*
Differences exist between sectors whose production mostly generates value added and sectors with high intermediate demand. Agriculture and services account for 91.8 percent and 60.5 percent of their production as value added, respectively. In contrast with the industry sector, with high intermediate demand and only 33.0 percent of its production distributed in value added.

c. *Import dependency and import tariff rates.*
As measured in the columns of commodity accounts, the industry sector imports the biggest share of supply at 83.8 percent and taxed at a rate of 17.9 percent. Manufacturing sector (e.g. factory machinery and consumer goods) the biggest sector with 48.3 percent and taxed at a rate of 14.2 percent, followed by petroleum and chemicals *(e.g.* motor fuel) at 20.0 percent and being taxed at 44.5 percent. Among the service sector, which imports 15.1 percent of the supply, private services imports the biggest share with 7.4 percent and taxed at 6.5 percent, followed by transportation (*e.g*. Bus, taxi services) at 6.7 percent of domestic supply. The agricultural sector constitutes only 1 percent import of the domestic supply, the biggest coming from other agriculture (*e.g*. wheat).

d. *Structure of external trade*.
Imports are dominated by manufactured goods at 48.3 percent and the exports by processed coffee at 41.9 percent. The balance of trade is negative as noted by comparing total imports (2,593.72 billion Ushs) to total exports (1,064.16 billion Ushs). The agricultural export sector only generates 8.2 percent of total exports with the highest contributor being fishing, followed by other agriculture, horticulture and maize the lowest. The low figure of 8.2 percent is due to the fact that processing of the traditional export crops i.e. coffee, cotton, tea and tobacco, have been included under the industry sector thus implying 66.4 percent figure. The highest export figure among the service sector comes from private sector at 15.1 percent, followed by the transport sector at 8.3 percent and lastly by utility (*e.g*. electricity) at 1.8 percent which exports 14.4 percent of its out put.

e. S*ources of household incomes.*
53 percent of the total households income comes from wages the rest comes from land and capital (in the form of rent) owned by households. Households that receive the highest share of income from unskilled labor are the farmer households at 71.1percent of total unskilled labor followed by non rural farm at 20.6 percent. Urban non poor are the only households receiving income from skilled labor who also get the highest income from capital at 73.6 percent. Capital ownership provides only 7.6 percent of farmers' income. The farmer households receive the highest percentage of income from land at 81.2 percent and urban non poor get only 0.3 percent of their income from land.

f. *Macroeconomic features.*
The investment rate in the economy is 18.7 percent of GDP with 69.8 percent of total investment in construction, 2.8 percent in manufacturing and the rest in transport.

Table 3. Structure of the 1999 Ugandan Economy.

	Output	Value Added	Exports	Imports	Export/ Output
	%	%	%	%	%
Sector ▼					
Agriculture [a]					
Coffee	2.56	3.06	-	-	-
Other cash crops [b]	1.28	1.30	-	-	-
Maize	1.94	2.86	0.87	-	3.55
Sorghum/millet	2.36	3.48	-	-	-
Cassava	1.81	2.67	-	-	-
Sweet Potatoes	1.73	2.55	-	-	-
Matooke	4.35	6.41	-	-	-
Horticulture	4.68	6.89	1.21	-	1.72
Other agriculture [c]	3.75	5.52	2.09	0.84	5.90
Livestock	5.03	7.34	-	0.13	-
Forestry	1.35	1.51	-	0.02	-
Fishing	1.73	2.20	4.11	0.01	15.87
Total	**32.56**	**45.79**	**8.27**	**1.00**	
Industry					
Meat and Dairy	0.93	0.42	-	2.24	-
Coffee processing	3.13	0.33	41.92	-	98.43
Grain milling	0.59	0.26	-	0.67	-
Other	8.38	4.73	8.36	1.85	6.86
Textiles	0.94	0.59	0.46	9.22	3.33
Manufacturing	4.75	3.22	15.75	48.39	23.36
Agric chemicals	-	-	-	1.37	-
Petroleum, other chemicals	1.00	0.44	-	20.07	-
Total	**19.73**	**9.98**	**66.48**	**83.82**	
Services					
Utility [d]	1.05	1.31	1.81	0.18	14.46
Construction	10.52	8.00	-	0.17	-
Trade	10.60	12.24	-	0.69	-
Transportation	7.56	4.95	8.31	6.73	9.16
Private services [e]	12.36	13.94	15.12	7.41	10.23
Public services	5.66	3.79	-	-	-
Total	**47.71**	**44.23**	**25.24**	**15.18**	
Total	**100.0**	**100.0**	**100.0**	**100.0**	
Agriculture	**33.65**	**44.44**	**6.87**	**1.01**	
Non-agriculture	**66.35**	**55.56**	**93.13**	**98.99**	

Source: Dorosh and Moataz (2004)

[a] Agriculture data have been aggregated across zones

[b] Includes tea, cotton, tobacco and cocoa

[c] Includes for example fruits, beans, ground nuts and sesame seeds

[d] Electricity, water and post and telecommunication.

[e] Subsistence farmers, traders, processors and service providers in rural finance, media, land surveying and legal profession.

The balance of payment deficit, an indication that the payments are less than receipts in transactions with other countries, is 5.0 percent. The deficit is mostly due to transfers abroad, as debt service, and capital flight (assets or money flowing out of the country) by households and the government. Total government expenditure (1476.3b Ushs) less saving (411.5b Ushs), plus capital expenditure [2] (624.8bUshs) account for 20.2 percent of GDP. Of the government budget, 60.7 percent is spent on consumption (*e.g.* administration and payment to private service), 36.9 percent on investment (*e.g.* construction, transport) and 2.3 percent to transfer to households (*e.g.* remittances, subsidies). The government deficit amounts to 14.4 percent of its revenue of 1476.3b Ushs

5.3 Uganda poverty indicators and zonal distributions.

Poverty statistics for the 1999/2000 surveys for the different agro-climatical zones and household groups in the 1999 Uganda SAM are presented in table 4. Along with the poverty statistics, the percentage of people in each zone, rural and urban household groups and their mean household CPAE is reported.

The P_0 indicator shows the percentage of individuals estimated to be living in households with real private consumption per adult equivalent below the national and zonal poverty lines. (Table 4). This implies that 34 percent of Ugandans are estimated to be in households which spend less than what is necessary to provide their calorie needs and a mark up for non-food needs like clothing and shelter, or below the absolute national poverty line of about 24 USD or 35,702 Ushs consumption per adult equivalent per month (estimated at the prevailing 1999 exchange rate).This is comparable to the '1 dollar a day' poverty line sometimes used for international poverty comparisons by the World Bank. Zone six has about 64 percent of the population below the zonal poverty line of 20,637 Ushs. Zones one and two have only 19.7 percent of population below its zonal poverty line. The poor are mainly found in rural areas, where about 37.4 percent of the population is poor, compared to 9.6 percent in urban areas. The table further shows that 96.3 percent of the poor in Uganda live in the country side, while only 37.4 percent of the population is considered poor.

Analysis of the data taking into account the poverty gap reveals that the national average poverty gap in Uganda in 1999/2000 was 10.0 percent. This implies that on average, every poor person would have required an additional Ushs 3,570 per month to reach the national poverty line (*i.e.* 10.0 percent of the Ushs 35,702 poverty line). Zone 6 has the highest poverty gap of about 25 percent or 5,159 Ushs for an average person to reach the zonal poverty line. Zones 1 and 2 have the lowest figure of 4.4 percent or 2,211 Ushs. This does not suggest, however, that cash transfers, even if perfectly targeted, are either practically feasible or the best policy option for alleviating poverty.

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[2] The SAM does not differentiate between private and government investments. For analytical purposes, I have allocated 40 percent of it to government investment.

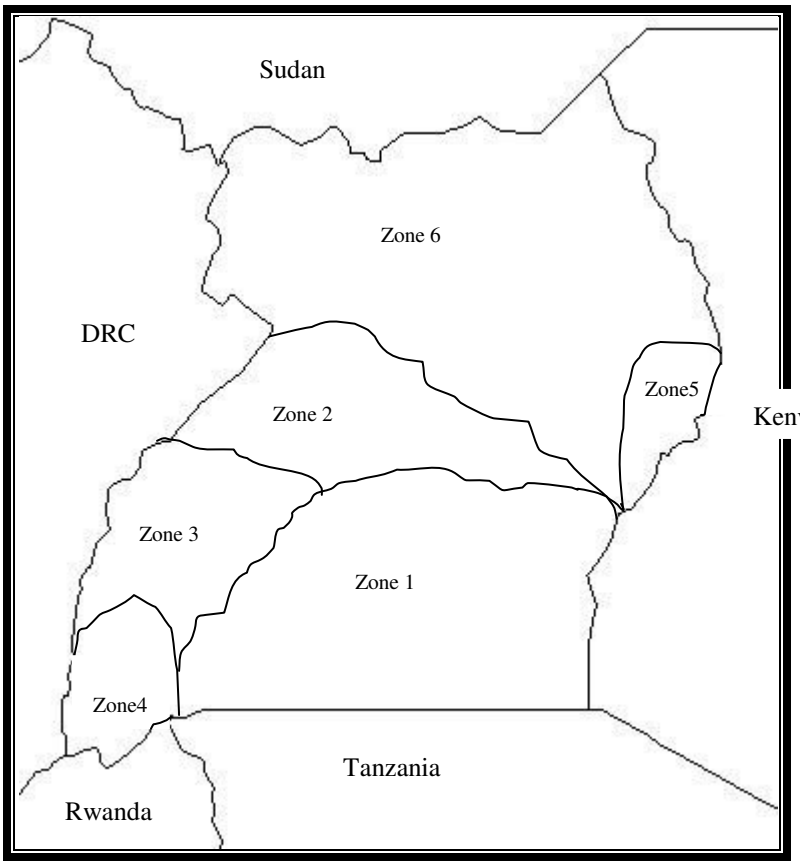
Table 4. Poverty indicators and zonal distribution. 1999/2000.

Zone	Pop Share %	Mean CPAE (Ushs)	P_0 %	P_1 %	P_2 %	Contribution to poverty P_0 %	Contribution to poverty P_1 %	Contribution to poverty P_2 %
National	100	35,702	33.8	10.0	4.25	100	100	100
Zone 1&d 2	28.9	50,270	19.7	4.4	1.47	16.9	12.8	10.0
Zone 3 & 4	25.4	34,408	26.2	6.1	2.07	19.7	15.6	12.4
Zone 5	26.6	31,869	35.0	9.3	3.61	27.5	24.8	22.6
Zone 6	19.0	20,637	63.7	24.6	12.31	35.9	46.9	55.1
Urban	13.1	75,043	9.6	2.1	0.68	3.7	2.7	2.1
Rural	86.9	29,778	37.4	11.2	4.79	96.3	97.3	97.9

Source. Dorosh and Moataz (2004) and UNHS(2002/2003)

Zone 1: Lake Victoria Crescent (high potential, bimodal rainfall, moderate elevation)
Zone 2: Central and western areas .Medium Potential (bimodal rainfall, moderate elevation)
Zone 3: Southwest moderate elevation Low Potential (bimodal rainfall,)
Zone 4: Southwest Highlands (high potential, bimodal rainfall)
Zone 5: Eastern Highlands (high potential, uni-modal rainfall)
Zone 6: Much north eastern and parts of north and eastern (low and medium potential, uni-modal rainfall, moderate elevation)
Urban: Urban poor and urban non poor
Rural: Farmers and Non farm rural.

Map 1: Uganda agro climatic zones.



Source: Partitioning based on Dorosh and Moataz (2004)

For example, in 1999, UNHS 2002/2003 reports that 56 percent of the age group 15 years and above in Uganda had no kind of primary education. Implying that many Ugandans above the Ushs 35,702 poverty line did not have adequate education and therefore providing such a transfer would still have insufficient finance for primary education to all Ugandans. However, decision makers could use this information to identify areas of deep poverty and to estimate how much it would cost to raise standards of living in such areas.

The poverty gap figures also show that poverty among rural people is deeper than urban people. Thus while the contribution to national poverty shown by P_0 for rural areas is 96.3 percent, the poverty gap, P_1 (which measures the both the proportion of the population that is counted as poor and the depth of poverty, see equation 4, page 9.) is 97.3 percent.

The fact that the P_2 measure emphasizes on how far below the poverty line the poor are, 97.9 percent, shows that poverty is deeper in rural areas. Zone 6 has the highest percentage of 12.31. Zones 1 and 2 have the lowest figure of 1.47 percent.

Several factors account for the current disparities in the incidence of poverty, including insecurity, climatic variations, HIV/AIDS incidence, type of agricultural activity and the degree of access to infrastructure and social services. Vulnerability to external shocks is another factor that continues to negatively impact on the economic and social gains. (MFPED 2005)

5.4 Agricultural Surplus:

The idea of agricultural surplus has been central to the history of economic thoughts on development. It has been used to show a variety of different transfers from agriculture to the rest of the economy. This resource transfer could be used for example as consumption of services and manufactured goods and payment of taxes to the state. Sadoulet and De Janvry (1995) quote that Kuznets (1965) summarizes the contributions of agriculture to the economy as supplying food and raw materials, providing a surplus of savings, generating income for the rural population that will raise demand for products of other expanding sectors and relaxing the foreign constraints.

The agricultural sector remains the backbone of Uganda's economy and presents a great opportunity for poverty eradication. In 1999 the sector accounted for about 49.1 percent. of GDP (1999 Uganda SAM), generated about 90 percent of export earnings and employed 80 or more percent of the labor force. It also provides the base for a number of manufacturing and processing industries. Agriculture therefore represents a resource for other sectors in Uganda. 85 percent or more of the population live in the rural areas where they are engaged wholly or predominantly in agriculture and smallholders account for practically the entire agricultural output; it is estimated that there are 2.5 million farm households, of which 80 percent cultivate less than 2.5 hectares of land each. (UNHS, 1999/2000). Thorbecke and Morrisson (1990) have suggested using the framework of the SAM to define the agricultural surplus. This is done by constructing a SAM which

Table 5: Social accounting matrix distinguishing between agriculture *A* and non-agriculture *N*.

		Categories of incomes →	**Activities / Commodities**		**Factors**				**Institutions:**		**Government**	**Savings**		**Rest of the world**		**Total income**
	Categories of expenditure ↓				Labor		Capital		Households							
			A	*N*	*A*	*N*	*A*	*N*	*A*	*N*		*A*	*N*	*A*	*N*	
1	**Activities/ Commodities**	*A*	X_a^a	X_a^n					C_a^a	C_a^n	C_a^g	I_a^a		E_a^r		Y_1
		N	X_n^a	X_n^n					C_n^a	C_n^n	C_a^g	I_n^a	I_n^n		E_n^r	Y_2
2	**Factors** Labor	*A*	VL_a^a	VL_a^n												Y_3
		N	VL_n^a	VL_n^n												Y_4
	Capital	*A*	VK_a^a	VK_a^n												Y_5
		N	VK_n^a	VK_n^n												Y_6
3	**Institutions** Households	*A*			L_a^a	L_a^n	K_a^a	K_a^n	TR_a^a	TR_a^n	TR_a^g			TR_a^r		Y_7
		N			L_n^a	L_n^n	K_n^a	K_n^n	TR_n^a	TR_n^n	TR_n^g				TR_n^r	Y_8
4	**Government**		TI_g^a	TI_g^n				K_g^n	TD_g^a	TD_g^n	TR_g^g					Y_9
5	**Savings account**	*A*							S_a^a	S_a^n	S_a^g			S_a^r		Y_{10}
		N							S_n^a	S_n^n	S_n^g				S_n^r	Y_{11}
6	**Rest of the world**	*A*	X_r^a				K_r^a		C_r^a			I_r^a				Y_{12}
		N		X_r^n				K_r^n		C_r^n	C_r^g		I_r^n			Y_{13}
	Total expenditures		Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9	Y_{10}	Y_{11}	Y_{12}	Y_{13}	

Source: Thorbecke and Marrisson (1990)

distinguishes between agriculture (*A*) and non-agriculture (*N*) in all the accounts as shown in table 5. In the present treatment, the surplus is defined as a flow of resources from agriculture to non-agriculture which is not compensated. For example, if farmers pay direct taxes to the state and the latter does not provide any services benefiting agriculture, the surplus transferred is equal to the direct taxes. In contrast, if the state provides services to agriculture, the surplus would amount to the taxes levied on agriculture minus the value of these services.

The notation of the transactions is such that the superscripts indicate the sector of origin of the money flows of transactions and subscript for the sector of destination of the money flow. Conversely, subscripts indicate the sector of origin of physical flows (goods and factors) and superscripts the sector of destination. Thus the direction of flow is from north to south and vice-versa for physical flows[3]. Thus C_n^a represents the consumption of (*N*) goods by the (*A*) households (a physical flow) as well as a corresponding expenditure of agriculture households on non agricultural goods (a monetary flow). Some transactions may however be purely monetary such as private transfers for (*N*) to (*A*) households, TR_a^n or physical flow such as free maize rations from government to (*N*) house holds *i.e.* no compensation in the opposite direction. Subscripts *a*, *n*, *g* and *r* refer to agriculture, non-agriculture, government and the rest of the world, respectively.

Since by definition the total incomes accruing to a given account equal the total expenditures of the same account, the first and second accounts can be written as follows:

Agricultural production activities

$$C_a^a + C_a^n + X_a^a + X_a^n + C_a^g + I_a^a + E_a^r = VL_a^a + VL_n^a + VK_a^a + VK_n^a + X_a^a + X_n^a + TI_g^a + X_r^a \qquad (7)$$

Non agricultural production activities

$$C_n^a + C_n^n + X_n^a + X_n^n + C_g^g + I_n^a + I_n^n + E_n^r = VL_a^n + VL_n^n + VK_n^n + VK_n^a + X_a^n + X_n^n + TI_g^n + X_r^n \qquad (8)$$

and consequently for other accounts.

By adding equations corresponding to the agricultural accounts 1,3,5,7, 9, 10 and 12 and through appropriate arrangement of terms, Thorbecke and Morrisson (1990) obtain the following expression:

$$\begin{aligned}
&\left[\left(C_a^n + C_a^g + X_a^n + VL_a^n + VK_a^n\right) - \left(C_n^a + X_n^a + VL_n^a + VK_n^a\right)\right] \rightarrow A_d \\
&+\left[\left(L_a^n + K_a^n\right) - \left(L_n^a + K_n^a\right)\right] \rightarrow B_d \\
&= \left(TR_n^a - TR_a^n\right) \rightarrow C_d \\
&+\left(S_n^a - S_a^n\right) \rightarrow D_d \\
&+\left[\left(TD_g^a + TI_g^a\right) - \left(TR_a^g + S_a^g\right)\right] \rightarrow E_d \\
&+ I_n^a
\end{aligned} \qquad (9)$$

[3]For a detailed description of transaction on the SAM see Thorbecke and Morrisson (1990)

$$A_d + B_d = C_d + D_d + E_d + I_n^a \quad (10)$$

Table 6 was derived from the 1999 Uganda SAM which conforms to its format. The values of the various component flows of agricultural surplus equation (10) were also derived from the same table.

A_d is the net outflow of consumer goods, intermediate inputs and primary inputs from agriculture to non-agriculture, i.e., it is equal to the sum of:

- consumption of final (*A*) goods by (*N*) C_a^n,
- consumption of intermediate (*A*) goods by (*N*) X_a^n,
- government consumption of (*A*) goods C_a^g, and
- the returns on agricultural primary inputs used in (*N*) activities VL_n^a and VK_n^a

.minus the sum of:

- consumption of final goods and intermediate (*N*) goods by (*A*), C_n^a and X_n^a.
- (*N*) primary inputs used in the production of (*A*) goods VL_n^a and VK_n^a respectively.

The SAM indicates no values for non agricultural primary inputs used in the production of agricultural products VL_n^a and VK_n^a. Rather than leaving it at zero and for analytical purposes, I have attributed 50 percent of the sum (Y_1) of the value added, intermediate inputs and indirect taxes to each of them. In the case of Uganda,

A_d = (1362.8 + 0.0 + 1099.8+ 2130.5+ 1972.9) - (2453.5+ 277.0 + 4245.6+ 4245.6) = -4655.7 billion Ushs.

B_d is the net outflow of labor services and capital services from (*A*) to (*N*), giving a net inflow of wage and rental income from (*N*) to (*A*). Labor services and investment of households into non agriculture activities are normally larger than compared to urban involvement into agriculture. I have allocated 100 percent of the sum of incomes accruing to agricultural households (Y_7) to L_a^n and K_a^n each as the SAM indicates no values for these elements. On this assumption B_d = (4886.4+4886.4) - (1173.2+2174.9) = 6424.7 billion Ushs.

C_d is the net monetary transfer of private remittances from (*A*) to (*N*) households. Its sign depends on whether there are more remittances from rural to urban areas. In the Uganda case this figure is expected to be negative and I have assumed that there are no remittances from the rural area to the urban. A figure of 113.4 billion Ushs is allocated to it. (0-113.4)

D_d represents the net savings from agriculture to non agriculture and is equal to 453.0 billion Ushs

E_d is the net monetary transfer from agriculture to the government i.e. taxes paid by agriculture, government monetary transfers to agricultural households and the

Table 6. 1999 Uganda SAM distinguishing between agriculture and non-agriculture in billions Ushs.

Categories of income → / Categories of expenditure ↓		Activities		Factors				Households		Government	Saving		Rest of the world		Total Incomes
				Labor		Capital									
		A	N	A	N	A	N	A	N		A	N	A	N	
Activities	A	3800.29	1099.82					2140.33	1362.9				88.05		**8491.39**
	N	277.03	12401.57					2453.57	2067.1	1025.7	1562.01			976.09	**20763.07**
Factors Labor	A	1934.68	2130.53												**4065.21**
	N		417.28												**417.28**
Capital	A	1883.47	1972.95												**3856.42**
	N														
Households	A			2891.96		1681.48							313.01		**4886.45**
	N			1173.25	417.28	2174.9				39.04				306.53	**4111**
Government		278.82	464.37						227.81				505.32		**1476.32**
Savings	A							292.53	453.25	411.51			404.7		**1561.99**
	N														
Rest of the world	A	317.08	994.08												**1311.16**
	N		1282.55												**1282.55**
Total expenditure		**8491.37**	**20763.15**	**4065.21**	**417.28**	**3856.38**		**4886.43**	**4111.06**	**1476.25**	**1562.01**		**1311.08**	**1282.62**	

Source: Calculations by the author basing on the 1999 Uganda Macro SAM

government savings for agricultural investment[4] The net of the first two elements is usually negative, representing a tax on agriculture. The last element, government savings for investment in agriculture, gives the distribution of the use of tax revenues in public goods. In the case of Uganda, E_d = -132.6 billion Ushs. This indicates a net transfer from the rest of the economy to agriculture through the government. This result can be justified in the case of Uganda, where coffee is a large source of government revenue. (0+278.8)-(0+411.5) = -132.6 billion Ushs. Finally, I_n^a is investment from non agriculture to agriculture and has a figure of 1562.0 billion Ushs.

The value of the net surplus of products, and factors from the agriculture sector to non-agriculture are represented by the left hand side of the equations (9) and (10). It is the net physical outflow of agricultural goods and resources (primarily labor). The right hand side of the equation gives the compensatory monetary and capital flows, i.e. the net private transfers, and the net savings from agriculture to non-agriculture, the net transfer from agriculture to the government and investment from non-agriculture into agriculture.

Alternatively, identity (10) indicates that investment into agriculture from non-agriculture I_n^a equals the difference between the net physical outflows of goods and resources from agriculture and the net monetary outflows of agriculture in the form of net transfers, net savings and net transfers to the government.

The domestic agricultural surplus can therefore be defined as the net (monetary) flow from (A) to the (N) sector used to buy physical the net physical flows from (A) to (N) consisting of net flow of food, intermediates (A) goods and agricultural factors to (N). The relationship above shows that it is exactly compensated by a net financial inflow into agriculture, in the form of transfers and savings from (N) to (A).

However, goods and services provided freely or subsidized by the government[5] to agricultural households is not indicated in the net transfer from agriculture to the government (E_d). These are not included in the SAM. The net monetary outflow from (*A*) to (*N*) has to be corrected for the subsidy-equivalent value of (*A*) and (*N*) goods and services received by (*A*) households from the government. Let $\alpha(0 \le \alpha \le 1)$ represent the actual subsidy equivalent, then

$$\alpha(C_a^g + C_g^a) = F_d \tag{11}$$

Where is the monetary value of the free or subsidized goods and services received by the (*A*) house hold from the government.

Subtracting from both sides of the equation (10) yields

$$A_d + B_d - F_d = C_d + D_d + E_d - F_d + I_n^a \tag{12}$$

and define the domestic agricultural surplus , SU_d , as

$$SU_d = C_d + D_d + E_d - F_d = A_d + B_d - I_n^a - F_d \tag{13}$$

[4] e.g. agricultural research, advisory services, policy formulation and management.

[5] e.g. UPE free education program, national agricultural advisory services, or free distribution of food to displaced households due to civil strife .

It can be verified that identity (10) holds i.e.,

$$A_d + B_d = C_d + D_d + E_d + I_n^a$$

$$-4655.7+6424.7= -113.4+453.0 -132.6+1562.0$$

$$1769 = 1769 \qquad (14)$$

Thus the domestic surplus for Uganda in 1999 could be estimated to be:

$$SU_d = C_d + D_d + E_d - F_d = A_d + B_d - I_n^a - F_d$$

$$=-113.4+453.0-132.6-=-4655.7+6424.7-1562.0-$$

$$=207- F_d =207- F_d \qquad (15)$$

Thus in 1999, it appears that the domestic agricultural surplus in Uganda was positive and was about 2.5 percent of GDP at factor cost. This means that the (N) sector received a net excess of goods and factors from (A) sector.

Thus the three components of this positive surplus consisted of; (a) marginal net receipt of private transfers by agricultural households amounting to 113.4 billion Ushs;(b) a net flow of savings out of (A) amounting to 453.0 billion Ushs; (c) a net positive public transfer from government to (A) of 175 billion Ushs and (d) subsidies received from the government = $\alpha(0+1025.7) = \alpha(1025.7)$.

Looking at the domestic agricultural surplus from the right hand side of the equation yields the following; (a) a net excess of consumption by agriculture of final goods, intermediate inputs and primary inputs from (*N*) of 4655.7 billion Ushs and; (b) a net surplus of factors moving out of agriculture giving a net inflow of wage and rental income into agriculture of 6424.7 billion Ushs, from which 1562.0 billion Ushs and have to be subtracted.

However, Thorbecke and Morrisson caution that the procedure developed in determining agricultural surplus is based on the assumption that all transactions and flows appearing in the SAM were or could be expressed as equilibrium prices and is a reliable analysis tool for a specific period, in this case 1999.

6. Methodology:

6.1 Multiplier analysis:

As is elaborated in Thorbecke and Jung (1994), the SAM can be used to estimate the effects of exogenous changes and injections, such as increases or decreases in the demand for specific products (sectoral outputs), on the whole socioeconomic system but on the assumption that there is excess in capacity so prices remain stable and that the expenditure propensities of endogenous accounts remain constant and that the technology and resources are for a specific period.

The logic of the methodology is to break down the SAM accounts into endogenous and exogenous accounts. Endogenous accounts are those for which changes in level of expenditures directly follow any changes in incomes, while exogenous accounts are those for which it is assumed that the expenditures are independent of incomes. In this study the government, rest of the world and savings accounts are exogenous[6] and the factors, household groups and sectoral production activities are endogenous.

A simplified SAM is presented in table 7. The exogenous accounts have been combined together and the sum of exogenous injections is also consolidated into one vector (x_i , i =1, 2, 3 represents the sum of injections from abroad, investment and government expenditures affecting i). Likewise l_i s represent the corresponding leakages.

Table 7: Simplified schematic SAM

	Expenditure ↓						
			Endogenous accounts			**Exogenous accounts**	**Totals**
Receipts →			Factors	Institutions	Production activities	Sum of other accounts	
			1	2	3	4	5
	Factors	1	0	0	T_{13}	x_i	y_1
	Institutions	2	T_{21}	T_{22}	0	x_2	y_2'
	Production activities	3	0	T_{32}	T_{33}	x_3	y_3'
	Sum of other accounts	4	l_1'	l_2'	l_3'	T	y_x'
	Totals	5	y_1'	y_2'	y_3'	y_x'	

Source: Thorbecke and Jung (1994)

The above simplified schematic SAM adds all exogenous transactions and corresponding leakages and shows the following transactions.

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[6]Government outlays are normally policy determined, the external sector is outside domestic control, and the model has no dynamic features so investment is exogenously determined.

- T_{13} which is the matrix that allocates the value added generated by the various production activities into incomes accruing to various factors of production,
- T_{33} shows the intermediate input needs,
- T_{32} reflects the expenditure pattern of the various institutions including the different household groups on the commodities which they consume,
- T_{21} reflects the mapping of the factorial income distribution into household income distribution (by household groups). It tells us the various sources of income of the different categories of households which, in turn reflect the resource endowment possessed by the different types of households and gives the inter-institutional transfers such as transfers among different types of households.

Table 7 also reveals that exogenous changes determine, through their interaction with the SAM matrix, the incomes of the endogenous accounts, i.e.

- the factor incomes (vector y_1),
- the house hold incomes (y_2) and
- the incomes of the production action activities (y_3).

The endogenous part of the transaction matrix is converted into the corresponding matrix of average propensities for analytical purposes. These can be obtained by dividing a particular element in any of the endogenous accounts by the total income for the column account in which the element occurs. From table 7 it can be seen that is partitioned as follows:

$$A_n = \begin{bmatrix} 0 & 0 & A_{13} \\ A_{21} & A_{22} & 0 \\ 0 & A_{32} & A_{33} \end{bmatrix} \tag{16}$$

From the definition of it follows that in the transaction matrix, each endogenous total income (y_n) is given as

$$y_n = A_n y_n + x \tag{17}$$

which states that row sums of the endogenous accounts can be obtained by multiplying the average expenditure propensities for each row by the corresponding column sum and adding exogenous incomes *x.*

Re- writing equation (17), one obtains

$$\begin{aligned} y_n &= (I - A_n)^{-1} x \\ &= M_a x \end{aligned} \tag{18}$$

From (18), endogenous incomes y_n (i.e. factor incomes, y_1; institutional incomes, y_2; and production activity incomes, y_3) can be derived by pre multiplying 'injection' or 'shock' x by a multiplier matrix M_a.

Thorbecke and Jung (1994) have called *M* the matrix of accounting multipliers as these multipliers, when computed, account for the results (e.g. income, consumption) obtained in the SAM without explaining the process that led to them. However they add that the

limitation of the accounting multiplier matrix M_a is that it implies unitary expenditure elasticities and that a more realistic alternative is to specify a matrix of marginal expenditure propensities C_n corresponding to the observed income and expenditure elasticities of the different agents, under the assumption that the prices remain fixed[7]. In this case C_n differs from A_n in the following way:

$$C_{13} = A_{13}, C_{33} = A_{33}, C_{21} = A_{21}, \text{ but } C_{32} \neq A_{32}.$$

Expressing the change in incomes (dy_n) resulting in changes in injection *dx,* one obtains:

$$\begin{aligned} dy_n &= C_n dy_n + dx \\ &= (I - C_n)^{-1} dx \\ &= M_c dx \end{aligned} \tag{19}$$

M_c has been called the fixed price multiplier matrix and its advantage is that it allows any nonnegative incomes and expenditure elasiticities to be reflected in M_c.

6.2 Multiplier Decomposition

The SAM multiplier analysis described above give an indication of possible results of an exogenous shock on the distribution of factor and institutional incomes as well as on the structure of production. However to shade more light on the nature of linkages in the economy leading to these results, it is possible to decompose the SAM multipliers further.

Equation (20) shows how the matrix of marginal expenditures propensities (C_n) is composed of:

$$C_n = \begin{bmatrix} 0 & 0 & C_{13} \\ C_{21} & C_{22} & 0 \\ 0 & C_{32} & C_{33} \end{bmatrix}. \tag{20}$$

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[7] Since the ratio of the marginal expenditure propensities (MEP_{hi}) to the average expenditure propensities (AEP_{hi}) is equal to the income elasticity for household group *h* and commodity *i* : εy_{hi} it follows that the matrix of the marginal expenditure propensities, C_{32} can be obtained once the income elasticities and expenditure propensities, A_{32}, are known i.e.

$\varepsilon y_{hi} = MEP_{hi} / AEP_{hi}; MEP_{hi} = \varepsilon y_{hi} AEP_{hi}$

Hence equation (19) can be written as:

$$\begin{aligned} dy_1 &= C_{13}dy_1 + dx_1 \\ dy_2 &= (I - C_{22})^{-1}C_{21}dy_1 + (I - C_{22})^{-1}dx_2 \\ dy_3 &= (I - C_{33})^{-1}C_{32}dy_2 + I - C_{33})^{-1}dx_3 \end{aligned} \tag{21}$$

The part of the fixed price multiplier matrix that we concentrate on is that linking production activities to household groups (M_{c23})[8]. Thus if we begin with an exogenous change in demand for a given production activity (dx_3) we would like to know the impact on the incomes of the different household groups (dy_2). Let m_{ij} be an element of this matrix, it shows the total direct and indirect effects of an increase of one unit in the demand for and the output of production activity *j* on the incremental incomes received by household group *i*.

Thorbecke and Jung (1994) showed that M_{c23} can be decomposed multiplicatively into two different matrices, which represent what can they called distributional (*D*) and interdependency (*R*) effects.

$$M_{c23} = R.\ D \tag{22}$$

where dimensions of matrix M_{c23}, R and D are (household groups X production activities), (household groups X household groups) and (household groups X production activities), respectively. A more detailed definition and discussion of the effects follows.

Distributional effects:

The origin of distributional effects occurs with an exogenous change in output of a particular production activity dx_3 and they represent effects on the incomes of household groups. For example if coffee output is increased by one unit and to produce this additional unit , intermediate inputs such as fertilizers and fuel may be used, that, in turn need intermediate inputs to be produced. The first, second and higher order effects are captured by the matrix $(I - C_{33})^{-1}$. Like wise (unskilled labor, capital and land are needed for the increase in output. The demand for these factors of production is represented by matrix C_{13}. In turn additional income will flow to households depending on the factors they own. This is represented by matrix C_{21}. Finally, income transfers occur between and among different households and are captured by $(I - C_{22})^{-1}$.

[8] M_{c23} is the matrix constituted by the columns of production activities and rows of socioeconomic household groups of the fixed price multiplier matrix, M_c.

The total distribution is thus defined as:

$$D = (I - C_{22})^{-1} C_{21} C_{13} (I - C_{33})^{-1} \tag{23}$$

D can be broken down multiplicatively into, $D_3 = (I - C_{22})^{-1}$, $D_2 = C_{21} C_{13}$ and $D_1 = (I - C_{33})^{-1}$ i.e.

$$D = D_3 D_2 D_1 . \tag{24}$$

The impacts of the various production activities on poverty groups can be compared. We need to identify these effects for the each pair of production activity and household groups. The direct distributional effects for each pair of production activity can be obtained from matrix D_2. The distributional transfer effects can be derived by using the property that matrices $D = D_3 D_2 D_1$ and $D_2 D_1$ have the same dimensions. We define $d_{3ij} = d_{ij} / d_{21ij}$ where d_{ij} is an element of D, and d_{21ij} an element of $D_2 D_1$. Then a number (scalar) d_{3ij} represents the effects of matrix D_3. Likewise, the distributional effects resulting from intersectoral production linkages from each production activity to each household. That is $d_{1ij} = d_{21ij} / d_{2ij}$, where d_{21ij} is an element of $D_2 D_1$ and, d_{2ij} is an element of D_2. Hence we obtain:

$$d_{ij} = d_{3ij} d_{2ij} d_{1ij} \tag{25}$$

Interdependency effects.

The interdepency effects capture the direct and indirect effects of spending and re-spending by a particular household under consideration, and other households that benefit, income wise from the exogenous output injection. The initial increase in incomes by the households is in turn, spent on food, clothing and other commodities. There is thus an increase in demand that needs to be satisfied by a corresponding increase in output which requires intermediate and primary inputs that generate an additional indirect flow of incomes for the households. Interdependency effects thus combine the impact of the initial spending and subsequent rounds of re-spending by the households.

Round and Pyatt (1979) in a separate multiplier decomposition, called this the closed loop effect and they showed that:

$$R = \left[I - (I - C_{22})^{-1} C_{21} C_{13} (I - C_{33})^{-1} C_{32} \right]^{-1} \tag{26}$$

The following expression is obtained for R given the definition of D in (31).

$$R = (I - DE)^{-1} \tag{27}$$

Where $(E = C_{32})$. The interdependency effects can thus be expressed as a function of the distribution effect (*D*) and the marginal expenditure propensities matrix (*E*). The larger the elements of *D* or *E*, the larger the dependency effects.

The matrix of fixed price multipliers connecting production activities to household groups M_{c23} can be expressed as follows by substituting *R* in (27) into (22):

$$M_{c23} = RD = (I - DE)^{-1} D \tag{28}$$

If m_{ij} is an element of M_{c23}, then it can be decomposed multiplicatively into two components:

$$m_{ij} = r_{ij} d_{ij} \tag{29}$$

Where d_{ij} is an element of *D*.

A multiplier m_{ij} can thus be decomposed as (see (25)):

$$m_{ij} = r_{ij} d_{ij} = r_{ij} d_{3ij} d_{2ij} d_{1ij} \tag{30}$$

In equation (19), $dy_2 = M_{c23} dx_3$, let dy_{2i} be an element of vector dy_2, and dx_{3j} be an element of vector dx_3. Then,

$$dy_{2i} = m_{ij} dx_{3j} = r_{ij} d_{ij} dx_{3j} = r_{ij} d_{3ij} d_{2ij} d_{1ij} dx_{3j} \tag{31}$$

6.3 Poverty sensitivity effects.

To determine the impact of a sectoral output change on poverty alleviation Thorbecke and Jung (1994) adopt the FGT P_α class of additively decomposable poverty measures. For the different values of α, the FGT P_α measures become, the head count ratio (α=0); the poverty gap (α=1); and the distributionally sensitive measure (α=2).

To clarify the relationship between the impact of income change on poverty measure, the authors showed that a change in poverty measure can be decomposed into the mean-per capita income and the change in income distribution of the household groups.

$$dP_{\alpha ij} = \frac{\partial P_{\alpha ij}}{\partial \overline{y}_i} d\overline{y}_i + \sum_{k=1}^{l} \frac{\partial P_{\alpha ij}}{\partial \theta_{ijk}} d\theta_{ijk} \tag{32}$$

where $P_{\alpha ij}$ is the FGT P_α measure linking sector *j* to household *i*, $\overline{y}_i$ is the mean per capita income of household *i* and θ_{ijk} the income distribution parameters. If it is assumed that change in output of sector *j* is distributionally neutral, then

$$\frac{dP_{\alpha ij}}{P_{\alpha ij}} = \eta_{\alpha i}\left(\frac{d\overline{y}_i}{\overline{y}_i}\right) \tag{33}$$

where $\eta_{\alpha i}$ is the elasticity of $P_{\alpha ij}$ in relationship to the mean per capita income of each household group i resulting from an increase in the output of sector j.

The mean capita income $\overline{y}_i$ can be re- written in order to connect it to the fixed price multiplier matrix, thus:

$$d\overline{y} = m_{ij}dx_j \tag{34}$$

Where dx_j is the change in output of sector j defined on a per capita basis for group i.

Equation (33) thus becomes:

$$\frac{dP_{\alpha ij}}{P_{\alpha ij}} = \eta_{\alpha i}m_{ij}\left(\frac{dx_j}{\overline{y}_i}\right) \tag{35}$$

By aggregating across the household groups the overall poverty alleviation effect can be determined. The aggregate poverty measure $P_{\alpha j}$ can be written as

$$P_{aj} = \sum_{i=1}^{m} P_{\alpha ij}\left(\frac{n_i}{n}\right) \tag{36}$$

where n_i is the population in the i th group and the total population $n = \sum_{i=1}^{m} n_i$.

Differentiating equation (36) yields:

$$\frac{dP_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^{m}\left(\frac{dP_{\alpha ij}}{P_{\alpha ij}}\right)\left(\frac{n_i}{n}\right) = \sum_{i=1}^{m}\left(\frac{dP_{\alpha ij}}{P_{\alpha ij}}\right)\left(\frac{dP_{\alpha ij}}{P_{\alpha ij}}\frac{n_i}{n}\right) \tag{37}$$

Using the definition of P_α class of poverty measures, equation (6) we obtain

$$\frac{dP_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^{m}\left(\frac{dP_{\alpha ij}}{P_{ij}}\right)\left(\frac{\sum_{k=1}^{q_i}\left((z-y_k)/z\right)^{\alpha}}{\sum_{l=1}^{q_i}\left((z-y_l)/z\right)^{\alpha}}\right) \tag{38}$$

where q_i is the number of poor in the i th household and the total number of poor q = $\sum_{i=1}^{m} q_i$. If the poverty share of household i out of total poverty is donated as $s_{\alpha i}$ ($\sum_{i=1}^{m} s_{\alpha i} = 1$)

then

$$s_{\alpha i} = \sum_{k=1}^{q_i} \left(\frac{z - y_k}{z} \right)^{\alpha} \Bigg/ \sum_{k=1}^{q} \left(\frac{z - y_k}{z} \right)^{\alpha} \tag{39}$$

Then,

$$\frac{dP_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^{m} \left(\frac{dP_{\alpha ij}}{P_{ij}} \right) s_{\alpha i} . \tag{40}$$

Combining equations (35) and (40) yields:

$$\frac{dP_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^{m} s_{\alpha i} \eta_{\alpha i} m_{ij} \left(\frac{dx_j}{\overline{y}_i} \right) \tag{41}$$

By definition, $m^{'}_{\alpha ij} = s_{\alpha i} m_{ij}$ and $q_{\alpha ij} = \eta_{\alpha i} \left(dx / \overline{y}_i \right)$. The modified multiplier is the part of multiplier m_{ij} which causes the income increase of the poor in a household *i*. The term $q_{\alpha ij} = \eta_{\alpha i} \left(dx / \overline{y}_i \right)$ represents the sensitivity of P_{α} to the change in income, which is called the poverty sensitivity effect. Since $m_{ij} = r_{ij} d_{ij}$, equation (29), defining $m^{'}_{\alpha ij} = s_{\alpha i} m_{ij}$ and $d^{'}_{\alpha ij} = s_{\alpha i} d_{ij}$, we get

$$\frac{dP_{\alpha j}}{P_{\alpha}} = \sum_{i=1}^{m} m^{'}_{\alpha ij} q_{\alpha ij} = \sum_{i=1}^{m} \left(r_{\alpha ij} \right) \left(d^{'}_{\alpha ij} \right) \left(q_{\alpha ij} \right) = \sum_{i=1}^{m} \left(r_{\alpha ij} \right) \left(s_{\alpha ij} d_{ij} \right) \left(q_{\alpha ij} \right) \tag{42}$$

The poverty sensitive effects are positively related to poverty elasticity ($\eta_{\alpha i}$) and negatively related to the mean per capita income ($\overline{y}_i$).

The modified direct distributional effects ($d^{'}_{2\alpha ij}$) as $d^{'}_{2\alpha ij} = s_{\alpha i} d_{2ij}$ and we obtain $d^{'}_{\alpha ij} = s_{\alpha i} d_{ij} = d_{3\alpha ij} \left(s_{\alpha i} d_{2ij} \right) d_{1\alpha ij} = d_{3\alpha ij} d^{'}_{2\alpha ij} d_{1\alpha ij}$. Equation (42) becomes:

$$\frac{dP_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^{m} r_{\alpha ij} d_{3\alpha ij} d^{'}_{2\alpha ij} d_{1\alpha ij} q_{\alpha ij} \tag{43}$$

The overall income change to the poor for all household groups due to output change in sector j ($m_{\alpha j}$) can be computed as $m_{\alpha j} = \sum_{i=1}^{m} m_{\alpha ij}^{'} = \sum_{i=1}^{m} s_{\alpha i} m_{ij}$. The overall distributional effect ($d_{\alpha j}$) can be computed as $d_{\alpha j} = \sum_{i=1}^{m} s_{\alpha i} d_{\alpha ij}$. The overall interdependency effect is defined as $r_{\alpha j} = m_{\alpha j} / d_{\alpha j}$. Finally the overall poverty effect $(q_{\alpha j}) = -\left(dP_{\alpha j} / P_{\alpha j} \right) / m_{\alpha j}$.

That is to say, the total poverty alleviation effects consists of the product of the mean income change of the poor households groups ($m_{\alpha j}$); and the sensitivity of the selected poverty measure to the mean incomes ($q_{\alpha j}$).

7. Results.

Table 8 gives the estimates of elasticities of P_α with respect to mean-incomes ($\eta_{\alpha i}$) and the shares of group poverty to aggregate poverty ($s_{\alpha ji}$). The elasticities indicate how P_α responds to a one percent change in household group incomes.

Table 9 shows the decomposition of the impact of sectoral output on the aggregate poverty measure $\left(dP_{\alpha j}/P_{\alpha j}\right)$. Equation (42) gives the main element of this decomposition;

-The modified ($m^{'}_{\alpha ij}$) which represents the mean income increase experienced by the poor in a particular household group.

-The poverty sensitivity effect ($q_{\alpha ij}$) which represents the sensitivity of the poverty measure to the increase in the mean incomes of group *i*. The total poverty effects are obtained by summing the group specific effects across all the different household groups. The poverty estimates presented in table 9 are for a change in exogenous injection of 100 billion Ushs per capita in the respective groups. Multipliers ($m^{'}_{\alpha j}$ in row 3) represent income increase and decomposed into distributional effects (row 1) and interdependency effects (row 2); and the distributional effects are further decomposed into inter sectoral production linkages direct links (row 1c), direct linkages (row 1b) and transfer linkages (row1a).

Table 8. Uganda estimates on poverty profiles of the 1999 SAM Household groups.

Households	Mean income. Billion Ushs	Population share	Elasticities of poverty measure to mean incomes			Group poverty share out of total poverty		
			Head count	Poverty gap	Distribution sensitive	Head count	Poverty gap	Distribution sensitive
	$(\bar{y})^a$	(n_i/n)	$(\eta_{0i})^b$	(η_{1i})	(η_{2i})	$(s_{0i})^c$	(s_{1i})	(s_{2i})
Urban poor	155.0	1.9	-0.2944	-0.7772	-1.0738	0.0053	0.0038	0.0030
Urban non poor	2366.8	11.3	-0.7606	-2.0078	-2.7742	0.0316	0.0231	0.0179
Farmers	4886.2	67.6	-0.2622	-0.6922	-0.9564	0.7499	0.7577	0.7624
Non farm rural	1589.1	19.2	-0.2998	-0.7915	-1.0936	0.2130	0.2152	0.2165

Source: [a] From Dorosh and Moataz (2004 page 17).

[b] Elasticities with respect to different poverty measures were obtained from povcalnet data set available at http:// research. Worldbank.org/povcalNet .These estimates were then used to derive the respective elasticities for the households taking into account shares of mean income obtained from Dorosh and Moataz (2004).

[c] Rural and urban Poverty shares were obtained from UNHS report 2002/3 (page 48). Each of the household was then allocated its share of poverty basing on its population share.

Table 9 further reveals that poverty alleviation effects is the product of the fixed-price multiplier ($m'_{\alpha j}$) and the poverty sensitivity effect ($q_{\alpha j}$). Likewise, the fixed price multiplier is the product of the corresponding distributional and interdependency effects. For example, the poverty alleviation effect from matooke is **0.367** which is the product of the modified fixed price multiplier **1.641** and the poverty sensitivity effect **0.224**. In turn, the fixed price multiplier **1.641** is the product of the modified distributional effects **0.571** and interdependency effect **2.873**. Similarly the modified distributional effects are equal to the product of the corresponding activity effects, modified distributional linkages and interhousehold transfer linkages.

Generally, the impact of a particular sector on poverty depends on the poverty measure in question. The ranking of each sector based on their total poverty alleviation tends to be constant across the poverty measures. Therefore, the discussion of poverty alleviation effects can be based on any one of the three poverty measures. The discussion is based on the headcount measure.

The distributional effects have a higher variation than do the poverty sensitivity effects and interdependency effects. Thorbecke and Jung (1994) found the same results for Indonesia. The transfer linkages (row 1a) show small variances across production activities, implying that the transfers among households have very little effect on income generating production activities. The conclusion drawn is that distributional effects i.e. direct linkages (income flows accruing to household groups from factors used in the production process and owned by those groups) and inter-production activities linkages (input-output inter-linkages on the production side) are the main factors explaining the impact of different production sectors on poverty alleviation.

Table 9 further shows that agricultural production activities have the biggest poverty alleviation effects ranging from **0.368** to **0.285**, followed by services sector from **0.317** to **0.178** and the industry sector from **0.298** to **0.147**. The agricultural sector has the largest direct distributional effects among the sectors, which is an indication that the sector is intensive in the use of factors of production, especially in terms of unskilled labor and land more than the other sectors. However, its effects are smaller than inter-production activities linkages. It can therefore be inferred that the limiting factor in alleviating poverty in this sector are the factors of production.

Among the agriculture sector, traditional export crops, coffee and other cash crops (tea, tobacco, cotton and cocoa) have low poverty alleviation effects than other food crops because of low direct distributional effects. Other cash crops have the lowest direct distributional effects (**0.339**) and a relatively large distributional effect from production linkages (**1.263**) among the agriculture sector. The interpretation of this is that farmers commit less factors of production in this sub-sector but that there exists a strong linkage with other sub-sectors. Cotton for example provides the raw materials for several local industries, such as textile mills, oil and soap factories, and animal feed factories. Tobacco provides raw tobacco for the cigarette industry. Movement of raw materials from farms to markets and factories can not be accomplished without the transport sector.

The above analysis suggests that to reduce poverty among farmer households, labor and land policies should aim at increasing earnings from these factors. This would reduce poverty because as noted in section 5, section 5.4, the majority of the poor in Uganda are employed in the agriculture sector of which 80 percent cultivate less than 2.5 hectares of land each. These policies should promote peasant agriculture by guaranteeing land tenancy rights to existing users of land and improving its productivity through access to appropriate technology, extension services and credit that would enable them to overcome constraints in production. In addition, constrains to demand for farm products should be removed by promoting products that end up as exports with or without processing. Farmers should also be furnished with information on the pattern of demand and the infrastructure necessary to access new markets.

Meat and diary processing, coffee processing, grains milling which are manufacturing sectors have a relatively large contribution to poverty alleviation (**0.298**, **0.298** and **0.287** respectively) because they have a high inter production activity linkages with agriculture. However, manufacturing, petroleum/chemicals and fertilizers show low total poverty alleviation effects of **0.147**, **0.179** and **0.155,** respectively. Like the agriculture sector, these sub sectors have small direct distributional linkages and large inter-sectoral production linkages. This is an indication that poor household are marginally employed in these sectors but that there are strong linkages with other sectors in the economy. The policy implication therefore is that the poor have be involved in the industrial process in order to benefit from it. This therefore calls for the use of skilled labor, through education and training rather than unskilled human capital to handle advanced technology. The private and commerce sub- sectors under the service sector emphasize the need for skilled labor. As shown in table 4, the sub sectors have the highest GDP per capita in the economy and yet they have low direct distributional linkages.

The above results indicate how the SAM can be used to analyze the impacts of policy on household groups in the form of a data source and an economic accounting framework. However it has some limitations that should be kept in mind. Round (2001) summarizes these limitations as:

Firstly, the information on the incomes in the system have to be relatively detailed and complete other wise the information will be limited by the weakest link in the chain. For example if in figure 2, information on taxes paid by households to government is lacking, it is impossible to know how much the government spends on transfers and the circular flow will therefore be affected by this missing information. Secondly, there is always adjustment to the data. For instance in construction the Ugandan SAM, Dorosh and Moataz (2004) report that no complete data on household incomes by factor was available and that estimates were made basing on the data on agricultural production by region and population data from the 1999/2000 household expenditure survey. Thirdly, the SAM assumes that there is no constraint in any of the sectors. There are circumstances when this is not the case for example, fluctuating world coffee prices affects farmer commitment to factors of production in this sector. The multiplier analysis therefore has to be viewed in different way.

Table 9. Poverty alleviation effects of income growth (per unit of income change to nearest three decimal points)

Agriculture	Coffee	Other cash. crops	Maize	Sorghum / Millet	Cassava	Sweet potatoes	Matooke	Horticulture	Other Agric	Livestock	Forestry	Fishing
1.***Headcount measure***($-dP_{0i}/P_{0i}$)												
1.Distributional effects ($d_{0i}=d_{30j}d'_{20j}d_{10j}$)	0.513	0.428	0.551	0.578	0.580	0.586	**0.571**	0.549	0.542	0.555	0.489	0.492
1a.Distributional transfer effects (d_{30j})	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1.b.Direct distributional effects($d'_{20i}=s_{0i}d_{20i}$)	0.482	**0.339**	0.489	0.548	0.552	0.564	0.533	0.485	0.500	0.493	0.382	0.422
1.c. Distributional effects from production linkages(d_{10j})	1.064	**1.263**	1.126	1.055	1.051	1.039	1.072	1.132	1.085	1.125	1.280	1.166
2. Interdependency effects(r_{0j})	2.769	2.973	2.979	2.837	2.829	2.802	**2.873**	2.990	3.024	2.964	2.956	2.965
3.Fixed price multipliers ($m'_{0i}=r_{0i}.d'_{0i}$)	1.419	1.273	1.641	1.641	1.641	1.641	**1.641**	1.641	1.639	1.644	1.446	1.458
4.Poverty sensitivity effects (q_{0i})	0.224	0.224	0.224	0.224	0.224	0.224	**0.224**	0.224	0.224	0.224	0.224	0.224
5..Poverty alleviation effects ($-dP_{0j}/P_{0j}=m'_{0j}q_{0j}$)	0.318	0.285	0.367	0.367	0.367	0.367	**0.367**	0.367	0.367	0.368	0.324	0.326
2.*Poverty gap measure*($-dP_{1i}/P_{1i}$)												
1.Distributional effects ($d_{1j}=d_{31j}d'_{21j}d_{11j}$)	0.518	0.432	0.556	0.584	0.585	0.591	0.577	0.554	0.547	0.560	0.493	0.496
1a.Distributional transfer effects (d_{31j})	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1.b.Directdistributional effects($d'_{21j}=s_{1i}d_{21i}$)	0.487	0.342	0.494	0.553	0.557	0.569	0.538	0.489	0.505	0.498	0.386	0.426
1.c. Distributional effects from production linkages(d_{11j})	1.063	1.261	1.125	1.055	1.051	1.039	1.072	1.131	1.084	1.124	1.279	1.165
2. Interdependency effects(r_{1j})	2.790	2.996	3.002	2.860	2.851	2.824	2.895	3.013	3.048	2.987	2.979	2.988
3.Fixed price multipliers ($m'_{1j}=r_{1j}.d'_{1j}$)	1.430	1.283	1.653	1.654	1.654	1.654	1.654	1.654	1.652	1.657	1.457	1.470
4.Poverty sensitivity effects (q_{1i})	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017
5..Poverty alleviation effects ($-dP_{1j}/P_{1j}=m'_{1j}q_{1j}$)	0.025	0.022	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.025	0.026
3.*Distribution sensitivity measure*($-dP_{2j}/P_{2j}$)												
1.Distributional effects ($d_{2j}=d_{32j}d'_{22j}d_{12j}$)	0.520	0.434	0.559	0.587	0.589	0.595	0.580	0.557	0.550	0.563	0.496	0.499
1a.Distributional transfer effects (d_{32j})	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1.b.Directdistributional effects($d'_{22j}=s_{2i}d_{22i}$)	0.490	0.344	0.497	0.556	0.560	0.573	0.541	0.492	0.508	0.501	0.388	0.428
1.c. Distributional effects from production linkages(d_{12j})	1.063	1.259	1.125	1.055	1.051	1.039	1.071	1.131	1.084	1.123	1.278	1.164
2. Interdependency effects(r_{2j})	2.761	2.972	2.974	2.830	2.822	2.794	2.866	2.985	3.018	2.958	2.953	2.961
3.Fixed price multipliers ($m'_{2j}=r_{2j}.d'_{2j}$)	1.437	1.289	1.661	1.661	1.661	1.662	1.662	1.661	1.660	1.664	1.464	1.476
4.Poverty sensitivity effects (q_{2j})	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
5..Poverty alleviation effects ($-dP_{2j}/P_{2j}=m'_{2j}q_{2j}$)	0.034	0.030	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.034	0.035

Table 9 (continued)

	Industry								Services					
	Meat/dairy processing	Coffee processing	Grain milling	Other beverages	Textiles/ leather	Manufacturing	Fertilizers	Petroleum /Other chemicals	Utilities	Construction	Commerce	Transport	Private. Services	Public. Services
1.*Headcount measure* ($-dP_{0j}/P_{0j}$)														
1.Distributional effects ($d_{0j}=d_{30j}d'_{20j}d_{10j}$)	0.297	0.453	0.322	0.326	0.128	0.070	0.060	0.071	0.089	0.243	0.325	0.184	0.265	0.195
1a.Distributional transfer effects (d_{30j})	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1.b.Direct distributional effects($d'_{20j}=s_{0j}d_{20j}$)	0.064	0.024	0.074	0.104	0.044	0.010	0.000	0.003	0.069	0.191	0.282	0.138	0.209	0.057
1.c. Distributional effects from production linkages(d_{10j})	4.623	18.663	4.385	3.147	2.900	6.765	0.000	22.349	1.289	1.271	1.154	1.338	1.267	3.404
2. Interdependency effects(r_{0j})	4.532	2.947	4.025	3.816	7.887	9.702	11.803	11.888	10.003	4.915	2.490	6.211	3.355	7.263
3.Fixed price multipliers ($m'_{0j}=r_{0j}.d'_{0j}$)	1.344	1.334	1.297	1.245	1.010	0.683	0.712	0.842	0.892	1.195	0.810	1.145	0.890	1.416
4.Poverty sensitivity effects (q_{0j})	0.222	0.223	0.222	0.221	0.220	0.215	0.218	0.213	0.219	0.220	0.219	0.219	0.218	0.224
5..Poverty alleviation effects ($-dP_{0j}/P_{0j}=m'_{0j}q_{0j}$)	**0.298**	**0.298**	**0.287**	0.275	0.223	**0.147**	**0.155**	**0.179**	0.196	0.262	0.178	0.251	0.194	0.317
2.*Poverty gap measure* ($-dP_{1j}/P_{1j}$)														
1.Distributional effects ($d_{1j}=d_{31j}d'_{21j}d_{11j}$)	0.298	0.456	0.324	0.328	0.128	0.070	0.060	0.071	0.084	0.243	0.326	0.185	0.265	0.193
1a.Distributional transfer effects (d_{31j})	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1.b.Directdistributional effects($d'_{21j}=s_{1j}d_{21j}$)	0.064	0.024	0.074	0.104	0.044	0.010	0.000	0.003	0.064	0.192	0.283	0.138	0.209	0.055
1.c. Distributional effects from production linkages(d_{11j})	4.638	18.760	4.398	3.155	2.901	7.202	0.000	23.998	1.309	1.269	1.153	1.336	1.269	3.520
2. Interdependency effects(r_{1j})	4.563	2.969	4.052	3.841	7.934	9.715	11.843	11.884	10.055	4.942	2.503	6.240	3.365	7.320
3.Fixed price multipliers ($m'_{1j}=r_{1j}.d'_{1j}$)	1.353	1.344	1.306	1.253	1.016	0.684	0.715	0.842	0.897	1.202	0.814	1.151	0.893	1.427
4.Poverty sensitivity effects (q_{1j})	0.018	0.017	0.018	0.018	0.018	0.020	0.019	0.020	0.019	0.018	0.019	0.019	0.019	0.017
5..Poverty alleviation effects ($-dP_{1j}/P_{1j}=m'_{1j}q_{1j}$)	0.024	0.023	0.023	0.023	0.019	0.014	0.014	0.017	0.017	0.022	0.015	0.021	0.017	0.025
3.*Distribution sensitive measure* ($-dP_{2j}/P_{2j}$)														
1.Distributional effects ($d_{2j}=d_{32j}d'_{22j}d_{12j}$)	0.299	0.459	0.325	0.329	0.129	0.069	0.061	0.071	0.081	0.244	0.326	0.185	0.265	0.192
1a.Distributional transfer effects (d_{32j})	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1.b.Directdistributional effects($d'_{22j}=s_{2j}d_{22j}$)	0.064	0.024	0.074	0.104	0.044	0.009	0.000	0.003	0.061	0.192	0.283	0.138	0.209	0.053
1.c. Distributional effects from production linkages(d_{12j})	4.647	18.819	4.406	3.160	2.902	7.496	0.000	25.110	1.323	1.268	1.153	1.335	1.270	3.595
2. Interdependency effects(r_{2j})	4.538	2.943	4.030	3.823	7.921	9.870	11.826	11.895	11.060	4.949	2.502	6.245	3.376	7.476
3.Fixed price multipliers ($m'_{2j}=r_{2j}.d'_{2j}$)	1.359	1.350	1.311	1.257	1.019	0.685	0.716	0.841	0.899	1.206	0.816	1.154	0.895	1.434
4.Poverty sensitivity effects (q_{2j})	0.024	0.024	0.025	0.025	0.025	0.027	0.026	0.028	0.026	0.025	0.026	0.026	0.026	0.024
5..Poverty alleviation effects ($-dP_{2j}/P_{2j}=m'_{2j}q_{2j}$)	0.033	0.032	0.032	0.031	0.025	0.018	0.018	0.023	0.0230	0.030	0.0208	0.029	0.023	0.034

8. Conclusion:

The study has used a multiplier decomposition procedure developed by Thorbecke and Jung (1994) to show that sectoral growth can be of help in formulating policies aimed at poverty alleviation in Uganda particularly in the rural areas and the northern, eastern and north eastern parts of the country where poverty is more prevalent. It was shown that the impact of a change in demand and output of a production activity on poverty depends upon the resulting income increase for poor household groups and the sensitivity of the poverty measures to the resulting income increase.

The income increase is represented by the modified fixed price multiplier which takes into account the poverty shares of the different households. This multiplier is decomposed into the modified distribution effects and interdependency effects. The former effects are further decomposed into distributional transfer effects, direct distributional effects and distributional effects from production linkages. The sensitivity of the poverty measure to household incomes depends upon the elasticity of the poverty measure to the mean incomes and the income levels. The group poverty alleviation effects resulting from an increase in output sectors are aggregated across different household groups to obtain total poverty alleviation effects.

The study showed that the agriculture sector contributed most to poverty alleviation followed by the service sector and the industry sector had the least poverty alleviation effects. Direct distribution and distribution production linkages contributed largely to poverty alleviation effects. The former linkages were a limiting factor to poverty alleviation since their effects were much smaller than the latter effects. This calls for suitable policies aimed at increasing productivity and incomes among poor households from the main factors of production, land and labor.

As Uganda progresses into an industrialized nation, there should be a gradual decrease of the share of the unskilled labor force employed in agriculture. Coupled with an adequate infrastructure supplied by the service sector, this process begins with increase in farm productivity and incomes of farmer households which would then create a demand for consumer goods (e.g. soft drinks and tobacco) and services and therefore an increase in output of the industry sector. This should create a basis for the growth of the industry and be able to absorb the much needed labor as shown by the low direct linkages in the manufacturing sector. This absorbed labor should be turned into skilled through education and training.

However, agro based industries that rely on relatively unskilled labor such as grain milling should not be displaced but processing should be stepped up. In Uganda this is possible because of the positive domestic agricultural surplus (equation 19). As supported by James and Khan(1997) the process of income generation for the poor in the transition to modern technology could rely on some traditional technologies in which the poor can be gainfully employed and their capabilities must be increased through further education and training. Availability of agricultural credit and to small scale industries could also help the poor.

The AIDS epidemic continues to have a negative impact on agricultural production. The WHO reports that it has the impact of loss of skilled and unskilled labor, for production, research extension services and in policy formulation. It has a direct impact on loss of assets. Aids mitigation measures therefore, will have a positive impact on agricultural production and household incomes.

Uganda's high population growth rate has also to be taken into consideration when developing policies aimed at poverty alleviation. According to UNFPA (2005) Uganda's large population base of almost 29 million and rapid growth rate of 3.5 percent per year, makes it the third fastest growing country in the world. This high rate is due to a high fertility rate among the women. It further adds that population growth is responsible, in part, for the country's deepening poverty. At the current growth rate, Uganda's population will increase to 54 million in 2025, doubling in less than 25 years. This is a serious challenge that affects income levels because bigger families share income among many people and therefore average per capita income decreases.

The negative impact of population pressure on land is especially evident in Southwestern Uganda where the average household land holding is estimated to be two acres. Population pressure and its direct contribution to deforestation and environmental degradation can trap farmers in a vicious state of low productivity and low incomes. (Okidi and Mugambe 2002).

The high population growth rate may seem to be compensated by the deaths due to AIDS epidemic, but according to Brown (1997) Uganda's population in 2020 will be 45 percent smaller as a result of AIDS .Yet, even with this impact, most forecasts project that the populations of nearly all of the worst affected African countries including Uganda, will at least double between 1990 and 2020. This therefore calls for the government to develop a national family planning programme that will check the presently high fertility rate.

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Pris: 100:- (exkl moms)

Tryck: SLU, Institutionen för ekonomi, Uppsala 2008

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