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Incidence of Poverty in Rural Areas of Uganda: Do Livelihood Strategies Matter?

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Abstract
This study adopts an asset based approach to conceptualize the livelihood strategies pursued in rural Uganda in particular, Masindi and Masaka districts respectively. The study uses household survey data from 2005 and 2008 surveys to compare the incidence, inequality and intensity of poverty among different livelihood strategy groups. A cluster analysis technique is used to classify household livelihood activities into distinct livelihood strategies and the Three I's of Poverty (TIP) curves are used to investigate the incidence, inequality and intensity dimensions of poverty across different livelihood strategy groups and check for poverty dominance. A random effect multinomial logit model is used to establish which factors constrain rural households from participating in high return livelihood strategies. The results indicate that there are five distinct livelihood strategies that are pursued in the study area which vary significantly in terms of their returns and the welfare rankings. The findings further reveal that household's participation in low return strategies is a result of not only the fewer assets at their disposal but also household's restricted capacity to use its available assets due to limited or lack of incentives in the economic system.
Keywords: Livelihood strategy; welfare ranking; poverty; cluster analysis

1. Introduction

The prevalence of poverty in developing countries, in particular, rural areas has been a center for policy debate and research work for decades. Even today when much of the research seems to have been done and the war against poverty (worldwide and country specific) appears to have taken its course, poverty statistics seem to point in opposite directions altogether across the world, between countries and among different groups within the same country (Chambers, 1995). For instance, poverty in Sub-Saharan Africa has been rising over the last decade regardless of the various development initiatives and policy interventions (notably the Millennium Development Goals (MDGs), Poverty Reduction Strategy Program Policy Document, as well as Bill and Melinda Gate Foundation (BMGF) poverty reduction project) that the region embarked on. Within the same region, Uganda has registered a conspicuous decline in poverty over the last decade from 56% (headcount index) in 1990s to 31% in 2005 (UBOS, Uganda National Household Survey; Report on Socio-Economic Module, 2005).

The most striking thing, however, is that even though Uganda seems to have made a landslide in alleviating poverty at national level, the drop in poverty levels between 1992 and 1999 was more concentrated in the central and western regions. Incidence of poverty remained high or probably worse in Arua, Moyo, and Apac in the northern region and Kasese district in the western region. Furthermore, the northern region and some districts in the western region including Masindi, Kasese and Bundibugyo registered high inequalities (ILRI, 2005). It is therefore evident and clear that the battle to alleviate and eradicate poverty remains a challenge.

One of the challenges facing the policy makers and governments of developing countries is to design policies and development programs that are tailored towards alleviating poverty in totality and reducing the inequality among different groups. Policies and development initiatives that are designed based on conventional (aggregate) poverty analysis tend to consider the poor as a homogenous group, yet as Chambers (1995) argues there is "more heterogeneity among the poor than probably is among the non poor"(Chambers 1995: page 188); "the strategies of the poor are usually diverse and often complex" (Chambers, 1995: page 192). In consequence such policies and development initiatives tend to improve the well being of a few while leaving out those in dire need. Consequently, those left out tend to adopt coping strategies (CPRC, 2008) which eventually dangle them into poverty trap.

However, designing of such inclusion or targeted policies and development programs requires understanding of how the aggregated poverty effect is distributed among groups (see Liberati, 2003) and yet most of the poverty research work has dwelled on aggregate poverty analysis rather than disaggregated (i.e. by population subgroups). One approach is to examine the incidences and severity of poverty based on small geographical units like villages or districts (e.g. Ravallion and Wodon, 1997). The other way of investigating poverty by subgroups is to group people based on the livelihood strategies they pursue and analyze the incidence of poverty within each group. This kind of analysis paves way for not only the understanding of how the aggregated poverty effect is distributed among groups but also the nature and forms of the constraints that the

poor face (May and Carter, 1999).

The livelihood focus draws upon Sen's entitlement approach[1] and suggests that "the poor or the vulnerable can be classified as those who share common income-claiming strategies or entitlements" (May and Carter, 1999: page 4). Brown *et al* (2006) analyze whether certain livelihood strategies are superior to others by using the Davidson and Duclos (1997) stochastic dominance analysis. They use income distributions from different strategies to check whether one strategy is dominant over the other. Their insightful findings reveal that certain strategies are superior to others and barriers exist that constrain households from engaging in superior strategies. They do not however investigate the incidence, inequality and severity of poverty among different livelihood strategy groups which is equally important for designing of inclusion policies and development interventions.

2. Objectives of the Study

The main objective of the study is first, to identify distinct livelihood strategies pursued in the study area; second, to examine and compare the incidence and severity of poverty between the different livelihood strategy groups; and lastly, to identify which factors determine household participation in a particular livelihood strategy.

In addition, the study, therefore, sought in addressing the following questions: Do the incidence, inequality and severity of poverty vary among different livelihood strategy groups? What are the major factors that determine household participation in those strategies? Thus, answering these questions would be of great importance to policy-makers in as far as targeting process is concerned and to development planners as it would provide a guide on which activities should be promoted or which reforms should be undertaken to better the lives of the poor.

3. Materials and Methods

3.1. Study Area

The households under investigation in this study were drawn from two rural districts of Uganda: (six villages in) Masindi and (eight villages in) Masaka districts of Uganda, respectively. The essence of selecting the two districts was to account for spatial heterogeneity effects that underlie the two districts. Masindi district is one of the unique districts in Uganda: first, because of its geographical location (i.e. is located 354 km away from Kampala city). It borders Gulu in the north and Democratic Republic of Congo in the west. The district harbors several tribes (about 55 tribes) with the Banyolo and Bagungu being the dominant tribes –forming about 59.9% of the population (IFPRI, undated).

Furthermore, the district harbors also several immigrants from Rwanda, Kenya, Sudan and Congo. Second, because of its climatic condition: the district is divided into three major climatic (rainfall zones); high rainfall (>1000mm), medium rainfall (800-1000mm), and low rainfall (<800mm). Generally however the district receives about 1,304 mm of rainfall per annum (even though most of the areas tend to suffer erratic rainfall or extended dry conditions) with annual average temperature of 25^{o} C. The common soils are clay loam and sandy loam soils and are characterized by low fertility. And lastly, because it is endowed with natural resources –in particular, a forest reserve (Budongo) and just recently, oil deposits have been discovered. While the forest reserve offers households with other options for livelihoods, many households in Masindi have smaller land holding sizes than households in Masaka district owing to the fact that much of the land in Masindi is protected estate since much of the natural resources accrue to the central government (MFPED, 2002).

In contrast, Masaka district is situated 130 km from Kampala city and lies in the central region. The district is endowed with deep fertile soils, well distributed rainfall and relatively high attitude and areas with large tree vegetation coverage. Its proximity location to the city compared to Masindi offers it several advantages in terms: market access to both agricultural and non agricultural goods produced by the rural households; improved access to improved services such as health, education and additional sources of livelihoods such as remittances and markets for off-farm labor (e.g. Dercon and Hoddinott, 2005). However, the presence of a forest in the Masindi district (which is not available in Masaka) entails that the households from Masindi district can access forest products without much effort.

In terms of socio economic activities, communities in Masindi district depend on agriculture, forest extraction, business as well as off-farm employment. On the other hand, communities in Masaka district depend on agriculture, business, as well as off-farm employment. The descriptive statistics (means and frequencies) for each activity type in Masaka, Masindi and eventually, the whole sample are presented in table 1.

[1]"It suggests that the ability to make claims and assemble a secure livelihood strategy dwells on household's social and economic endowments and the claiming systems to which the endowments give access" (May and Carter, 1999: page 9)

Table 1: Frequencies and Means for Different Activities in Masaka and Masindi

Activities	Percentages of Households		Means (acres of land)		
	Masaka (n=120)	Masindi (n=110)	Masaka (n=120)	Masindi (n=110)	Total Sample (N=230)
Farming					
Food crops	89.2	93.2 *	2.5	2.2	2.3
Mixed (cash crop and food crops)	53.3	18.1 ***	1.3	0.47 *	0.91
Cash crops	21.3	21.3	0.24	0.28	0.26
Livestock					
Cattle	30.0	1.8 ***	1.1	0.06***	0.58
Small ruminants[1] and pigs	50.4	59.7 **	2.0	3.0***	2.5
Poultry	74.2	74.7	6.2	6.5	6.4
Off-farm Activities					
Non- agricultural	47.1	40.3 *	0.69	0.47***	0.58
Agricultural	24.6	13.1 ***	0.25	0.13***	0.19

*** significant at 1%; **significant at 5% : *significant at 10%
Source: Survey data

Masindi district is the leading producer of maize in the western region of Uganda and the third in the country after Iganga and Kapchorwa districts respectively. Maize is grown as a major cash crop as well as a staple crop. The other traditional cash crops are tobacco, coffee and cotton. The rest of the other crops grown are simsim, sunflower, cassava, sweet potatoes, beans, beans, pigeon peas, banana, sorghum, field peas, Irish potatoes and vegetables.

On the other hand, Masaka households depend heavily on coffee (a major cash crop for Uganda) and banana production unlike Masindi which depends more on maize, cassava and forest extraction. The other major crops grown in Masaka district are maize, beans vanilla, sweet potatoes and pineapples. The majority in both districts however, are subsistence farmers. In general, however, Masindi is relatively poor compared to Masaka district. Table 2 shows the poverty statistics for the two districts in 2002.

Table 2: Poverty Statistics in the Study Area

District/Sub county	Headcount (%)	Poverty Gap (%)	Inequality (%) Gini coefficient
Masindi	**42.0**	**15.0**	**42.0**
Bujenje county	32.0	9.0	42.0
Bulisa county	65.0	32.0	46.0
Buruuli county	37.0	12.0	33.0
Kibanda county	42.0	14.0	44.0
Masaka	**30.0**	**7.0**	**32.0**
Bukomansimbi county	32.0	8.0	32.0
Bukoto county	29.0	7.0	33.0
Kalungu county	29.0	7.0	31.0

Source: UBOS, (2007: pages 73-88)

3.2. Data Collection Methods

The data were collected using two structured questionnaires: household survey questionnaire and village level questionnaire which was administered to key informants in the village. The same households that were sampled by NOMA students in 2001 and 2005 were the ones that were sampled in the 2008 survey. The idea was to build a panel data. The total sample size was 502. Since the data collection exercise was done at a group level (i.e. NOMA students graduating class, 2009) just as it was the case with the previous surveys, the household questionnaire that was used in the previous studies was adjusted to accommodate the new research questions.

The remarkable limitation of the data set however was the high attrition rate due to the fact that some households had migrated away. Furthermore even though the same questionnaire was used in the previous surveys, the compatibility of our panel data is not squarely good as some variables were only included in 2005 and 2008 surveys. It is therefore for this reason that I use the data collected in 2005 and 2008 surveys only.

[1] Small ruminants include goats and sheep

3.3. **Methods of Data Analysis**

*3.3.1. **Concept and Definitions***

Researchers who have studied poverty and livelihoods have all linked livelihoods to wellbeing, but the question of causality has remained a subject of controversy (Hans *et al*., 2005). Is poverty an outcome of the livelihood strategies people pursue or the vice-versa? Livelihood strategies are a combination of the different activities that a household engages in to make a living (Morris et al., 2003). Such activities may range from agricultural intensification and extensification, livelihood diversification, to migration (Scoones, 1998; Swift, 1998). Livelihood diversification is viewed as the household's practice of broadening an array of activities (on-farm and/or off-farm). In contrast, agricultural intensification and extensification is regarded as the household's prolonged and increased reliance on farming by increasing the resource use per unit area and by enlarging the land area allocated to agriculture respectively. Migration however is regarded as critical strategy to secure off-farm employment and may either be voluntary or forced (Scoones, 1998; Swift, 1998; Morris *et al*., 2003).

Devereaux (1993) and Davies (1996) on the other hand, classified the livelihood strategies based on their impact on household wellbeing. Based on this classification, household livelihood strategies that lead to a boost in resource use and accumulation of assets are termed as accumulative strategies while those that do not necessarily lead to accumulation of assets but rather smooth out the risk of consumption failure are referred to as adaptive strategies. Coping strategies on the other hand are those that suppress the effect of the shock and usually involves depletion of stocks of assets or/and reduction in consumption. The prolonged and extended pursuit of coping strategies without a relief may force a household to adopt survival strategies (Morris *et al*., 2003). Implicit in this classification is the idea that "certain household livelihood strategies (accumulative livelihood strategies) generate higher return on the assets than others (survival or coping strategies)" (Brown *et al*., 2006).

If that idea is anything to go by, then three questions arise: which household activities can be classified as remunerative strategies or inferior strategies? Can a household graduate from one strategy to the other? If yes, what obstacles exist in the economic systems that bar households from participating in the more remunerative strategies? To answer these questions, it is important to make a clear cut line between one livelihood strategy and the other. Such an analysis would be a prerequisite for formulation of policies and projects that are particularly meant to improve the livelihoods of the poor (Brown, *et al*., 2006).

However, since households engage in different types of activities, it is rather difficult to figure out what represents a distinct livelihood strategy rather than a merely subtle subset of activities belonging to the same livelihood strategy (Brown, *et al.,* 2006). This poses a huge challenge to the empirical research as there is no universal criterion of clustering the household activities in distinct livelihood strategies. Most empirical research woks have adopted the use of income shares to assign households to different livelihood strategies (e.g. Babulo *et al*., 2008). The drawback of this approach, however, is that the realized incomes are stochastic and the livelihood strategies that households embark on stems from the household asset portfolio rather than just income (Brown, *et al.,* 2006).

This study however will adopt the asset based approach articulated by May and Carter (1999) and Carter and Barrett (2006). Under this approach, the livelihood strategy the household pursues and the income it realizes is assumed to be determined by the asset holdings the household possesses. In consequence, "households having similar asset holdings may be confined to similar livelihood strategies even though they may realize quite different incomes in any given period, regardless of the fact that they are structurally identical" (Brown, *et al.,* 2006).

*3.3.2. **The Asset Based Framework***

The household, which is the basic unit of analysis in this study, is equipped with various assets –tangible and intangible –and the portfolio of assets differs from one household to the other. Following Brown *et al* (2006) we assume that a household seeks to maximize its utility defined over realized incomes by allocating its asset holdings to a set of activities, $j = 1, 2, \ldots, K$, given the environment the household is operating, M. If we assume that a unique set of activities comprise of a strategy and that different strategies exhibits different income distributions that can be compared and ranked to some order for instance in terms of poverty dominance, then, going by an axiom of revealed preferences, a household that adopts a poverty dominated strategy (lower return strategy) relative to others in its neighborhood must have done so because certain constraints are binding (i.e. either it has limited assets or it cannot freely reap the benefits from its assets due to disparities regarding access to markets and public goods). This can be specified as follows:

$$I_j = G_j(A_j; M) + \varepsilon_j \qquad (1)$$

Where G_j is an increasing function specifying the relationship between household assets drawn to activity j, A_j; and the stochastic return from that activity, I_j, in a given environment, M; while ε_j is an error term (i.e. that captures any measurement errors and the unanticipated shocks to the income realized from that particular activity). Household's total income Y is therefore a summation of all the realized incomes, Ij, a household generates from pursuing various activities (i.e. $Y = \Sigma_j Ij$) in that particular environment. Thus the household is

confronted with a utility maximization problem which can be specified as follows:

$$\max_{A_j} \mathbf{U}(Y) = U\left(\sum G_j(A_j; M) + \varepsilon_j\right) \qquad 2$$

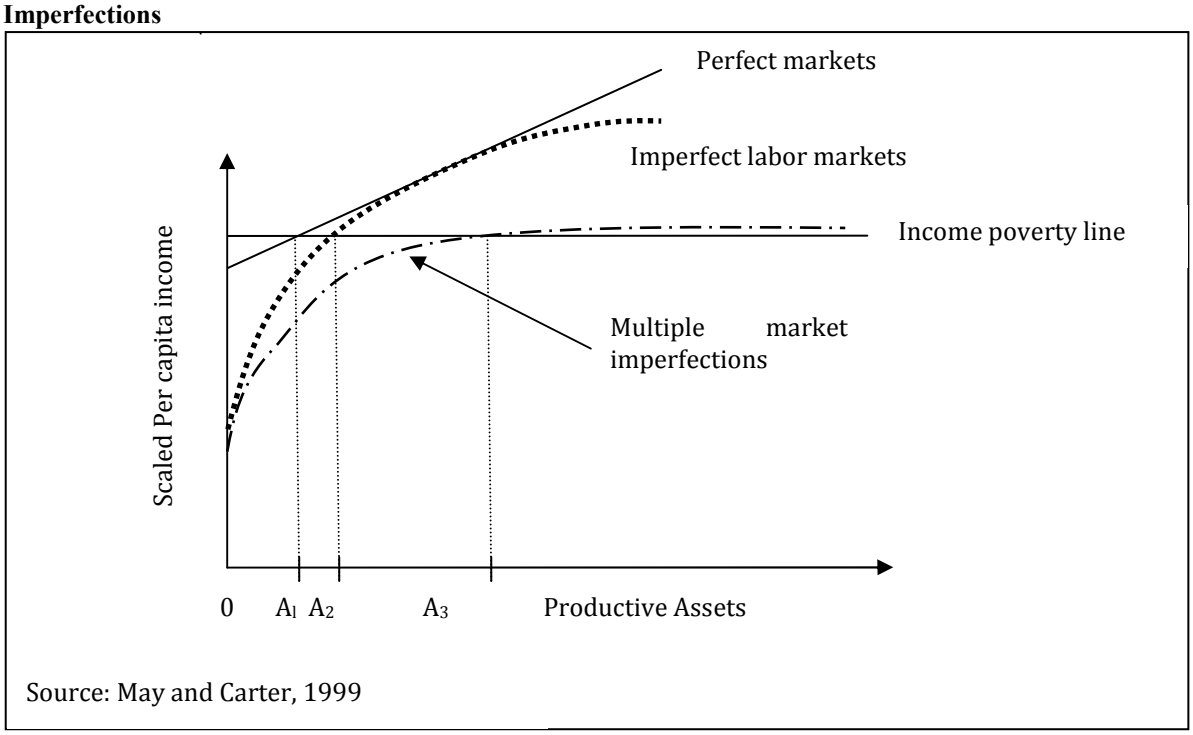
Subject to:

$$\sum_j A_j \leq A_0$$

Confronted with this livelihood strategy choice problem, the household weighs the marginal utility it derives, in any time period, from allocation of its asset holdings to different sets of activities, taking into account the expected income from a given allocation, $G_j(A_j; M)$, as well as the entire underlying distribution of each ε_j which generates a welfare ranking among alternatives generating exactly the same expected income (Brown *et al.,* 2006). This is analogous to Sen's (1981) entitlement mapping, however rather than focusing on higher dimensional commodity space as illustrated by Sen (1981), it narrows its assets mapping into only one dimensional income space (May and Carter, 1999). Diagrammatically this is presented in Figure 1.

When the household has access to full and complete, competitive markets then its production decisions become separable from consumption decisions and its overall wealth and endowments (May and Carter, 1999). In this case, the marginal returns to endowments would be constant (as depicted by a straight line in figure 2) as such the assets bundle owned by the household would not matter nor affect the marginal returns to any particular asset or endowment (i.e. $G_j(A_j; M) = R'A_i$). Thus being poor, in this case, would be a question of having inadequate assets as May and Carter (1999) put it "there would be no ancillary constraints which inhibit the effectiveness with which households use endowments to generate income, nor constraints which might inhibit household's ability to utilize effectively assets which might be transferred to them" (May and Carter 1999: page 11). In terms of policy implications, alleviating the poverty of these households could be a question of just transferring the assets or income to these households.

Figure 1: Livelihood Mapping under Perfect Markets, Imperfect Labor Markets and Multiple Market Imperfections



Source: May and Carter, 1999

However, if markets are not perfect, then household's production decisions are inseparable from consumption decisions and its overall wealth and endowments (Sadoulet and Janvry, 1995). In this case, the livelihood mapping is no longer a straight line but a curve that depicts diminishing returns to assets owing to the fact that a household is less able to freely allocate its assets across activities in the economic system. For instance, May and Carter (1999) illustrate that if a household is faced only with imperfect labor markets (i.e. cannot buy or sell labor) the livelihood map would be represented by the dotted line with the anticipated income reaching up to the perfect markets income map only at asset level where the households that are not constrained would wish not to either hire or sell labor. The steep gradient of the curve at the low productive asset levels simply exhibits the "household's anxiety and undervaluation of its own labor time (as it would opt to intensively exploit any

additional resource units it has access to) when living standards are low" (May and Carter 1999).

The minimum required level of assets to enable the household to live beyond the poverty line would therefore increase from A_1 (under perfect market) to A_2 (under imperfect labor markets) signaling a point that poverty results not just from possession of inadequate assets but also from disparities in the opportunity set (e.g. unequal access to labor markets, credit markets, insurance markets as well as public goods and services). In this case, poverty becomes more complex and cannot just be alleviated by income or asset transfers *per se* (May and Carter 1999). The curve flattens further if multiple markets imperfections exist and the minimum asset level required for the household to live equal or above the poverty line increases further to A_3. Thus "returns on assets might vary across activities and by scale or scope if barriers exist that restrict households' ability to allocate assets freely across all activities observed in an economy" (Brown, *et al.,* 2006).

3.3.3. ***Cluster Analysis***

As mentioned before, there is no standard way of classifying activities into distinct livelihood strategies. In this study we use cluster analysis method to classify the various activities undertaken in the study area into distinct livelihood strategies following Brown *et al.* (2006). Cluster analysis is a technique of constructing a judicious and informative classification of an originally unclassified set of data, by using the observable variable values on each object. The beauty of this approach is that instead of classifying livelihood strategies based on general subjective rules, for instance, by looking at the income shares, which is a common trend in literature, it lets the data speak for itself by segregating the household's activities into distinct livelihood strategies so that each livelihood strategy exhibit some common trait; hence, reflecting how households allocate assets across the different activities (Barrett et al. 2005; Brown *et al*., 2006).

Thus the cluster technique aggregates the objects under investigation into distinct groups based on similar statistic (for example, mean or median) or distance (dissimilarity measures) and does not require specification of any assumptions about the statistical distributions. It is therefore a "highly flexible and intuitive method of classifying the household livelihood strategies, even though it is computationally intensive" (Brown *et al.,* 2006).

Basing on the five broad activities identified in the study area, we therefore use k-means cluster analysis to allocate each household to a distinct group based on the household's allocation of the following asset variables: land area allocated to 1) maize, 2) bananas, 3) Coffee, 4) beans, 5) cassava, 6) groundnuts, 7) potatoes, 8) other crops, and number of 9) Tropical livestock unit[1] (TLU), and finally, number of household members engaged in 10) off-farm activities and 11) farm activities. The 2005 and 2008 data were pooled together in this analysis in order to see which households remained in the same strategy or switched to another strategy in 2008.

3.3.4. ***Poverty Analysis***

Poverty in general refers to "lack of physical necessities, assets and income" (Chambers, 1995: page 175). However, in most of the empirical studies (including this study) poverty definition has been narrowed to financial deprivation as it is easier to measure income than other forms of deprivation. Thus based on this definition, the poor are classified as those that live below the income poverty line[2] and the non-poor as those that live above the income poverty line. The term 'poverty incidence' is used to refer to the proportion of people in a population living below the poverty line.

While knowing the incidence of poverty gives an overall picture of the poverty levels, it does not convey any information about what happens if the poor get poorer. Owing to this, economists have gone further to examine the average poverty gaps sometimes referred to poverty intensity. The average poverty gap measures how far the poor are from the poverty line (i.e. how much resource is needed to bring the poor to the poverty line) and such analysis could be of paramount importance for policy interventions targeting the poor. However one of the shortfalls of the average poverty gap is that it is not sensitive to poverty severity and to overcome this problem, a squared average poverty gap is used instead.

The conventional way of conducting this analysis in literature has been to use the Foster Greer Thorbecke (FGT) poverty indices (Foster *et al*., 1984) which are given by:

$$P_{\alpha} = \frac{1}{N}\sum_{i=1}^{N} I\left(\frac{D - Y_i}{D}\right)^{\alpha} \qquad (3)$$

Where α is non-negative poverty aversion parameter; *N* is the sample size; *D* is the income Poverty line; *Y* is the income per adult equivalent; and *I* assumes the value of 1 for the poor and 0 otherwise. When α = 0, the index reduces to the head count index and measures the proportion of the population (sample) that is poor. If α=1, the index measures average normalized poverty gap and lastly if α= 2, the index measures the severity and

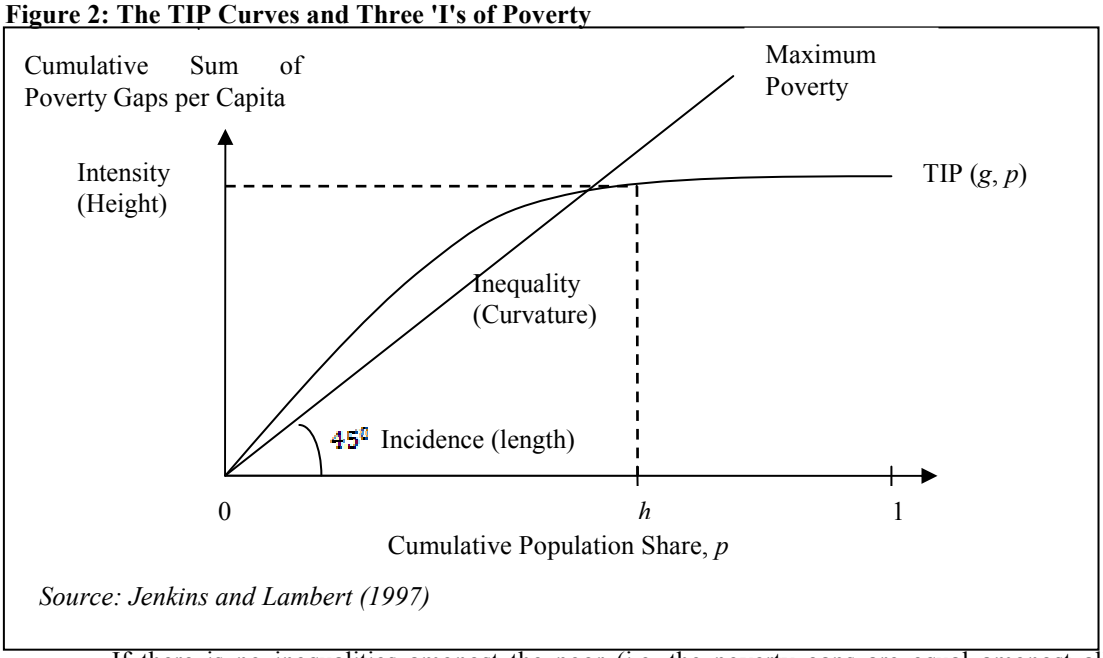
[1] TLU was obtained by using the scale: 1=cattle, 0.15=goat/sheep/pigs, and 0.005=chicken/other.
[2] An income poverty line is a minimum amount of money that is considered adequate to enable the individual or household meet the basic necessities.

acuteness of poverty.

In this study, however, we use the Three I's of Poverty (TIP) curves[1] following Jenkins and Lambert (1997) to examine and compare the incidence of poverty in the study area across time and among households pursuing different livelihood strategies (classified under cluster analysis). The TIP curves are favored at the expense of the FGT poverty indices because of their stunning feature to concisely and "simultaneously portray the incidence, intensity and inequality dimensions of aggregate poverty" (Jenkins and Lambert, 1997: page 317). The TIP curve is obtained by plotting the cumulated proportion of population on the horizontal axis and the cumulated per capita poverty gap on the vertical axis beginning with the poorest to the richest. Thus the curve cumulates the poverty gap measure at decreasing rates until the maximum poverty line is reached and at that point, the curve becomes horizontal (Bellu *et al*., 2005). For illustration, see figure 2:

The incidence dimension of poverty is depicted by the horizontal distance from the origin to a point where the TIP curve becomes a horizontal line while the intensity dimension of poverty is depicted by the vertical distance from the origin to a point where the TIP curve becomes a horizontal line. The inequality dimension of poverty is captured by the degree of the curvature of the TIP curve before it gets horizontal (Jenkins and Lambert, 1997).

Figure 2: The TIP Curves and Three 'I's of Poverty



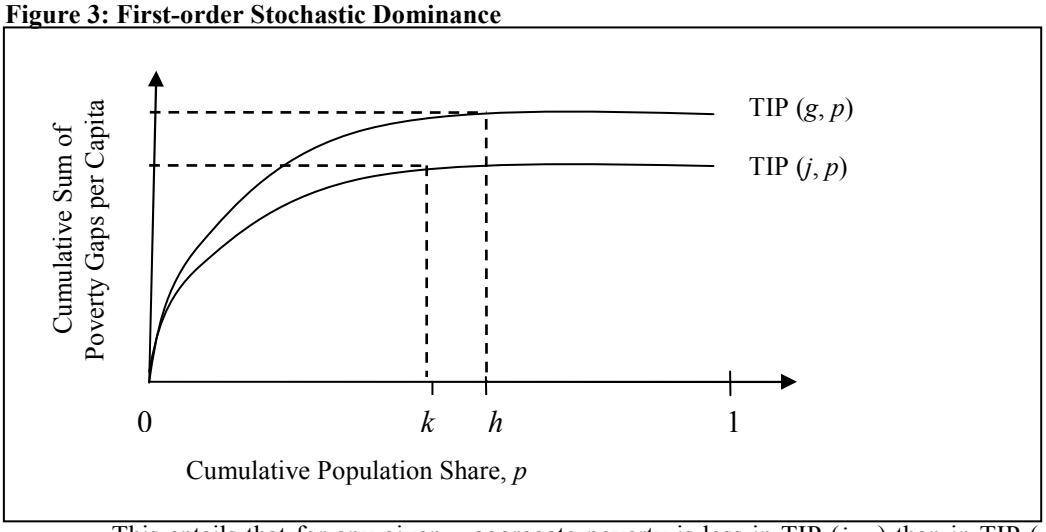
Source: Jenkins and Lambert (1997)

If there is no inequalities amongst the poor (i.e. the poverty gaps are equal amongst all the poor households), the curvature part of the TIP curve becomes just a straight line. In contrast, if higher inequality exists (i.e. there is a huge difference in poverty gaps), then the TIP curves becomes more concave (Bellu *et al*., 2005). Maximum poverty would be a situation where everybody has zero incomes and in this case, the TIP curve is a 45^0 straight line from the origin and has the area equal to 0.5. On the other extreme, however, if none is poor (everybody has income equal to or greater than the poverty line) the TIP curve overlaps with the horizontal axis (Jenkins and Lambert, 1997).

In order to make poverty comparisons therefore between the two districts across time (i.e. 2005 and 2008) two TIP graphs are constructed: one for Masindi and Masaka in period 2005 and the other for both districts in period 2008[2]. This is a more appealing way because it enables one not only to examine the three 'I's of poverty but also to check for poverty dominance (Jenkins and Lambert, 1997). Given the two income distributions with their corresponding TIP curves: TIP (*g; p*) and TIP (*j; p*) respectively, then TIP (*g; p*) curve is said to be first-order stochastically dominant over the TIP (*j; p*) curve if and only if by any class of normalized poverty gap measures, *p,* the "TIP (*g; p*) lies entirely above the TIP (*j; p*)" (Jenkins and Lambert, 1997: page 320).

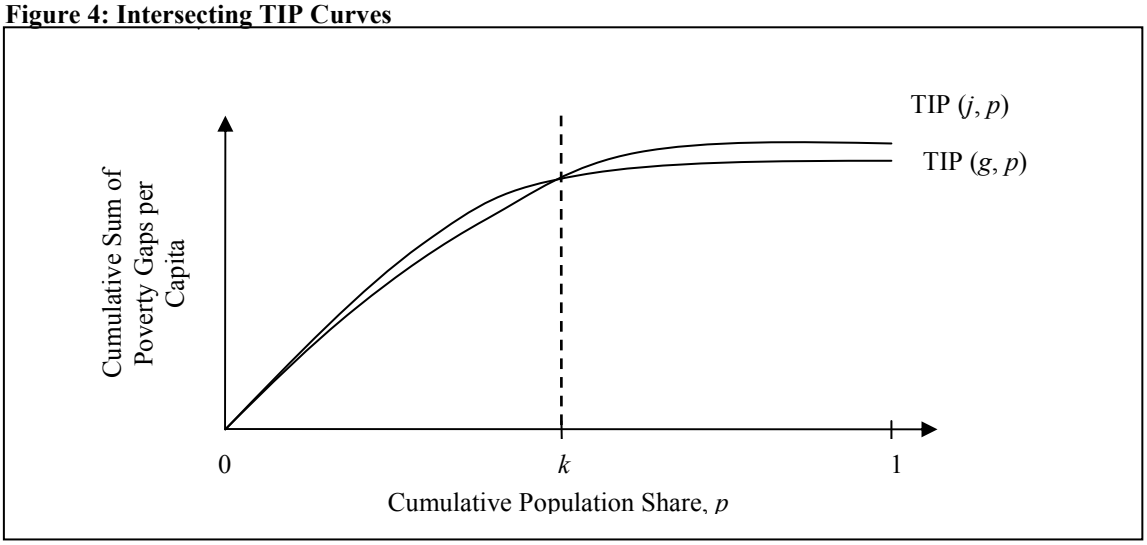
[1] For a detailed explanation, interested readers should see Jenkins and Lambert (1997)
[2] To account for inflation, incomes for 2008 are deflated by using consumer price index (CPI) of 1.153 with 2005 as base year.

Figure 3: First-order Stochastic Dominance



This entails that for any given p aggregate poverty is less in TIP (j; p) than in TIP (g; p). If the TIP curves cross or intersect then the ranking gets ambiguous. For instance if p is set at k as in figure 4 below, then aggregate poverty is dominant in income distribution represented by TIP (j; p) curve only up to a point k (i.e. where the TIP (j; p) = TIP (g; p)) and the reverse is true beyond that point. One cannot therefore unambiguously state which TIP curve exhibits dominance over the other. Jenkins and Lambert (1997) however concludes that "if the two TIP curves intersects once and the FGT (2) is higher in the initially dominant TIP curve, then poverty is greater in that distribution for a sub class of poverty indices, P^1 or Q^2 for which the aversion to income inequality amongst the poor is sufficiently large" (Jenkins and Lambert, 1997 page 321). Likewise, to investigate poverty levels among households pursuing x different livelihood strategies (identified under cluster analysis), we construct x TIP curves for each sub-group (identified by the livelihood strategy) and check for poverty dominance in each group's income distribution. A remunerative strategy is therefore defined as the one whose TIP curve is dominated by the rest of the other TIP curves (Jenkins and Lambert, 1997).

Figure 4: Intersecting TIP Curves



3.3.5. *Random Effect Multinomial Logit Model*

Following Ben Akiva *et al* (1993) and Train (1998), the household choice problem of livelihood strategies can be cast into a random utility model. Consider a household i, from a sample of N households that has to choose a livelihood strategy j (i.e. $j = 1, 2, \ldots, J$), at time t. Assuming that each household attaches a utility U_{ijt}, to each livelihood strategy, then in any time period t, a household chooses a livelihood strategy s, if and only if $U_{ist} > U_{ijt}, \forall\ j \neq s$. According to Verbeek (2004) the household's utility function can be expressed as a linear function of observable (household and/or alternative specific) characteristics X_{ijt}, and unobserved components (i.e. the unobserved effect α_j, which is linked to the intrinsic utility of strategy j, and an error term

[1] P is the class of replication invariant increasing Schur-convex functions of poverty gap vectors.
[2] Q is as P, except defined over normalized poverty gaps

ε_{ijt}) as follows:

$$U_{ijt} = \beta X_{ijt} + \propto_j + \varepsilon_{ijt}, \qquad \propto_j \sim IID\ (0,\ \sigma_\alpha^2), \tag{4}$$

If we assume the error components are independent and identically distributed (iid) extreme value type (Hensher, *et al.*, 2001); then, the probability of a household choosing strategy *j* at time *t*, can be given by multinomial logit model with a random effect $\propto_j$, as follows:

$$P_{it}(j|\ \propto, \beta) = \frac{e^{\beta X_{ijt} + \alpha_j}}{\sum_{j=1}^{J} e^{\beta X_{ijt} + \alpha_j}} \tag{5}$$

When $\propto_j$ and the β's for one of the strategy, for instance, strategy one are set to zero, the multinomial logit model for each strategy (i.e. $\forall j \neq 1$) can be given by:

$$P_{it}(j|\ \propto, \beta) = \frac{e^{\beta X_{ijt} + \alpha_j}}{1 + \sum_{j=2}^{J} e^{\beta X_{ijt} + \alpha_j}} \qquad \text{and}$$

$$P_{it}(1|\ \propto, \beta) = \frac{1}{1 + \sum_{j=1}^{J} e^{\beta X_{ijt} + \alpha_j}} \tag{6}$$

This can be estimated by using the maximum likelihood estimator with stata command '**gllamm**'[1] and selecting the **expanded**[2] **(.)** option (Rabe-Hesketh *et al.*, 2002; 2004). Thus for estimation purposes, the data is expanded in such a way that every household is presented with all the alternatives available and the actually selected alternative is coded by a dummy variable (1 if chosen and 0 otherwise). This makes it easier to specify the random effects in the model (Rabe-Hesketh *et al.*, 2004). For instance, if we let strategy one be the base strategy then we have $J-1$ random effects for $J-1$ alternatives.

To identify factors that influence household participation in different livelihood strategies, we estimate a multinomial logit regression with random effects (equation 5). The essence of introducing random effects is to account for heterogeneity in preferences among households. The dependent variable is a polychotomous choice variable representing the livelihood strategy alternatives, for household *i,* at time *t.* The household productive assets (land holding size, education level of the household head, tropical livestock unit (TLU)) and demographic characteristics (total labor force, sex of the household head) at time *t,* are used as the explanatory variables in the model. The district dummy variable that indicates the household location (i.e. 1=Masindi; 0=Masaka) and the household specific component are included in the model to control for spatial heterogeneity effects (i.e. differences in economic incentives –such as road network and infrastructure, access to information, credit, education and health services as well agro-ecological context –that condition opportunities across all households in the district) and differences in preferences among households.

The statistical significance of the effect of household asset endowments on the observed household livelihood strategy choices implies that households participation in low return strategies is a result of asset constraints Babulo *et al*. (2008) while the statistical significance of the district dummy variable in the regression entails that household's participation in low return strategies is a result of household's restricted capacity to use its available assets due to limited or lack of incentives in the economic system. The joint significance of both household asset endowments and district dummy variable therefore entails that both assets and the economic incentives matter.

3.3.6. ***Description of the variables***

This study used household endowments (land holding size, education level of the household head, tropical livestock unit (TLU)) and demographic characteristics (total labor force, sex of the household head) as well as a district dummy variable (that indicates the household location) as explanatory variables. The choice of these variables is motivated by the empirical findings of the previous studies. Generally, these variables have been found to be the major force behind household participation in different livelihood strategies.

Barrett *et al*. (2001) found that the odds of a household engaging in either unskilled on-farm or off-farm employment increases with a household owning small land holding sizes and having low education levels. Babulo *et al*. (2008) on the other hand, found that households with high education levels, big land holding sizes

[1] "Is a stata program used for fitting Generalized Linear Latent and Mixed Models" (Rabe-Hesketh *et al.*, 2004: page 110)

[2] Is used to "specify the clusters of households representing a single alternative set so that gllamm computes a single likelihood contribution for each alternative set equal to multinomial probability in equation (5)" (Rabe-Hesketh *et al.*, 2004: page 110)

and a better access to the markets are more likely to choose a strategy that is oriented towards crop and livestock production (high return livelihood strategy). They further argue that households with better education have better chances to engage in high return strategies for instance, off-farm skilled work.

Finally, Babulo *et al*. (2008) further found that households with a big household size and total labor force are more likely to engage in labor intensive activities such as forest extraction (e.g. pit sawing and charcoal burning), off-farm work, or mixed strategies. Female headed households are more likely to engage in petty businesses such as selling food items, locally brewed beer as well as non timber forest products e.g. fuelwood.

4. Results and Discussion

4.1. Identification of Livelihood Strategies

Based on the cluster analysis results, five distinct livelihood strategies were identified (i.e. k=5). The proportion of households engaged in each activity in each livelihood strategy, mean land holding size and the mean incomes (in Ugandan Shillings) are summarized in the table 3. The deflated total income per adult equivalent was computed by summing up the values of: annual net income from crops; annual net income from livestock; annual net income from forestry, woodlands and environment; annual net income from off-farm activities; annual income from remittances; and then dividing the sum by a deflation factor and adult equivalent[1]. Note that n represents the proportion of people who were engaged in that strategy in one or both periods. The disaggregated analysis is done in section 5.4.

The first strategy (diversified commercial crop production), is employed by a small number of households (44). The majority of the households pursuing this livelihood strategy are from Masaka district and only four are from Masindi district. This is not surprising as Masaka district is endowed with deep fertile soils and receives evenly distributed rains throughout the year. Besides, households from Masaka have relatively a greater access to a big market (Kampala city) which offers them an opportunity to sell their farm produce at relatively better prices. The strategy has the highest mean annual income per adult equivalent and households in this strategy have both pure stands (for cash crops, food crops) as well other plots where cash crops and food crops are mixed or intercropped.

The second strategy, diversified commercial crop and livestock production, is employed by only two households in the study area and only appears in 2008. The strategy differs from strategy one in that this strategy is characterized by both large scale cash crop and diversified livestock production. This strategy has the highest mean household land holding size, highest mean livestock head, and highest mean labor force, yet surprisingly though; the average mean annual income per adult equivalent is less than that of strategy one. The probable explanations for the low mean annual income per adult equivalent could be the high entry costs that tremendously reduce the net incomes in the initial periods since the strategy requires huge investments in terms of land, labor as well as livestock units but one would expect the net incomes to increase tremendously thereafter. Thus since none was engaging in this strategy in 2005 those who had moved into this strategy by 2008 had incurred high entry costs and hence the lower mean income than strategy one.

The third strategy (subsistence production), which can also be viewed as specializing into food crop production, is probably one of the basic strategies employed by the poor in the study area. The strategy is dominated by households from Masindi district (68%) and is characterized by the smallest mean landholding size, smallest mean labor force and smallest mean income. Members in this strategy engage in food crops production and have the smallest pieces of land allocated to cash crops. Their failure to engage in cash crop production and off-farm activities could be attributed to small land holding sizes and imperfect labor markets coupled with liquidity constraints. Barrett (2001) argues that constraints of this nature do not just limit households into diversifying in high return activities but also forces the households to diversify into low return activities.

The fourth strategy (small scale commercial crop and livestock production) is characterized by both crop commercial production and livestock commercial production just like strategy two except that the production is at a relatively lower scale. Thus the differences in returns between the two strategies can be attributed to nothing but the scale of production. The strategy is pursued by only sixteen households in the study area and (just like strategy two) none was engaged in this strategy in 2005. The strategy equally demands some scale of investment in both livestock, land as well as labor force. Thus only households who have amassed enough assets (capital) are expected to embark on this strategy. The poor therefore are confined to strategy three and five whose entry costs are less restrictive.

[1] The adult equivalent was obtained by using the OECD (1982) equivalence scale which assigns a value of 1 to the first household member, 0.7 to each additional adult and 0.5 to each child (i.e. adult equivalence=(1+0.7*(adult-1)+0.5*(child)).

Table 3: Identification of Livelihood Strategies

Variable	Strategies 1 (n=44)	2 (n=2)	3 (n=172)	4 (n=16)	5 (n=222)
Average resources allocated to each activity based on the livelihood strategy					
Farming					
Food crops (in acres)	3.3	3.1	1.7	2.2	2.6
Mixed (cash crop and food crops) (in acres)	4.1	0.00	0.27	0.53	0.81
Cash crops[1] (in acres)	0.51	0.75	0.08	0.57	0.33
Livestock					
Cattle (head)	0.47	40.5	0.02	6.7	0.27
Small ruminants & pigs (head)	0.84	5.5	1.4	5.1	3.4
Poultry	5.3	2.5	4.8	7.3	7.7
Off-farm Activities					
Petty trade	0.23	0.00	0.21	0.33	0.41
Shop	0.06	0.50	0.06	0.06	0.12
Wage work	0.23	0.00	0.28	0.27	0.36
Percentage of household engaging in each strategy by district					
Masaka	95.5	100	32.3	93.3	54.1
Masindi	4.6	0.00	67.7	6.7	45.9
Mean incomes, total labor force and land holding size for each livelihood strategy					
Mean income[2] & Standard deviation	**759354 (2279004)**	**728894 (681156)**	**91355 (69021)**	**367921 (229581)**	**436940 (487064)**
Mean total household labor force & Standard deviation	**3.41 (1.85)**	**6.00 (1.41)**	**3.31 (1.84)**	**4.33 (1.95)**	**3.41 (1.92)**
Mean Land owned & Standard deviation	**8.30 (16.18)**	**59.75 (65.41)**	**2.61 (2.64)**	**8.32 (12.60)**	**4.76 (6.90)**
Name of strategy	**Diversified commercial crop production**	**Large scale Commercial crop & livestock production**	**Subsistence production**	**Small scale Commercial crop & livestock production**	**Mixed (smallholder) farming**

The last strategy, (mixed smallholder farming) is almost similar to strategy three except that the average land holding size allocated to mixed crops and the mean number of small ruminants kept by the households pursuing this strategy is three times as big as that in strategy three. Besides, the strategy has the highest mean number of households engaged in off-farm activities. Thus the differences between the two strategies are more in terms of scope than scale of production. Interestingly, the strategy has the highest number of household participants (222) and 55% of them come from Masaka district while 45% come from Masindi district. The high number of participants can be attributed to low entry costs since just like strategy three, the strategy does not demand initial tangible investments and therefore seem to be the second convenient strategy for the poor (after strategy three). Barrett *et al*., (2001) argue that "poor endowments of productive, non-labor assets such as land or livestock commonly force poorer households to hire themselves out to work on other's fields or to herd other's animals for low wages" (Barrett *et al*., 2001: page 370).

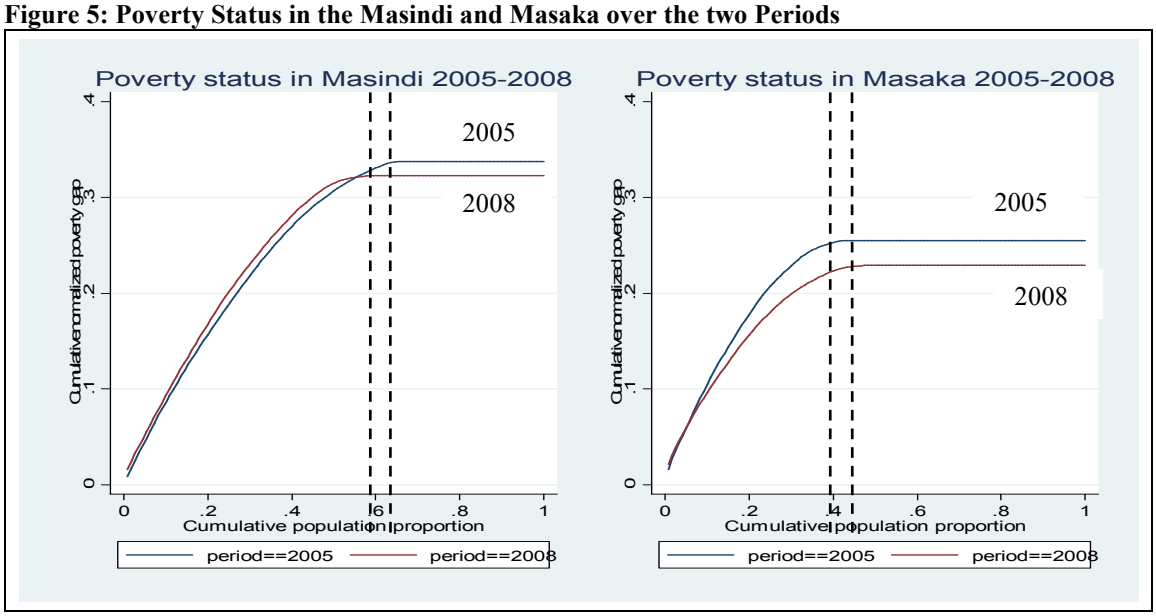
Thus, the higher participants of households from Masaka district than from Masindi could be partly explained by limited economic incentives in Masindi compared to Masaka which is located near to Kampala city and besides, there is more of cash crop production in Masaka than in Masindi which should create more opportunities in Masaka for petty trade as well as wage work than in Masindi. It should however be noted that while the cluster analysis sheds some light on these issues more robust methods are required. Further investigations on factors that influence household participation in different livelihood strategies were done in subsequent sections.

4.2. Poverty Status in the two Districts between the two Periods

The TIP curves for Masaka and Masindi districts for period 2005 and 2008 are shown in figure 5 and figure 6 respectively. The incidence and intensity dimensions of poverty were higher in Masindi in 2005 than in 2008 as depicted by the curves. The World Bank extreme poverty line of $1.25 per capita per day (World Bank, 2008) which translates to 282710.8 Ugandan shillings per year[3] is used.

[1] Coffee, tea, tobacco, cotton, sugarcane, cocoa, vanilla, moringa, aloevera and sisal
[2] Income per adult equivalent in Ugandan Shillings
[3] Using the 2005 purchasing power parity of $1= 619.64 Ugandan shillings

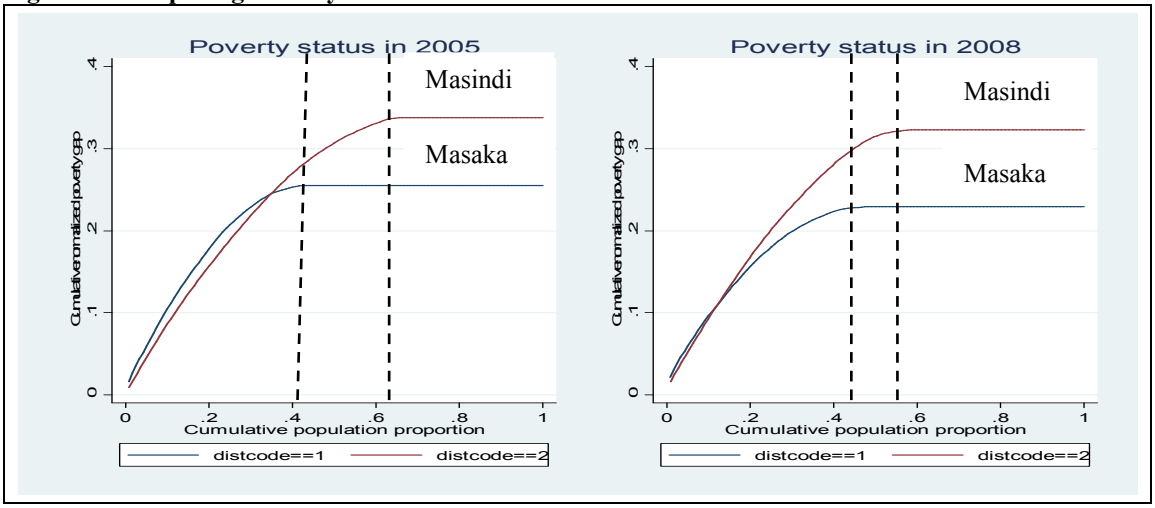
Figure 5: Poverty Status in the Masindi and Masaka over the two Periods



The decrease in incidence of poverty in Masindi (i.e. from 66% in 2005 to 59% in 2008) can be attributed to on one hand, good crop harvests that the district witnessed in 2007 due to good weather and on the other hand, the stability of the region (which was previously under intermittent attacks from the rebels) which has seen many household who had sought refuge in the district moving away back to their respective homes (UBOS, 2008). However since the two curves intersect (figure 5) poverty ranking in the two distributions is somewhat ambiguous. Thus if we set poverty line at any point before the point where the two curves intersect, then poverty incidence will be higher in 2008 than in 2005; and conversely, if the poverty line is set at any point above the point of intersection of the curves, then poverty incidence is higher in 2005 than in 2008. Nevertheless, drawing from Jenkins and Lambert (1997) conclusion, we can conclude that since the severity of poverty (FGT (2)) was greater in period 2008 (23%) in Masindi than was in period 2005 (21.0 %), then the aggregate poverty was greater in period 2005 than in 2008 in Masindi for all members of Foster *et al*. (1984) class FGT (α) except for the head count index (Jenkins and Lambert, 1997). This is because the head count index is sensitive to the poverty line.

As for Masaka, the TIP curve for 2005 lies entirely above the other TIP curve for 2008 (i.e. the two curves do not cross or intercept at any point for all values of *p*) then aggregate poverty was higher in 2005 than in 2008 even though the incidence of poverty increased from 44% in 2005 to 48% in the 2008. Thus the intensity and inequality dimensions offset changes effected by the change in incidence of poverty over the two periods. Comparing the poverty levels in the two districts (figure 6) reveals that poverty levels were higher in Masindi than in Masaka in both 2005 period and 2008 period. However, poverty incidence reduced more in Masindi (i.e. from 66% in 2005 to 59% in 2008) and increased slightly in Masaka (i.e. from 44% in 2005 to 48% in 2005). The Masaka TIP curve in 2005 however intersects the Masindi curve once and owing to this, the welfare ranking again becomes ambiguous. Again, drawing from Jenkins and Lambert (1997) conclusion, we can conclude that since the severity of poverty (FGT (2)) was greater in Masindi (20.99%) than was in Masaka (20.55%), then aggregate poverty was greater in Masindi than in Masaka in 2005 for all members of Foster *et al*. (1984) class FGT (α) except for the head count index (Jenkins and Lambert, 1997).

Figure 6: Comparing Poverty Status in the two Districts in the Two Periods

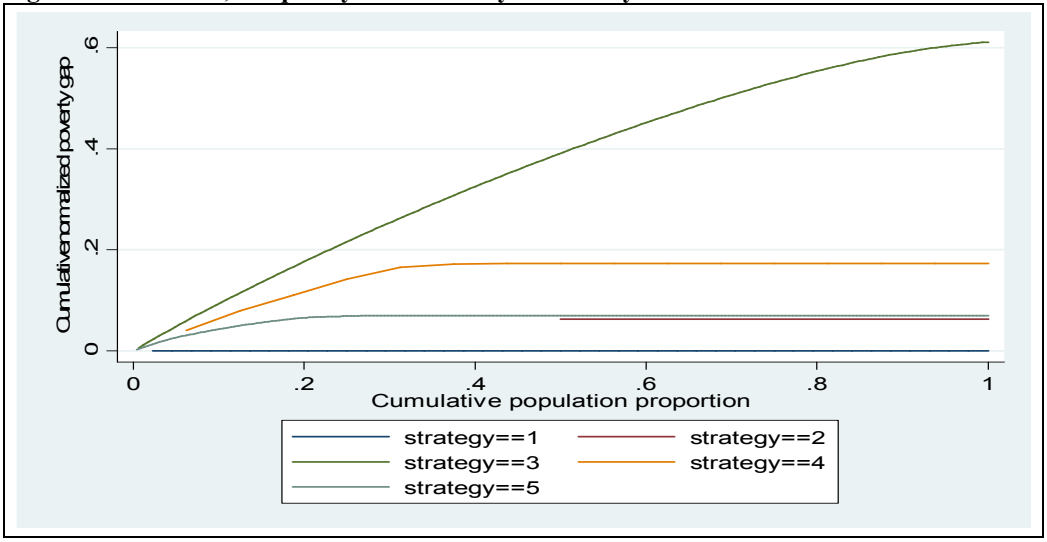


4.3. Incidence of Poverty among Households Pursuing Different Livelihood Strategies

Even though the cluster analysis presented in section 3.2 gives an overview of the welfare ranking of strategies based on their income mean differences[1], that is a necessary but not sufficient evidence for one to conclude that one strategy is superior over the other. One can use the distributions of incomes per capita to see whether one strategy is superior over the other by assessing whether the income distribution of one strategy dominates over the income distribution of the other strategy (e.g Brown, *et al.,* 2006). In this paper we use TIP curves to investigate poverty within each livelihood group and check for poverty dominance.

Figure 7 shows the TIP curves for different livelihood strategies pursued in the study area. The TIP curve for strategy three dominates the rest of the other curves. This entails that poverty is higher in this strategy (head count index of 94% and cumulative normalized poverty gap of 60%) than in any other strategy. This confirms the cluster analysis results that depict this strategy as having the least mean income. On the other hand, strategy one is dominated by all other TIP curves and this as well confirms the findings from cluster analysis as this strategy is depicted as having the greatest mean income. Thus poverty is lowest in strategy one (in fact, there is no poverty at all). In general, it is evident that the TIP curves depicted in figure 7 confirms the cluster analysis findings and based on the TIP curve dominance checks, strategy one is the most superior and strategy three the most inferior. The ranking or ordering of strategies is based on which TIP curve dominates the other. Strategy A is inferior to B if the TIP curve for strategy A dominates the TIP curve for strategy B.

Figure 7: Incidence, Inequality and Intensity of Poverty Dimension in Each livelihood Strategy Subgroup



In terms of policy implications, it means that it would require more resources to pull the poor to

[1] A one-way analysis of variance with Bonferroni correction was used to account for possible spurious inferences due to multiple comparisons between group means (Brown et al., 2006)

poverty line in strategy three than in any other strategies. Thus if the government's policy objective is to reduce incidence of poverty, then it would be wise to target households in strategy two and strategy five as they would need less resources[1] (on average 28271 Ugandan Shillings per household) to be pushed to the poverty line than households in strategy three (i.e. would require 265748 Ugandan Shillings). On the other hand, if the government policy objective is to reduce the inequality among the poor then it would be wiser to target those pursuing strategy three to bring them closer to the poverty line.

4.4. Strategy Dynamics

Having classified livelihood strategies and ranked them based on their superiority, it is now worthwhile to see how households switch from one strategy to the other. Just like Barrett (2001) found Ivorian farmers, in particular two-thirds of the households, were not confined to one strategy between 1993 and 1995, likewise, I find Ugandan rural households exhibiting great mobility among livelihood strategies between 2005 and 2008. It is interesting to note that by 2008, 55% of the households had switched strategies. Table 4 shows how many households had switched from one strategy to the other and how many had remained in their initial strategy in the two periods. The diagonal elements in the table show the number of households who had remained in the initial strategy and the off-diagonal elements show the number of households who had switched strategies between the two periods.

Surprisingly, all the households but one who were in strategy one (superior strategy), had moved to other strategies with the majority moving to strategy four (17.07%) and five (68.29) respectively. The majority of the households that were engaged in this strategy were from Masaka and coffee is the major cash crop grown in the area. The probable explanation for the households' change of strategies therefore could be the impact of coffee wilt disease which currently has no cure and farmers are advised to destroy and burn the infected trees in order to curb its spread. By 2006 the disease had destroyed half of the Uganda's 300 million Robusta coffee trees (Musoke, 2008). Thus, households' switch to strategy four (which is characterized by tangible investment in livestock production) and strategy five (which is characterized by high participation in off-farm activities) reveals the rural households' risk aversion behavior (i.e. leaving a high return strategy with relatively higher risk for low return strategies with relatively lower risk).

Table 4: Livelihood Strategy Transitional Matrix

Movements of Households from one strategy to the other		Strategies 2008										Total
		1		2		3		4		5		
Strategies 2005	1	**1**	**(2.44)**	1	(2.44)	4	(9.76)	7	(17.07)	28	(68.29)	41 (100.00)
	2	0	(0.00)	**0**	**(0.00)**	0	(0.00)	0	(0.00)	0	(0.00)	0 (0.00)
	3	0	(0.00)	0	(0.00)	**42**	**(44.21)**	2	(2.11)	51	(53.68)	95 (100.00)
	4	0	(0.00)	0	(0.00)	0	(0.00)	**0**	**(0.00)**	0	(0.00)	0 (0.00)
	5	2	(2.25)	1	(1.12)	20	(22.47)	7	(7.87)	**59**	**(66.29)**	89 (100.00)
	Total	3	(1.33)	2	(0.89)	66	(29.23)	16	(7.11)	138	(61.33)	**225 (100.00)**

On the other hand, out of 95 households who were in strategy three, 51 households (53.68%) moved to strategy five and none moved to either strategy one or strategy two (higher return strategies). This is not surprising as strategy five is predominantly characterized by petty trade, unskilled work, and other off-farm activities that do not necessarily require high investments. However switching to strategy one or strategy two requires a household to make some tangible investments in assets.

4.5. Factors that Influence Household's Participation in Different Livelihood Strategies

The cluster analysis results show that very few households engage in high return strategies and probably, worse more, fewer households had adopted the higher return strategy (for instance, strategy one) by 2008 than those who had moved away from this strategy. This suggests that there are constraints that bar households from adopting high return strategies. The random effect multinomial logit regression results presented in the table 5 give a special insight. Note that strategy one and two were combined with strategy four because they had small number of observations which could jeopardize the results if they were included in the regression as separate strategies. Strategy five is used as a base strategy.

[1] The resources required (on average) to bring a household to a poverty line is obtained by multiplying the poverty gap with the poverty line (for instance strategy two and strategy five households would require 0.10*282710.8 Ugandan Shillings per household while strategy three households would require 0.94*282710.8 Ugandan Shillings per household)

Table 5: Random Effect Multinomial Logit Regression Results

Variable	Strategy1		Strategy3	
	Coefficient	Standard errors	Coefficient	Standard errors
Masindi	-2.7874***	0.6475	1.3044***	0.3465
Household total labor force	-0.0535	0.1247	0.0435	0.1149
Household size	-0.0335	0.0739	0.0361	0.0628
Sex of household head	0.1142	0.4902	0.3259	0.3780
Age of household head	-0.0019	0.0134	-0.0107	0.0108
Education of household head	0.5121**	0.2116	0.2608	0.2205
TLU	0.4448***	0.1142	-1.8996***	0.3648
Land owned	0.0522 *	0.0268	-0.1446***	0.0505
Random intercept	0.8538	0.9633	-1.4775*	0.8332
Number of level one units	**1344**	**Variance of the random effects (1)**		**0.0680 (0.1868)**
Number of level two units	**231**	**Covariance of the random effects (2,1)**		**-0.2469 (0.3624)**
Log-likelihood Value	**-326.2262**	**Correlation of the random effects (2,1)**		**-1.0000**
Base Strategy	**5**	**Variance of the random effects (2)**		**0.8959 (0.7266)**
AIC	**694.4525**			

*** significant at 1%; **significant at 5%; *significant at 10%

The odds of choosing strategy one (diversified commercial crop production) over strategy five (mixed smallholder farming) significantly and substantially decreases with a household's residence being in geographically remote placed Masindi district. This could be attributed to three reasons: first, due to the remoteness of the area that limits its access to a larger market (Kampala city); second, due to less fertile soils and unfavorable weather condition that do not favor coffee production; and finally, due to small land holding sizes per household as the probability of adopting strategy one significantly decreases with an increase in household size and a decrease in land holding sizes. The odds of adopting strategy one also significantly increases with an increase in the education of the household head and livestock owned. These findings are consistent with the previous findings of other studies in Africa which assert that differences in asset endowments –especially, land, labor, education and livestock –and access to markets are the plausible explanation for rural household's choice of low return livelihood strategies (Dercon, 1998; Carter and May, 1999; Barrett *et al*., 2001).

Barrett *et al*., (2001) argue that the pursuit of this full time farmer strategy (in this paper referred to as diversified commercial crop production strategy) demands possession of adequate land by the household at the onset or possession of finances or social capital that would enable the household to acquire or gain access to additional land and enable it make full use of its available household labor force. They further argue that the strategy may be more appealing to households that live in high potential agro-ecological zones with satisfactory market access. Thus even if the strategy one has the highest mean income of the five strategies, the Masindi households are less likely to adopt the strategy because of climatic and land holding size constraints.

The odds of choosing subsistence production (lowest return strategy) over mixed smallholder farming however is significantly influenced by the area of residence of the household, livestock owned, as well as household land holding size. Households with fewer assets are more likely to adopt the subsistence production over mixed smallholder farming. The odds of choosing subsistence production over mixed smallholder farming increases substantially with a household's place of residence been Masindi. The significance of Masindi variable underscores the importance of incentives in the economic system (e.g. liquidity, market access, road network and infrastructure and availability of public goods and services such as health and education). Thus households who operate in an environment with limited incentives of this nature face limited choices since they fail to allocate their assets freely due to imperfect markets. It is therefore not surprising that the majority of the households from Masindi district (68%) are confined to subsistence production (the lowest return) strategy

5. Conclusion and Policy Implications

This study has identified five livelihood strategies that are pursued in the study area: namely; diversified commercial crop production, large scale commercial crop and livestock production, subsistence production, small scale commercial crop and livestock production, and mixed smallholder farming. The strategies significantly differ in terms of their welfare ranking. Subsistence production strategy has the lowest mean income and has the highest poverty levels (i.e. poverty incidence, inequality as well as intensity) while commercial diversified crop production has the highest mean income and lowest poverty levels of all –in fact, there is no poverty at all.

Both household's asset endowments (in particular, land, livestock and education) and incentives in the economic system (road network and infrastructure, information and market access, availability of public goods and services, agro-ecological conditions etc.) constrain households from participating into high return livelihood strategies. Households with lower asset holdings and living in a location with limited economic incentives (Masindi district) are confined to low return livelihood strategies (for instance, subsistence production) and face an uphill task to overcome the entry barriers to adopting higher return strategies. Development interventions

therefore aimed at improving the assets of the poor (for instance livestock, land holding sizes as well as education) or the incentives in the economic system (e.g. road network and infrastructure, household's access to information, credit, delivery and availability of public goods and services for instance education and health) can substantially improve the poorer household's chances of pursuing more rewarding livelihood strategies. Ignoring such constraints on the other hand, would render the poor helpless and gravitate into poverty trap as they would not be able to seize the emerging opportunities in the economic system. Thus the study has provided some of the basic necessary information required for development agents wanting to bring in projects or any interventions that seek to transform the lives of the poor in rural Uganda.

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