Graduate School of Development Studies

ESCAPING POVERTY IN RURAL AREAS: A CASE STUDY OF A HOUSEHOLD ASSET DYNAMICS IN TANZANIA

A Research Paper presented by:

Moses Wilson Dulle

(Tanzania)

In partial fulfilment of the requirements for obtaining the degree of
MASTERS OF ARTS IN DEVELOPMENT STUDIES

Specialization:
[Economics of Development]
(ECD)

Members of the examining committee:

Prof. Dr Michael Grimm [Supervisor]
Dr. Peter de Valk [Reader]

The Hague, The Netherlands
November 17, 2010

Disclaimer*:*

This document represents part of the author's study programme while at the Institute of Social Studies. The views stated therein are those of the author and not necessarily those of the Institute.

Inquiries*:*

Postal address:	Institute of Social Studies P.O. Box 29776 2502 LT The Hague The Netherlands
Location:	Kortenaerkade 12 2518 AX The Hague The Netherlands
Telephone:	+31 70 426 0460
Fax:	+31 70 426 0799

Acknowledgement

My sincere thanks go to my reputable supervisor, Professor Michael Grimm for his valuable guidance, comments and beneficial supervision. It could be difficult for me to complete this paper without his experienced and constructive ideas, quick responses and guidance; from the beginning to end. Also, I would like to thank Dr. Peter de Valk for his helpful comments, particularly when I was presenting my first draft. I am kindly acknowledging their supervision which helped me a lot in most of the hard times in the entire process my research paper. Finally, I would like to thank my sponsor; the Government of the United Republic of Tanzania, class mates, and my family for their necessary supports and encouragement throughout the process of my paper.

Contents

Acknowledgement *iii*
List of Tables *vi*
List of Figures *vi*
Abstract *viii*
Relevance to Development Studies *viii*

Chapter One: Introduction **1**

Chapter Two: Literature Review **4**
2.1. Assets and asset poverty 4
2.2 Major perspectives on assets and poverty 5
2.2.1 Consumption model 5
2.2.2 Social stratification theory 6
2.2.3 Development perspective 6
2.2.4 Capability perspective 7
2.3 Using Asset Dynamics to Measure Poverty 7

Chapter Three: Data and Descriptive analysis **9**
3.1 Source of Data and Sampling of the households 9
3.2 Variables covered during the Survey 9
3.3 Summary statistics of productive asset as adopted from household's budget survey reports 10
3.4 Current Status of rural poverty in Tanzania 11
3.5 Summary statistics computed from selected asset variables 12
3.6 Re-sale prices of durable assets 13

Chapter Four: Methodology and Model specification **15**
4.1 Construction of an asset index 16
4.2 Distribution of means and asset dynamics by cohorts 18
4.3 Distribution of asset dynamics by socio-economic status quintile 22
4.4 Distribution of factor scores, means and standard deviation by zones 24
4.5 Comparing stability of the households ranking using the asset index and income data 26
4.6 The reliability of the asset-based index 28
4.6.1 Internal coherence of the asset-based index 28
4.6.2 Robustness of an asset- based index 29
4.7. Discussion 31

Chapter Five: Conclusion **35**

References *37*

Appendixes **41**

Appendix A: Distribution of means of asset variables by cohorts *41*

Appendix A (Cont.....): Distribution of means of asset variables by age groups *42*

Appendix A (Cont.....): Distribution of means of asset variables by cohorts *43*

Appendix B Ownership of assets by socio-economic status quintile *44*

Appendix C Scoring factors and summary statistics of asset variables by zones *45*

Appendix C (Cont.....) Scoring factors and summary statistics of asset variables by zones *46*

Appendix D Distribution of means of asset variables and asset index by regions *47*

Appendix D (Cont...) Distribution of means of asset variables and asset index by regions *48*

Appendix E-1 Incidence of rural household's poverty by quintile *49*

Appendix E-2 Incidence of rural household's poverty by zones *49*

Appendix E-3: Incidence of rural household's poverty by education level *49*

Appendix F Number of households classified into similar quintile when asset based index and income data sets are applied *50*

List of Tables

Table 1: Percentage of the Households owning Productive Assets 11
in Rural Areas, Tanzania 11
Table 2 Statistical summary of asset variables 13
Table 3 Re-sale prices of durable assets 14
Table 4 Scoring factors and summary statistics for variables entering the computation of the first principal component 17
Table 5 Distribution of asset dynamics by cohorts from 1991/92-2007 20
Table 5 (Cont....) Distribution of asset dynamics by cohorts from 1991/92-2007 21
Table 6 Asset index dynamics by cohorts 22
Table 7 Decomposition of asset dynamics by socio-economic status quintile 24
Table 8 Categorization of regions into zones 25
Table 9 Proportion of households classified as poor and rich by using both asset-based index and official poverty measures 27
Table 10 Number of households classified into similar socio-economic status quintiles when asset and income data set are used 27
Table 11 Scoring factors and summary statistics for the productive assets 29
Table 12 Scoring factors and summary statistics for the consumer durables 30
Table 13 Distribution of means of asset index by years of study and zones 30

List of Figures

Figure 1 Incidence of Poverty in rural areas, Tanzania 12
Figure 2 Rate of inflation: 2001-2008 14

List of Acronyms

CPRC	Chronic Poverty Research Centre
GDP	Gross Domestic Product
HBS	Household Budget Survey
MDG	Millennium Development Goals
NBS	National Bureau of Statistics
NMS	National Master Sample
NSGRP	National Strategy for Growth and Reduction of Poverty
PCA	Principal Component Analysis
PRSP	Poverty Reduction Strategy Paper
PSU	Primary Sampling Units
SAP	Structural Adjustment Program
URT	United Republic of Tanzania

Abstract

In this paper, we argued that for the past thirty years, poverty scrutiny has been vital in understanding the ongoing levels of development scantiness in developing countries. Various ant-poverty policies, goals, programs and strategies such as Structural Adjustment Program (SAPs) and Millennium Development Goals (MDGs) have been designed and implemented but little progress has been made in terms of poverty reduction. Failure of these interventions, particularly in Tanzania is likely due to unrealistic framework designs to deal with specific type of poverty; such that, it is based on standard poverty measure. The rural households in particular, where poverty is more concentrated earn their livelihood through physical productive assets. In order to sustainably address the economics of rural poor, we would much understand the economics of physical productive assets. Thus, asset-based approach (asset-based index) from Principal Component Analysis was employed to examine rural asset dynamics and found that majority of rural households lack basic combination of productive assets which are sustainably accumulated over time. We found rural poor, with poor asset accumulation over time and this could be attributed among others by lack of basic asset combination in the production process and consumption smoothing as well. For sustainable rural poverty reduction, it is important to assess the household's asset stocks and understand how these assets interact with the circumstances to attract the choice of livelihood strategies which can determine a household's well-being.

Relevance to Development Studies

The poverty reduction programs and policy interventions in Tanzania rely much on income and expenditure indicators. Since income and expenditure indicators are unreliable and expensive to collect; largely due to budget and capacity constraints, it is worth to consider the household's assets as a proxy for poverty studies and policy design. The distribution of poverty across groups of people and regions, and the extent that poverty has been reduced should be done based on household's assets evaluation because assets are the major source of the households' income. Thus, in order to generate sustainable income for sustainable development, policy makers should design better informed development interventions that protect household's asset stocks.

Keywords[1]

[1] Poverty, rural areas and asset dynamics

Chapter One: Introduction

The majority of the households in the rural areas are poor. If developmental institutions knew the economics of being poor, they would know much of the economics that really matters to lift the poor out of poverty cycle. Most of the rural poor people earn their living from physical-productive assets; so, if we understand the economics of productive assets we would know much of the economics of being poor (Schultz, 1980). This idea of Schultz has a special inference for poverty interventions. Schultz's argument is supported by Hulme and McKay (2005), that "existing work on chronic poverty, and poverty dynamics in general, has so far been conceptualized in very narrow terms, and this has created important limitations in our understanding". In other words, poverty has been deliberated almost completely in connection to income or consumption notion. Over years, developmental institutions focused much on the identification of poverty and show a relationship without developing an understanding of the underlying processes by which some people are trapped in poverty cycle while others escape. Also, Barrett (2004) argued that selection of the appropriate policy to support a certain subgroup of rural poor people requires explicit understanding of the nature of the rural poverty.

The recent policymakers' and scholars' greatest concern; revolves around poverty which seems to be derived from low initial endowments of productive assets that owned by households. Depletion or development of productive assets comes into sight to the story of asset poverty because household's income is positively related to returns from assets (Barrett, 2004). Understanding poverty with widespread acceptance of the multidimensional nature of poverty, and of the importance of considering the depth and severity of poverty will therefore provide a good starting point of knowing the economics of being poor and better policy interventions.

An indicator for poverty measure is a crucial variable that persuades public consciousness of social welfare, as well as public policies and programs. Historically, income and expenditure have been the main focus of poverty measurement indicators, and income protection has been the most important goal of public policies considered to address poverty miscellaneous. Yet, for the past thirty years, poverty and poverty traps scrutiny have been vital in understanding the ongoing levels of development scantiness in developing countries. Various ant-poverty policies, goals, programs and strategies such as Structural Adjustment Program (SAPs) and Millennium Development Goals (MDGs) have been designed and implemented nationally and internationally but little progress has been made in terms of poverty reduction. Failure of these interventions is largely due to unrealistic framework design to deal with specific type of poverty; such that, it is based on standard poverty research findings and recommendations. Like any other developing countries, Tanzania was forced to replace SAPs with Poverty Reduction Strategy Paper (PRSP) as a strategy to reduce poverty following unsuccessfully implementation of SAP's conditions. Adoption of PRSP stretched the Government of Tanzania to formulate poverty reduction strategy known as the National Strategy for Growth and Reduction of Poverty (NSGRP) as a national organizing framework for putting the focus of poverty reduction on the top of the country's development agenda. The NSGRP is in line with the aspirations of

Tanzania's Development Vision (Vision 2025) and MDGs for high and shared growth, high quality livelihood, peace, stability and unity, good governance, high quality education and international competitiveness (NSGRP, 2005). With all these, 37.6% of rural households in Tanzania still live below the basic poverty line[2].

Using income or expenditure as the basis to measure and alleviate poverty pay no attention to the importance of productive assets. Productive assets are essential to a household's economic security. Productive assets generate hard cash in times of economic difficulties and can be used to pay for extra investment such as education, to acquire a shelter, or to maintain a decent standard of living before and after retirement or aged period. Occupied land for instance, moreover, is an important part of household assets, as it provides produces and frees up resources that would otherwise be spent on purchasing by its products. Households without productive assets are forced to live from one pay-check to the next, require support when their income flow is disrupted, and are depressed from vigorously looking for a better life such as moving to a better neighbourhood or looking for a more attractive occupation (Caner and Wolff, 2004).

Though poverty line has been used as an official measure of poverty, there is currently widespread consensus among scholars and policymakers that the official poverty measure is imperfect statistic that no longer provides a functional level to assess the extent and composition of those facing material destitution (Dercon, 1998, Carter and May, 1999 and Haddad and Ahmed, 2003). The recent researchers have had attempted to challenge the standard measure and identify structural constraints that may limit many of the poor programs from getting them out of poverty. Since 1990s, many scholars appear in criticizing poverty alleviation programs based on a standard measure by policy makers of quite different political influences (Cater and May, 1999). Supporters of neoliberal capitalism acknowledge asset programs because they encourage poor people to save, accumulate and participate in the market economy. Scholars and agencies who believe that the state has a positive function to play in promoting social wellbeing will also acknowledge and support asset programs since they involve public matching funds and offer an opportunity for governments to address poverty issues through various ways, particularly redistribution way of balancing resources between poorer and richer (Midgley, 2003).

Like any other countries, Tanzania has been committed to poverty reduction based on income and expenditure variables. Ambition targets for reducing national poverty have been twisted towards national and international income indicators and poverty level in which government is presenting Poverty Reduction Strategy Paper (PRSPs) and international agencies are focusing their consideration on mobilizing funds and influencing policies that will provide pro-poor growth and alleviate poverty (Hulme and Shepherd, 2003). Since 2000s, the central focus is Millennium Development Goals (MDGs). In Tanzania, the PRSPs and National Strategy for Growth and Reduction of Poverty (NSGRP) was developed with much reference to both income and non-income poverty indicators and less emphasize on asset developments. Tan-

[2] Poverty and Human Development Report, 2009

zania's poverty is a mixture of transient and chronic poverty but chronic group is more sensitive when analyzing causes, effects and interventions. Though household's physical productive assets are seen to be useful, there is no explicit initiatives being outlined in the first NSGRP document. A great deal has been directed to growth of the economy and reduction in income poverty, improvement of quality of life and social well-being and good governance and accountability (NSGRP, pg 34-54). There are no specific strategies for improvement of productive assets though an issue of property right has been mentioned.

In order for policies, strategies and interventions be successful, it is very imperative if the right group is targeted. Hence, the classification of vulnerable groups is momentous. This paper, as a result, has the rationale to study the asset dynamics of rural households in Tanzania and highlight relevant implications in relation to poverty reduction strategies. The intention is based on the fact that, more than 80% of rural Tanzanians posses their assets in form of local physical assets or non-formalized assets such as land, livestock, poultry, housing etc. Without formal recognitions, consumption smoothing is done promptly particularly during crisis though households may sell their assets at lowest price rather than using such assets as a collateral in lieu of accessing credit and insurance markets. The more they sell their assets at minimal prices and without replacement, the more they reduce their productive capacity hence increasing the probability of falling into asset poverty. On the other hand, rich households to whom they benefit from crisis usually tend to increase their productive capacity. Also, poor rural households remain poor mainly because their assets such as land, housing, livestock or small business activities remain informal and marginalized from formal economic returns and policy design[3].

This paper is therefore intending to address the following research questions; is there any significant development of assets in rural areas? Does asset-based approach reliable for poverty ranking in rural Tanzania? Does location of a household has an influence on asset accumulation? In order to address these questions, we applied an asset-based index from Principal Component Analysis (PCA) as an alternative poverty measure to income and consumption measures. The rest of the paper is organized as follows; chapter two discuss the literature review, chapter three discuss data and descriptive analysis, chapter four discuss methodology, model specification and results and chapter five concludes the paper.

[3] Rural households are poor because the market value of their assets is low and because opportunities to argument these assets continue to be low as well. "In addition, the poor are often at a disadvantage with respect to the rate and variability of return on these assets, which helps explain their low market rate" (Siegel, 2005).

Chapter Two: Literature Review

2.1. Assets and asset poverty

Assets are stocks of resources. Asset is what people accumulate and hold over time. "Assets provide for future consumption and are a source of security against emergency" (Sherraden, 1991). Assets as an investment tend to generate proceeds that usually increase aggregate lifetime consumption and improve a household's well-being over an extended period of time (Yunju, Huang, and Sherraden, 2008). Assets can be categorized as financial, physical or durable assets. Also, human and social capital such as education and community organizations are regarded as assets. According to Siegel (2005), the assets of a household include productive, social and locational assets that determine the opportunity set of choices for livelihood strategies.

Asset poverty is reorganized as a situation whereby a household is considered to be poor if he/she does not have enough assets to meet its basic needs for a period of three months (Caner and Wolff, 2004). The term asset poverty has been used by many researchers to capture this notion of lack of sufficient assets, as poverty is formally defined by using income indicator. Although the notion of asset poverty has been suggested by scholars such as Ruggles and Williams (1989) and Oliver and Shapiro (1995), Haveman and Wolff (2000) were among the first scholars to provide an operational definition. A household or an individual was classified as an asset poor if its assets are not sufficient to meet his/her basic needs for the period of three months. Then, they constructed a number of different measures of asset poverty based upon this overall definition. However, asset might be defined in terms of a household's overall net asset; "basic needs" or could be defined as being above the official poverty line. Based on Haveman and Wolff's definition, a household who does not have sufficient assets to sustain him/her above the poverty line for the periods of three months would be considered as an asset poor.

A households who is experiencing asset poverty do not have enough cash reserves and physical asset stocks (savings, stocks, retirement accounts, land, livestock, equity in a home or business) to get by at the community poverty level for three months when their main source of income is get rid of through job loss or other disruption. Asset poverty is a measure of economic well-being and mobility of a household based on a significant value of assets. Significant value of assets or net worth is defined as the total value of all assets, such as a house or land, minus any liabilities (debts). "This means that asset poor households do not have enough savings or wealth to provide for basic needs during extended periods of economic hardship such as a sudden job loss or a medical emergency"[4].

[4] http://www.illinoisassetbuilding.org/data/assetpoverty/accessed on 10/11/2010

Historically, poverty is defined as the minimum amount of annual income a household needs in order to meet basic needs. By referring exclusively on income, income poverty tells only part of the statistics of a household financial security by ignoring the lack of other personal properties, such as land ownership, business equity, education and savings. Measuring net worth by taking into consideration assets and liabilities, as contrasting to income only, provides a more long-term and encompassing outlook of economic safety and mobility. In his study, Wertheim (2008), found that twice as many households in Illinois-United State of America are asset poor than are income poor (26.9% vs. 10.9%). Both physical and financial are the basis for long-term financial strength and achievement. Assets provide households incredible to fall back on in times of economic insecurity and give people direction and hope toward the future. Households with potential assets would like to save more, work more and earn more, worried for their properties, are participated in their societies, and plan for education and retirement benefits (Sen, 1999: Wertheim, 2008). Assets help households get forward and not otherwise.

2.2 Major perspectives on assets and poverty

The purpose of this paper is to investigate and assess the likelihood of poor rural households being falling into asset poverty and poverty traps taking into account the household's asset dynamics. The motivation of this study is based on the fact that, there is strong relationship between asset accumulation, its productivity and well-being of the households (Basu, Pascali, Schiantarelli and Serven 2010, Barrett 2004). "Whether a household is temporarily or permanently poor may be related to its resource endowments, its organizational capacity to manage and deploy its resources, its labor force position, the coping mechanisms available to it and external or family contingencies which affect it." (Rakodi, 1995b). Several numbers of perspectives have been debated regarding assets and it's alike; in this paper, we will focus on consumption model, social stratification theory, and development and capability perspective in describing poverty. Based on the interest of this study, we will finally review the asset-based approach in relation to poverty dynamics.

2.2.1 Consumption model

In this model, asset is seen as a storehouse for future consumption. With few exceptions, existing measures of poverty and policy interventions are based implicitly or explicitly on the consumption model. The consumption model describes asset as a flow at a point in time or as a storehouse for future consumption and it is linked to life cycle and buffer stock theories of asset accumulation. From this point of view, income and assets are viewed as alternative forms of economic resources accessible for consumption. Nevertheless, income and assets are to some extent different; income is a flow and assets are a stock of resources (Carter and Barrett 2006, and Barrett 2004). "Scholars using the consumption model have experimented with income-

wealth joint measures of economic well-being and poverty as an alternative to measures based on income alone. Thus, by recognizing that income is not perfectly correlated with assets, the consumption model seeks to develop better indicators of economic well-being and poverty by taking assets into account" (Nam, Huang, and Sherraden, 2008). One of the weaknesses of consumption model is the probability of households being better off in one stage than another without any considerable change in their fundamental conditions, mainly the stock of useful assets under their control due to unplanned prices and yield fluctuations and irregular earnings. Consumption model is therefore associated with transitory poverty rather than chronic poverty (Carter and Barrett, 2006).

2.2.2 Social stratification theory

Asset is considered as a best indicator of class status and a major instrument for transforming class from one generation to another. In this theory, assets are viewed as a key factor for transforming class status from one period to the next. It focuses to the timing of asset ownership and serves as a critical device in maintaining the present socio-economic structure and inequalities. Thus, assets are theoretically different from income and consumption. Yunju, Huang and Sherraden (2008) say; "the roles of assets go far beyond the satisfaction of consumption needs". Even though, asset status may not reflect good asset owner's welfare if it disregards transformation of those assets into consumption units and development of human needs, including human capital and social development. Though assets are viewed differently from consumption in this theory, social stratification research often uses asset measures similar to the consumption model (Oliver and Shapiro, 1995; Shapiro, 2004). Thus, supporters of social stratification theory are not yet to come up with different measures of poverty that reflects theoretical differences from consumption model even if they consider its roles far beyond than the consumption model (Yunju, Huang, and Sherraden, 2008).

2.2.3 Development perspective

A number of researchers and policy makers view assets as tools for socio-economic development. In this perspective, assets promote the capacity of households to attain its objectives beyond satisfaction of consumption needs and status. As income alone cannot, assets enable households to generate economic, social, political, physical and human capabilities for their owners; because the latter is more stable and reliable form than the former (Sherraden, 1991). "Arguably, these permit a holistic analysis of all the relevant social, economic, political and environmental factors that deepen the appreciation of the mutually reinforcing ways in which private, civil and state action can improve individual, group and social welfare" (Hulme. Moore and Shepherd, 2001). Conversely, researchers in this perspective have also paid attention on poverty measures based on income and consumption model. This implies that, net worth and financial assets are recurrently used in estimating determinants and effects of asset accumulation on household's well-being (Nam, Huang, and Sherraden, 2008).

2.2.4 Capability perspective

Capability perspective inferred to Sen's perspective on development as freedom. Sen's (1999) perspective on development as freedom states that, the main objective of development is to give households with greater freedom and choice. He says that poverty needs to be perceived as the "deprivation of basic capabilities, rather than merely as a consequence of low income. Deprivation of elementary capabilities can be reflected in premature mortality, significant undernourishment (especially of children), persistent morbidity, widespread illiteracy and other failures"(pg 20). A lack of income is important but not a crucial ending point for the study of poverty issues. He points out that "Development consists of the removal of various types of un-freedoms that leave people with little choice and little opportunity of exercising their reasoned agency".[5] Development as freedom presents a complementary literature to asset-building policies as suggested by Sherraden (1991). Sherraden deemed that the accumulation of assets play a bigger role in the development of the capabilities necessary for freedom. At large, social welfare system is much focused on income generation. This is essential, but it is also necessary to begin working on asset building among the deprived. Thus, welfare alone cannot lift those households on low-income to build competitive productive assets.

2.3 Using Asset Dynamics to Measure Poverty

Using an asset-based approach to understand and evaluate the rural poverty in developing countries; like Tanzania, gives overall development strategies and specific policy and investment alternatives in terms of households' production opportunities. It involves the ways on how assets go together, and the specific interventions that can be undertaken to strengthen and protect them in order to improve household's well-being. "Picking the right policy to help a given poor subpopulation depends on accurate understanding of rural poverty dynamics" (Barrett, 2004). Negative changes are often increasing risk and uncertainty and reproduce asset poverty, particularly for those who suffer much asset depletion. For the reason that people move in and out of poverty, asset dynamics is seen to capture better the processes of change than more static measures of poverty (Moser, 1998).

[5] "The understanding of the nature and causes of poverty and deprivation by shifting primary attention away from means (and one particular means that is usually given exclusive attention, viz., income) to ends that people have reason to pursue, and, correspondingly, to the freedoms to be able to satisfy these ends. ... The deprivations are seen at a more fundamental level - one closer to the informational demands of social justice" (Sen, 1999)

The economic well-being of a household is reliant on its stock of assets. Naschold (2009) says; "from a dynamic perspective it is the accumulation of assets which over time enables households to earn enough income flows to move out of poverty". Asset-based makes measure of household welfare more appropriate for forward looking policy design and interventions. Furthermore, asset stocks vary less frequently from day to day than income and, consequently, are nearer to the measure of structural poverty that is eventually of attention to forward looking policy design. Assets can be undertaken in measuring the fundamental structural poverty of a household while income, and to some extent expenditure, includes a much bigger amount of stochastic variation (Carter and May 2001). It is simpler for a household to remember and quantify how much variable Z it has than how much it spent on X or obtained in payment over the past fourteen days (Naschold, 2009)

Asset poverty under this approach can be expressed by "a threshold in asset space around which accumulation dynamics bifurcate and are defined by the existence of some range over which increasing returns might prevail" (Carter and Barrett, 2006). Temporary income shocks may push households below the poverty line but it does not necessarily degrade its asset stock and hence he/she would be expected to recover to its pre-shock level of socio-economic position. However, a household that suffered a loss of productive assets might definitely fall into poverty traps. Carter and Barrett (2006) argued that, "without a firm grounding in an asset-based approach to poverty which permits us to distinguish the dynamics of households that experience stochastic from structural transitions, we cannot test empirically for the existence of poverty traps". So far, the fundamental difficult for policy and decision makers in developing countries is how poorer can be distinguished, how poverty be measured, analyzed and signified objectively in order to target reduction measures. Since income indicator is associated with transitory poverty, it is important to understand how asset-based method works so as to use the findings appropriately for policy design[6].

[6] The high levels of poverty in Africa constitute one of the primary development challenges the continent is facing today. One concept of poverty is based on income or consumption measures of welfare (Shimeles andThoenen, 2005)

Chapter Three: Data and Descriptive analysis

3.1 Source of Data and Sampling of the households

In order to assess the households asset dynamics overtime, we utilize the Repeated Cross Sectional data from the National Bureau of Statistics (NBS), Tanzania. This is three years Household Budget Survey (HBS) data set, collected in 1991/92, 2000/01 and 2007. The surveys drawn from the National Master Sample (NMS), a generalized sample design set up by the NBS in order to fit any kind of a survey a researcher plans to put into practice. Although three surveys differ in coverage and scope, they are countrywide representative samples and comparable at national level. The household's sample size for 1991/92 was 4,823, 2000/01 was 22, 178 and 2007 was 10, 466. In relation to the sample size, the number of Primary Sampling Units (PSUs) or clusters was 222, 1,158 and 447 respectively. The sample size in each period was selected using the systematic random sampling procedure by surveying random households across periods. The head of the household was a person in charge respondent in both rural and urban areas. A household was defined as a single person or a group of people (altruisms), who usually live, cook and eat together, related or not related. For 1991/92 and 2000/01, the NMS frame was developed based on the 1978 Population Census and later updated with information from the 1988 Population Census. However, the sample size for 2007 was based on a new NMS that was developed out of the 2002 Population Census's information. The 2000/01 HBS had a wide range of household's or individual's information and sample size in relation to other periods. However, 2000/01 survey added some variables mostly defined in both PRSPs and NSGRP.

In terms of survey design and data collection, the questionnaire's form was issued to members of the households in which a type and quantity of assets owned by households were mentioned and identified. However, a number of assets that was mentioned were not deemed to be necessary to achieve an acceptable standard of living. All participants in the survey were given an exclusive number which was used to link their questionnaire form to their demographic data. Each questionnaire had the name of each asset and households were asked to tick where his/her asset falls. Assets were not categorized as most important, important or least important.

3.2 Variables covered during the Survey

Though the sample size differs from one year to another, important variables or indicators are comparable to each other. This includes consumption poverty and other productive as well as social sector indicators. HBS for 2000/01 was aligned to NSGRP as an important instrument for monitoring progress under the five years of Government programs. Indicators covered were household's information such as age, education, economic activities and health status, income, expenditure and con-

sumption, ownership of consumer goods and assets, housing structure and materials, distance to services and families and food security.

For the sake of ensuring comparability between surveys, household questionnaires and data collection methods were very similar for the periods under review (2007 HBS report, 2009 pg 67). Unlike other surveys, community questionnaires were introduced for 2007 HBS. However, 2007 questionnaires had some improvements just to capture important information required for NSGRP monitoring progress such as ownership of mobile phones, access to internet, time spent for fetching water and the distance to the nearest all-season passable road.

3.3 Summary statistics of productive asset as adopted from household's budget survey reports

Table 1 below shows the percentage of the households owning productive assets in rural Tanzania for year 1991/92, 2000/01 and 2007. The table indicates that, most households in rural areas owned large proportion of their productive assets in form of hoes, field/land, poultry, livestock and plough. These assets are major source of rural household's income and most common in rural areas. In terms of variation, percentage of households who own poultry has been increased since 1991/1992 while other assets have slightly de-accumulated over time. Poultry keeping is growing because it's keeping and general management is relatively simpler in relation to livestock which requires enough and potential land for grazing. The proportion of households owning specialized farming and fishing equipments is very low (below 10%), particularly mechanization. Proportion of households owning carts and milling machines have gradually increased since 1991/92 due to nature of rural life particularly farming transport and grinding of cereals. The general trend of low ownership of specialized farming and fishing equipments implies that, rural people are at risk of continuing owning local assets; unless prospective interventions are in place.

Table 1: Percentage of the Households owning Productive Assets in Rural Areas, Tanzania

	Year		
Variable	1991/92	2000/01	2007
Cart	1.7	2.4	2.6
Boat/canoe	0.4	0.8	0.9
Wheel barrow	2.6	3.1	1.4
Livestock	44.6	44.5	41.3
Poultry	60.1	64.5	68.3
Donkeys	3.8	3.9	3.8
Field/land	90.1	89.4	86.7
Hoes	90.3	91.8	87.6
Spraying Machine	3.7	2.7	3.1
Tractor	0.2	0.2	0.1
Plough	11.3	11.1	10.3
Milling Machine	1.6	1.9	2.4
Coffee pulpingm	0.1	1.5	0.7
Fishing equipments	2.9	2.6	5
Beehives	4.9	6.4	4.6

Source: Final Report, HBS, 2007 (2009), NBS, Tanzania

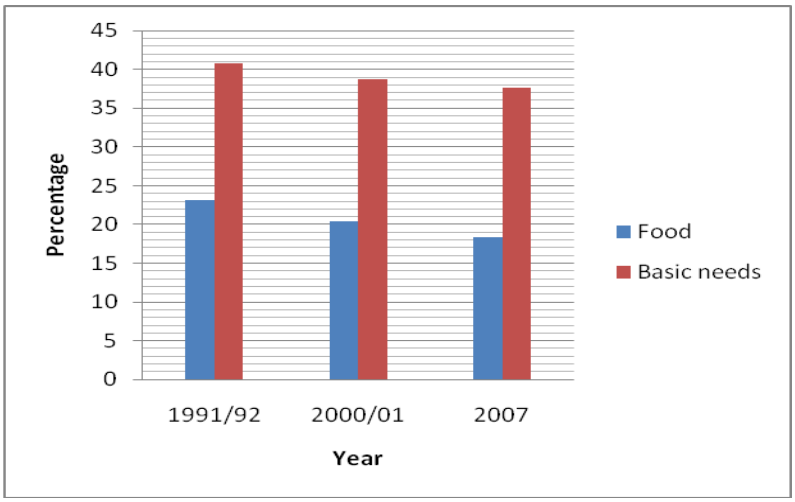
3.4 Current Status of rural poverty in Tanzania

The main objective of 2000/01 HBS to have a wide range of household's or individual's information and sample size in relation to other periods was basically to align more household's information with the national strategy for poverty reduction (NSGRP). NSGRP was intended to reduce the incidence of poverty basic needs from 39% in 1991/92 to 24% by 2010. However, data from 2000/01 and 2007 indicates that poverty rate remain higher in rural areas. About 37.6% of rural households are living below the basic needs poverty line[7]. The incidence of food poverty decreased from 23.1% in 1991/92 through 20.4% in 2000/01 to 18.4 in 2007 while the basic needs decreased from 40.8% in 1991/92 through 38.7% in 2000/01 to 37.6% in 2007 (see figure 2). In line with the MDG's target of reducing incidence of poverty by 50% between 1990s and 2015 (from 39% to 19.5% basic needs poverty), the standing point is still far and MDGs target may not be reached by 2015. Arguably, all efforts towards poverty reduction in Tanzania are based on standard measures. Nevertheless, criticisms have been made over using monetary measures, either income or expenditure, to evaluate household's livelihood position and socio-economic status in less developed countries. One criticism is that using a monetary variable does not take into account how money is earned and how much time is spent (Piachuad, 1987). Furthermore, Sahn and Stifel (2003) argued that the quality of income and expenditure data is

[7] Poverty and Human Development Report (2009)

most likely to be poor, mostly in middle and low income countries where the economy is more subsistence. Also, consumer price indices in less developed countries like Tanzania are unavailable and unreliable, especially when inflation tends to be high or uneven. Thus, other non-monetary indicators of household welfare such as the asset-based index have been initiated and developed as an option tool for analyzing rural household poverty (Filmer and Pritchett 2001; Sahn and Stifel 2003).

Figure 1 Incidence of Poverty in rural areas, Tanzania



Source; Tanzania Poverty and Human Development Report (2009)

3.5 Summary statistics computed from selected asset variables

From our data we selected for analysis (non dichotomous), we constructed a table (2) which indicates the means of asset owned by rural households for 1991/92, 2000/01 and 2007. On average, households were found to own 3 acres of land in 1991/92, 3 in 2000/01 and 3.5 in 2007. About 159 households out of 1760, equivalents to 9.03% did not own land/field in 1991/92, 245 (13.92%) in 2000/01 and 209 (11.88%) in 2007. Livestock per household was 6.44 in 1991/92, 5.94 in 2000/01 and 5.81 in 2007. We found 901 households (51.19%) without livestock in 1991/92, 1,041(59.15%) in 2000/01 and 970 (55.11%) in 2007. Moreover, 85% of households were found without plough in 1991/92, 88.6% in 2000/01 and 89% in 2007 while ownership of tractor, harrow, trailer, cart and spraying machine was varying between 0.1% and 4% in all three periods.

Table 2 Statistical summary of asset variables

	1991/92		2000/01		2007	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Land	2.920	3.600	3.100	7.260	3.500	5.590
Livestock	6.330	14.600	4.180	11.270	5.810	24.070
Poultry	6.720	9.650	5.940	12.380	6.920	8.270
Hoe	3.490	2.420	3.190	2.380	3.120	2.250
Plough	0.200	0.540	0.150	0.460	0.140	0.480
Wbarrow	0.130	1.710	0.080	1.330	0.020	0.170
Donkey	0.120	0.630	0.140	2.150	0.120	1.160
Sprayingm	0.080	0.520	0.040	0.290	0.060	0.380
Tractor	0.000	0.070	0.010	0.140	0.000	0.020
Trailer	0.010	0.140	0.020	0.150	0.000	0.030
Harrow	0.010	0.120	0.020	0.190	0.000	0.030
Beehive	0.570	10.290	0.280	2.160	0.310	2.670
Sewingm	0.050	0.540	0.070	0.300	0.050	0.240
Cart	0.030	0.200	0.030	0.200	0.030	0.190
Bicycle	0.390	0.600	0.500	0.680	0.510	0.710
Radio	1.110	23.950	0.650	0.830	0.780	0.750
Chair	4.230	8.020	3.730	4.390	3.650	3.620
Bed	2.490	2.460	2.240	1.890	2.210	1.700
Cupboard	1.060	1.780	0.430	2.360	0.240	0.840
Table	1.330	1.420	1.160	1.470	1.100	1.140
House	1.470	1.220	1.390	1.090	1.370	0.930

Source; Household Budget Survey, 1991/92, 2000/01 and 2007, NBS, Tanzania

3.6 Re-sale prices of durable assets

In this study, we do not have the values of selected asset variables for all three periods of study. However, we present on overview of the values of durable assets (re-sale price as reported by NBS in its data set) owned by rural households for year 2000/01 and 2007. Table 3 shows that there is a huge gap between the minimum and maximum re-sale prices. In rural areas where cash income is not common, consumable assets such as a chair, table, bed and cupboard are not produced professionally. In most cases, these assets are produced individually or within localities for local consumption and without any value addition. Polishing, decoration and other professional makeup are not common and hence its values remain very low. The only group with possible access to quality and modern assets including manufactured assets is rich group. The huge gap between the minimum and maximum re-sale prices reflects

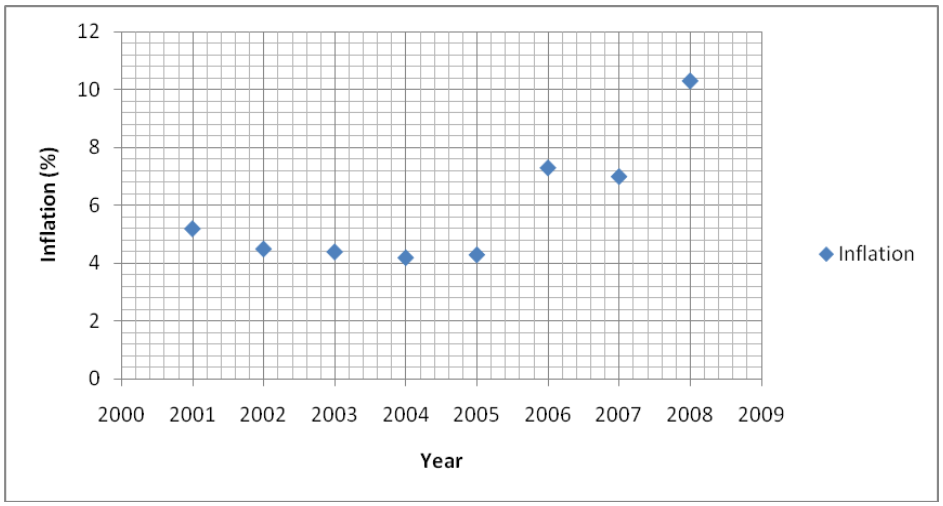
the fact that inequality usually exist in any community. An increase in re-sale prices or values of assets can be interlinked with the rate of inflation over time (see figure 2).

Table 3 Re-sale prices of durable assets

	2000/2001		2007		Final Change	
	Re-sale Price in US$		Re-sale Price in US$		Re-sale Price in US$	
Variable	Min	Max	Min	Max	Min	Max
Radio	0.262	305.677	0.442	318.021	0.180	12.344
Chair	0.055	13.100	0.177	19.435	0.122	6.334
Table	0.164	13.100	1.767	17.668	1.603	4.567
Bed	0.328	60.044	4.417	106.007	4.089	45.963
Cupboard	1.092	109.170	7.067	176.678	5.975	67.508
Bicycle	13.100	65.502	17.668	88.339	4.567	22.837
	1$ = 916 Tshs		1$ = 1132 Tshs			

Sources: Author's computation using BHS data set from NBS, Tanzania

Figure 2 Rate of inflation: 2001-2008



Sources: NBS, Tanzania , Economic survey, 2008.

Chapter Four: Methodology and Model specification

A considerable methodology for poverty analysis in developing countries is money metric or standard method. Like any other statistical method, standard method has been used over years in defining and constructing poverty line or profiles, making poverty comparisons across households and identifies sub-households. In our study, we applied an asset-based approach to classify and analyse the household's socio-economic status by using HBS data set from the NBS, Tanzania. Our data is three periods (1991/92, 2000/01 and 2007) repeated cross sectional data set. Since our aim is to assess the household's assets dynamics over time, we constructed pseudo panel data for the periods under review, as proposed by Deaton (1985), in which, different numbers of cohorts can be defined and traced. Based on an asset-based approach, we employed Principal Component Analysis (PCA) in constructing an asset index, such that, comparison of assets dynamics can be explored over time.

In technical term, a PCA can be defined as a linear combination of optimally – weighted observed variables. This is a multivariate statistical technique used to reduce the number of variables in a data set into smaller number of dimensions (Vyas and Kumaranayake, 2006)."It is a way of identifying patterns in data, and expressing the data in such a way as to highlight their similarities and differences" (Smith, 2002). The main advantage of PCA is that, when we have obtained patterns in the data, it is appropriate and feasible to compress the data by reducing the number of dimensions, without much loss of information. The reduced number of variables is known as principal components that usually used to account for most of the variance in the observed variable (Filmer and Pritchett, 2001). "By definition the first principal component variables cross households or individuals has a mean of zero and a variance of λ, which corresponds with the largest eigenvalue of the correlation matrix of x" (C'ordova, 2008).

In algebraic term, PCA generates uncorrelated indices or components, where each component is a linear weighted combination of the initial variables. Usually, the first principal component is the linear index of variables with the largest amount of information and universal to all of the variables. As a result of the asset index, we can model our equation derived from PCA for every household asset with the following equation:

$$\mathbf{A\ j = f1*(a\ j1-a1)\ /\ (s1) +\ldots+\ f\ n*(ajn\ -\ an)/\ (sn)}$$

$$\mathbf{Aj} = \sum_{i=1}^{n} \boldsymbol{f}_i(\boldsymbol{a}_{ji} - \boldsymbol{a}_i) \,/\, \boldsymbol{S}_i$$

Where;

- *A j is* an asset index for each household (j =1… n)
- *fi is* the scoring factor for each asset of household (i =1,……,n)

- *aji* is the i^{th} asset of j^{th} household (i ,j =1,……,n)
- *ai* is the mean of i^{th} asset of household (i =1,……,n)
- *si* is the standard deviation of i^{th} asset of household (i =1,……,n)
- *Z* is the standardized variables of each household.

Based on PCA computation, the first principal component or the efficient component yields an asset index that assign a larger weight to assets that vary the most across households such that an asset found in all households is given a weight of zero (McKenzie, 2005) . It implies that, a new factor which has a linear correlation with original variables will be generated. The weights for every principal component are given by eigenvector of the correlation matrix or covariance matrix depending on the organization of the data. The first principal component or asset index can be assigned positive or negative values. Then, the eigenvalue gives the variance for each principal component of the corresponding eigenvector. The components are listed in order; so that the first component captures the largest possible amount of variation in the original data, subject to the constraint that the sum of the square weights ($a^2_{i1}+a^2_{i2+}$ …….$+a^2_{in}$) is equal to one (Vyas and Kumaranayake, 2006). So long as the eigenvalues equals the number of variables in the initial data set, the proportion of the total variation in the original data set accounted by each principal component is given by λ_i/n

4.1 Construction of an asset index

In line with the model specification, we constructed the asset index by using PCA as recommended by Filmer and Pritchett (2001). At first glance, the factor scores were computed by using pooled data set (all three periods' data sets) and mean and standard deviation of each asset were then calculated on year basis. As suggested, all asset variables were first dichotomized (1=Yes, 0=No) to show the ownership of each household asset variable (Vyass and Kumaranayake, 2006). Since we do not have a panel data, a number of cohorts as defined by year of birth, quintiles and zones were constructed for comparison purposes. Our assumption is that, households within each cohort have the same characteristics and hence asset dynamics can be traced over time.

Table 4 reports the scoring factors from the first principal component analysis of the 21 assets. As the whole asset variables are zero or one (dichotomous), a move from zero to one changes the asset index by factor score of each variable divide by its standard deviation[f_i/s_i (i= 1,….,n)] (Filmer and Pritchett, 2001). For example, a third column of table 4 in each year of survey shows that, a household will increase its wealth index by 0.440 units if he/she owns a piece of land in 1991/92, 0.365 units in 2000/01 and 0.390 units in 2007. Owning a tractor raises a household's asset index by 3.712 units in 1991/92, 1.940 units in 2000/01 and 8.971 units in 2007 respectively (see table 4 below). Ownership of a tractor, trailer, wheel barrow, harrow, sewing machine and cart increases an asset index of a household more than any other assets.

The coefficient on any asset or variable is correlated to how much information it gives about the other variables. For instance, if ownership of one type of asset is highly investigative of ownership of other assets, then it is assigned a positive coefficient. If ownership of an asset holds roughly no information about what other assets the household owns (its correlation coefficient is near zero), then it receives a coefficient near zero. And if ownership of an asset shows that a household is likely to own few other assets, then it receives a negative coefficient. Positive/higher and negative/lower coefficients mean that ownership of that asset gives more or less information about the other assets (Moser and Felton, 2007). Generally, majority of rural adults for all three periods owned land (between 88% and 91%) while over 86% did not own plough, wheel barrow, spraying machine, tractor, trailer, harrow, sewing machine and cart. Since almost, all households own a hoe and land; these assets received very low weights. This means that, having these assets does little to increase household's index score compared to a household who does not have a hoe or land.

Table 4 Scoring factors and summary statistics for variables entering the computation of the first principal component

		1991/92			2000/01			2007		
Variable	**FS**	**Mean**	**Std.Dev.**	**FS/SD**	**Mean**	**Std.Dev.**	**FS/SD**	**Mean**	**Std. Dev.**	**FS/SD**
Land	0.126	0.910	0.287	0.440	0.861	0.346	0.365	0.881	0.324	0.390
Livestock	0.305	0.488	0.500	0.609	0.409	0.492	0.619	0.449	0.498	0.611
Poultry	0.213	0.628	0.483	0.440	0.620	0.485	0.439	0.724	0.447	0.476
Hoe	0.096	0.903	0.295	0.327	0.901	0.299	0.322	0.891	0.311	0.310
Plough	0.270	0.149	0.357	0.755	0.114	0.318	0.847	0.109	0.312	0.864
Wbarrow	0.205	0.041	0.198	**1.034**	0.033	0.179	**1.144**	0.015	0.123	**1.665**
Donkey	0.065	0.051	0.220	0.297	0.036	0.186	0.352	0.035	0.183	0.357
Sprayingm	0.168	0.048	0.214	0.786	0.032	0.176	0.955	0.033	0.179	0.939
Tractor	0.215	0.003	0.058	**3.712**	0.013	0.111	**1.940**	0.001	0.024	**8.971**
Trailer	0.165	0.009	0.095	**1.733**	0.013	0.114	**1.444**	0.001	0.034	**4.841**
Harrow	0.153	0.006	0.079	**1.937**	0.011	0.106	**1.443**	0.001	0.034	**4.500**
Beehive	0.040	0.047	0.211	0.191	0.050	0.218	0.185	0.049	0.217	0.186
Sewingm	0.238	0.035	0.183	**1.301**	0.056	0.229	**1.039**	0.043	0.203	**1.172**
Cart	0.225	0.031	0.173	**1.303**	0.028	0.166	**1.358**	0.031	0.174	**1.295**
Bicycle	0.313	0.333	0.471	0.664	0.420	0.494	0.633	0.430	0.495	0.632
Radio	0.320	0.398	0.490	0.652	0.499	0.500	0.639	0.622	0.485	0.659
Chair	0.243	0.835	0.371	0.655	0.749	0.434	0.560	0.764	0.425	0.572
Bed	0.212	0.858	0.349	0.606	0.874	0.331	0.639	0.906	0.292	0.724
Cupboard	0.246	0.532	0.499	0.492	0.220	0.415	0.592	0.131	0.337	0.728
Table	0.327	0.664	0.472	0.693	0.636	0.481	0.680	0.644	0.479	0.683
House	0.111	0.814	0.389	0.286	0.886	0.317	0.351	0.910	0.287	0.387
Asset index		**0.084**	**1.519**		**0.063**	**1.814**		**-0.021**	**1.473**	

**Each variable takes a binary form (0 or 1). The largest Eigenvalue, λ of the first principal component is 2.592 and proportion of variance explained is 0.123. *FS=factor score and SD= standard deviation. *FS estimated on the pooled sample*

Sources: Author's computation using HBS data set from NBS, Tanzania

4.2 Distribution of means and asset dynamics by cohorts

After having computed an asset index, we constructed a series of life table that permit us to assess the period, cohorts and age patterns of asset development from 1991/92 to 2007. "Cohorts are defined by the year of birth of the reference person in the household" (Attanasio, 1993). In our case for instance, the first cohort was created by households whose reference individuals were born between 1977 and 1973, whose aged between 15 and 19 years in 1992, 24 and 28 years in 2001 and 30-34 years in 2007. All households whose head was born before 1908 or after 1977 were eliminated from the sample size because the former did not feature in 2007 and the later did not feature in 1991/92. The number of cohorts, referred to three periods data set pooled together. Table 5 and appendix A divides the sample size into 14 cohorts on the basis of the age of the household head, and each group defined by five years age band, from 15-19 years to 95-99 years. In table 5, we report the means and dynamics of each asset for the initial and final periods (1991/92 and 2007)[8]. However, appendix A contains means of each asset by cohorts for all three periods.

From table 5, our results show that over years, all cohorts have had experienced a positive change of poultry ownership. The magnitudes of an increase in poultry ownership were ranged between 0.046 units (lowest) and 0.429 units (highest). Also, a radio, bed, bicycle and house were found to perform well except for aged adults. Contrary, almost all cohorts experienced a negative change of plough and cupboard ownership. Tabulation of a plough indicates only 12.42% of the households of the sample under review own plough. Out of fourteen cohorts, three of them were only found with good performance of plough accumulation. Furthermore, almost all cohorts experienced poor performance of land and livestock ownership in 2000/01 (see appendix A).Young and aged adults were found to own few numbers of assets, particularly between the ages of 15-19 and 80-99. Young adults experienced an increasing assets ownership while aged adults experienced a decreasing assets ownership across cohorts. Moreover, our results indicate that, prevalence of asset accumulation is relatively higher between the ages of 30 and 60.

In table 6, we present the means of asset indexes for 14 birth cohorts entering 1991/92, 2000/01 and 2007 HBS data set. For those households who were born between 1968 and 1977, their asset indexes were improved over time. As we can see, those who were born between 1973 and 1977 increased their asset index by 0.389 units and those who were born between 1968 and 1972 increased by 0.211 units. This means that, the households who were born between 1968 and 1977 improved their asset accumulation between 1991/92 and 2007. Between the ages of 25-29 and 60-64: almost, all cohorts experienced at least one year of assets de-accumulation (see appendix A). The overall trend indicates that age groups that were found in year 1991/92 (per years of birth) were better off compared to other years of study except for young adulthoods (see bolded years of birth in table 6). Thus, we could say that, there was poor performance of rural household's asset accumulation between

[8] Initial period is referred to year 1991/92 and final period is 2007.

1991/92 and 2007. However, the higher the negative asset indexes in the first two age groups in 1991/92 and last two age groups in 2007 imply that young adulthoods and aged adulthoods always experiences low levels of asset ownerships.

Table 5 Distribution of asset dynamics by cohorts from 1991/92-2007

Year of birth →	1973-1977			1968-1972			1963-1967			1958-1962			1953-1957			1948-1952			1943-1947		
Variable	Initial	Final	Change	Initial	Final	Change	Initial	Final	Change	Initial	Final	Change	Initial	Final	Change	Initial	Final	Change	Initial	Final	Change
Land	1.000	0.878	-0.122	0.853	0.869	0.016	0.919	0.899	-0.020	0.895	0.911	0.016	0.929	0.863	-0.066	0.905	0.869	-0.036	0.921	0.890	-0.031
Livestock	0.571	0.435	-0.136	0.353	0.390	0.037	0.503	0.475	-0.028	0.468	0.516	0.048	0.520	0.432	-0.088	0.508	0.414	-0.094	0.517	0.532	0.015
Poultry	0.286	0.670	0.384	0.544	0.750	0.206	0.622	0.732	0.110	0.644	0.714	0.070	0.657	0.734	0.077	0.656	0.724	0.068	0.547	0.725	0.178
Hoe	1.000	0.878	-0.122	0.868	0.881	0.013	0.881	0.905	0.024	0.925	0.906	-0.019	0.909	0.878	-0.031	0.889	0.897	0.008	0.901	0.881	-0.020
Plough	0.000	0.139	0.139	0.132	0.097	-0.035	0.130	0.117	-0.013	0.127	0.156	0.029	0.146	0.086	-0.060	0.196	0.069	-0.127	0.143	0.138	-0.005
Wbarrow	0.000	0.022	0.022	0.015	0.025	0.010	0.070	0.022	-0.048	0.052	0.005	-0.047	0.047	0.000	-0.047	0.042	0.000	-0.042	0.030	0.009	-0.021
Donkey	0.143	0.061	-0.082	0.044	0.034	-0.010	0.054	0.011	-0.043	0.045	0.047	0.002	0.059	0.000	-0.059	0.021	0.028	0.007	0.059	0.092	0.033
Sprayingm	0.000	0.048	0.048	0.044	0.013	-0.031	0.059	0.022	-0.037	0.030	0.010	-0.020	0.028	0.022	-0.006	0.053	0.041	-0.012	0.099	0.028	-0.071
Tractor	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	-0.004	0.004	0.000	-0.004	0.000	0.007	0.007	0.005	0.000	-0.005
Trailer	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.006	0.001	0.011	0.000	-0.011	0.004	0.000	-0.004	0.011	0.000	-0.011	0.025	0.000	-0.025
Harrow	0.000	0.000	0.000	0.000	0.004	0.004	0.011	0.000	-0.011	0.000	0.005	0.005	0.008	0.000	-0.008	0.011	0.000	-0.011	0.020	0.000	-0.020
Beehive	0.000	0.043	0.043	0.029	0.051	0.022	0.038	0.050	0.012	0.041	0.057	0.016	0.051	0.043	-0.008	0.048	0.055	0.007	0.054	0.046	-0.008
Sewingm	0.000	0.039	0.039	0.029	0.034	0.005	0.059	0.045	-0.014	0.026	0.052	0.026	0.028	0.058	0.030	0.058	0.048	-0.010	0.034	0.028	-0.006
Cart	0.000	0.057	0.057	0.015	0.042	0.027	0.038	0.022	-0.016	0.030	0.031	0.001	0.031	0.007	-0.024	0.026	0.028	0.002	0.054	0.046	-0.008
Bicycle	0.143	0.465	0.322	0.309	0.386	0.077	0.395	0.447	0.052	0.296	0.484	0.188	0.327	0.424	0.097	0.397	0.407	0.010	0.374	0.367	-0.007
Radio	0.429	0.683	0.254	0.353	0.551	0.198	0.400	0.648	0.248	0.345	0.677	0.332	0.445	0.626	0.181	0.402	0.566	0.164	0.433	0.624	0.191
Chair	0.857	0.748	-0.109	0.794	0.716	-0.078	0.849	0.799	-0.050	0.831	0.745	-0.086	0.827	0.734	-0.093	0.847	0.786	-0.061	0.818	0.780	-0.038
Bed	0.857	0.917	0.060	0.779	0.856	0.077	0.876	0.944	0.068	0.861	0.906	0.045	0.870	0.914	0.044	0.873	0.924	0.051	0.837	0.862	0.025
Cupboard	0.714	0.143	-0.571	0.426	0.127	-0.299	0.551	0.112	-0.439	0.472	0.156	-0.316	0.535	0.158	-0.377	0.561	0.124	-0.437	0.532	0.119	-0.413
Table	0.714	0.661	-0.053	0.588	0.589	0.001	0.692	0.687	-0.005	0.652	0.615	-0.037	0.693	0.662	-0.031	0.651	0.662	0.011	0.675	0.606	-0.069
House	0.571	0.887	0.316	0.735	0.915	0.180	0.778	0.950	0.172	0.813	0.901	0.088	0.835	0.928	0.093	0.804	0.897	0.093	0.818	0.862	0.044

Sources: Author's computation using HBS data set from NBS, Tanzania.

Table 5 (Cont....) Distribution of asset dynamics by cohorts from 1991/92-2007

Year of Birth	1938-1942			1933-1937			1928-1932			1923-1927			1918-1922			1913-1917			1908-1912		
Variable	Initial	Final	Change	Initial	Final	Change	Initial	Final	Change	Initial	Final	Change	Initial	Final	Change	Initial	Final	Change	Initial	Final	Change
Land	0.893	0.901	0.008	0.933	0.841	-0.092	0.902	0.940	0.038	0.905	0.958	0.053	0.889	1.000	0.111	1.000	1.000	0.000	0.600	0.750	0.150
Livestock	0.497	0.475	-0.022	0.407	0.378	-0.029	0.510	0.640	0.130	0.476	0.458	-0.018	0.533	0.400	-0.133	0.500	0.333	-0.167	0.200	0.250	0.050
Poultry	0.638	0.762	0.124	0.637	0.683	0.046	0.755	0.820	0.065	0.631	0.833	0.202	0.533	0.650	0.117	0.571	1.000	0.429	0.600	0.750	0.150
Hoe	0.910	0.911	0.001	0.911	0.878	-0.033	0.922	0.960	0.038	0.929	0.917	-0.012	0.867	0.900	0.033	0.857	1.000	0.143	0.800	0.750	-0.050
Plough	0.147	0.129	-0.018	0.111	0.085	-0.026	0.186	0.120	-0.066	0.155	0.000	-0.155	0.311	0.200	-0.111	0.107	0.000	-0.107	0.000	0.250	0.250
Wbarrow	0.017	0.050	0.033	0.015	0.000	-0.015	0.049	0.020	-0.029	0.024	0.000	-0.024	0.089	0.050	-0.039	0.036	0.000	-0.036	0.000	0.000	0.000
Donkey	0.051	0.050	-0.001	0.037	0.024	-0.013	0.078	0.020	-0.058	0.107	0.042	-0.065	0.044	0.050	0.006	0.000	0.000	0.000	0.000	0.000	0.000
Sprayingm	0.028	0.059	0.031	0.030	0.037	0.007	0.059	0.040	-0.019	0.071	0.125	0.054	0.022	0.050	0.028	0.071	0.000	-0.071	0.200	0.000	-0.200
Tractor	0.006	0.000	-0.006	0.000	0.000	0.000	0.010	0.000	-0.010	0.012	0.000	-0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Trailer	0.011	0.000	-0.011	0.000	0.012	0.012	0.010	0.000	-0.010	0.012	0.000	-0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Harrow	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	-0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Beehive	0.068	0.059	-0.009	0.037	0.073	0.036	0.039	0.040	0.001	0.036	0.042	0.006	0.044	0.050	0.006	0.071	0.000	-0.071	0.000	0.250	0.250
Sewingm	0.028	0.059	0.031	0.022	0.024	0.002	0.000	0.040	0.040	0.048	0.042	-0.006	0.044	0.000	-0.044	0.071	0.000	-0.071	0.000	0.000	0.000
Cart	0.011	0.040	0.029	0.000	0.000	0.000	0.059	0.020	-0.039	0.036	0.000	-0.036	0.044	0.050	0.006	0.000	0.000	0.000	0.000	0.000	0.000
Bicycle	0.288	0.416	0.128	0.304	0.378	0.074	0.324	0.460	0.136	0.298	0.333	0.035	0.333	0.450	0.117	0.393	0.333	-0.060	0.000	0.500	0.500
Radio	0.390	0.614	0.224	0.356	0.524	0.168	0.392	0.740	0.348	0.393	0.583	0.190	0.422	0.550	0.128	0.464	0.000	-0.464	0.600	0.250	-0.350
Chair	0.887	0.822	-0.065	0.793	0.720	-0.073	0.794	0.860	0.066	0.786	0.875	0.089	0.933	0.700	-0.233	0.964	0.667	-0.297	0.800	0.250	-0.550
Bed	0.836	0.911	0.075	0.844	0.890	0.046	0.873	0.940	0.067	0.810	0.875	0.065	0.956	0.950	-0.006	0.929	0.667	-0.262	1.000	0.750	-0.250
Cupboard	0.503	0.168	-0.335	0.570	0.073	-0.497	0.549	0.160	-0.389	0.619	0.167	-0.452	0.556	0.050	-0.506	0.643	0.000	-0.643	0.800	0.000	-0.800
Table	0.633	0.634	0.001	0.622	0.573	-0.049	0.657	0.700	0.043	0.679	0.625	-0.054	0.689	0.700	0.011	0.821	0.667	-0.154	0.600	0.250	-0.350
House	0.836	0.921	0.085	0.844	0.890	0.046	0.794	0.940	0.146	0.881	0.917	0.036	0.867	1.000	0.133	0.714	1.000	0.286	0.800	0.750	-0.050

Sources: Author's computation using HBS data set from NBS, Tanzania.

Table 6 Asset index dynamics by cohorts

	Initial		Final		
Year of Birth	**Age group**	**Mean**	**Age group**	**Mean**	**Change**
1973-1977	15-19	-0.302	30-34	0.087	0.389
1968-1972	20-24	-0.446	35-39	-0.235	0.211
1963-1967	**25-29**	**0.223**	40-44	0.108	-0.115
1958-1962	30-34	-0.06	45-49	0.108	0.168
1953-1957	**35-39**	**0.161**	50-54	-0.100	-0.261
1948-1952	**40-44**	**0.222**	55-59	-0.097	-0.319
1943-1947	**45-49**	**0.223**	60-64	-0.051	-0.274
1938-1942	50-54	-0.037	65-69	0.177	0.214
1933-1937	55-59	-0.207	70-74	-0.40	-0.193
1928-1932	**60-64**	**0.211**	75-79	0.411	0.200
1923-1927	**65-69**	**0.136**	80-84	-0.035	-0.171
1918-1922	**70-74**	**0.388**	85-89	0.053	-0.335
1913-1917	**75-79**	**0.354**	90-94	-0.838	-1.192
1908-1912	80-84	-0.36	95-99	-1.222	-0.862

Sources: Author's Computation using HBS data set from NBS, Tanzania.

4.3 Distribution of asset dynamics by socio-economic status quintile

After an asset index was calculated by using PCA, we sorted households by the asset indexes and identify cut off values of percentiles of the households in order to classify them into different social economic status quintiles. Cut off approach is an arbitrary approach which has been used to classify households into socio-economic status (Filmer and Pritchett, 2001: Vyas and Kumaranayake, 2006). Common arbitrary cut-off points are 40% (the poorest quintile), 40% (middle poor) and 20% (rich quintile). In our case, we used an asset index of 1991/92 as a base index in classifying or grouping households into socio-economic status. Table 7 indicates the decomposition of ownership of assets and asset dynamics per each quintile between 1991/92 to 2007. For example, out of 18 (total number) of assets owned by households in the first quintile (poorest), only 8 assets (equivalent to 44.44%) experienced a positive change. For productive assets, it is only poultry which experienced the highest positive change (0.064 units) while radio experienced 0.206 units change for durable assets. In this group, we did not find any ownership of a tractor, harrow and cart while ownership of a trailer, wheel barrow and sewing machine was nearly negligible.

Like poorest quintile, middle poor quintile indicates a similar trend of negative asset dynamics though its magnitude is less big. All productive assets experienced a negative change except poultry and beehive. Poultry ownership increased by 0.141 units and beehive by 0.013 units. For durable assets, a radio, bicycle, bed and house

experienced a good performance and the highest performance observed for radio (0.289 units). Unlike the poorest group, middle poor group experienced the ownership of all productive assets except a tractor, though the final period experienced no ownership of a tractor, trailer and harrow (see table 7).

Unlike poorest and middle poor quintiles, the richest quintile accomplished a positive change of 50% of its productive assets and 85.71% of its durable assets. Households in this group experienced an ownership of all assets. Though it is a richest group, ownership of tractor, trailer, harrow and cart was very low. Ownership of a tractor, trailer and harrow was between 7% and 0.3% while that of cart was between 16% and 13% (see appendix A). Unlike any other assets, poultry ownership increased among quintiles as well as across periods. In general, we found two assets with big differences between the poorest and the richest; theses are poultry (40% in the final periods) and bicycle (65.7% in the initial periods). However, Middle poor quintile performed well in terms of poultry accumulation (0.141 units) over time. Since we have used an asset index of 1991/92 (initial period) as a base index in constructing a poverty asset dynamics, we could then say that year 1991/92 was better off. Also, when households are classified into socio-economic status, the results indicate that the majority of poor rural households are ranked in year 2000/01 (48.07%), are from zones 2 and 5, and in each education level, poverty rank is almost equally distributed. However, the majority of rich are from zone 1 while middle poor are concentrated in zone 4 (see appendix D 1-3). Therefore, distribution of assets into quintiles depicts well the distribution of asset ownership and can help policy makers to plan for the future development of households assets. The means of asset indexes also increases as you move from the first quintile to the third.

Table 7 Decomposition of asset dynamics by socio-economic status quintile

Quintile of Wealth→	Quintile means-40% Poorest			Quintile means-40% Middle Poor			Quintile means-20% Rich		
Variables	Initial	Final	Change	Initial	Final	Change	Initial	Final	Change
Land	0.866	0.804	-0.062	0.929	0.918	-0.011	0.958	0.973	0.015
Livestock	0.256	0.179	-0.077	0.526	0.511	-0.015	0.870	0.907	0.037
Poultry	0.443	0.507	0.064	0.721	0.862	0.141	0.811	0.910	0.099
Hoe	0.883	0.838	-0.045	0.922	0.907	-0.015	0.907	0.976	0.069
Plough	0.030	0.011	-0.019	0.102	0.077	-0.025	0.479	0.389	-0.090
Wbarrow	0.003	0.004	0.001	0.021	0.003	-0.018	0.155	0.066	-0.089
Donkey	0.036	0.032	-0.004	0.051	0.021	-0.030	0.082	0.069	-0.013
Sprayingm	0.013	0.005	-0.008	0.030	0.027	-0.003	0.155	0.105	-0.050
Tractor	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.003	-0.014
Trailer	0.000	0.001	0.001	0.004	0.000	-0.004	0.037	0.003	-0.034
Harrow	0.000	0.000	0.000	0.001	0.000	-0.001	0.028	0.006	-0.022
Beehive	0.047	0.030	-0.017	0.041	0.054	0.013	0.056	0.081	0.025
Sewingm	0.000	0.003	0.003	0.021	0.016	-0.005	0.130	0.189	0.059
Cart	0.000	0.000	0.000	0.010	0.003	-0.007	0.132	0.159	0.027
Bicycle	0.093	0.159	0.066	0.363	0.494	0.131	0.746	0.886	0.140
Radio	0.106	0.312	0.206	0.505	0.794	0.289	0.761	0.940	0.179
Chair	0.699	0.541	-0.158	0.913	0.903	-0.010	0.949	0.958	0.009
Bed	0.717	0.812	0.095	0.948	0.963	0.015	0.958	0.994	0.036
Cupboard	0.273	0.047	-0.226	0.654	0.140	-0.514	0.803	0.293	-0.510
Table	0.370	0.335	-0.035	0.834	0.825	-0.009	0.907	0.937	0.030
House	0.726	0.860	0.134	0.848	0.938	0.090	0.921	0.958	0.037
Asset index	**<= -0.378 (1991/92)**			**<= 1.232 (1991/92)**			**>1.232 (1991/92)**		

Sources: Author's Computation using HBS data set from NBS, Tanzania.

4.4 Distribution of factor scores, means and standard deviation by zones

Appendix C indicates a distribution of factor scores, means and standard deviation of asset ownerships by zones. We pooled three periods data set together and compute factor scores, means and standard deviation separately or per each zone (Chuma and Molyneux, 2008, pg 88). In our construction, we maintained an existing number of zones as categorized by the government of the United Republic of Tanzania (URT). A list of regions per zone is as follows;

Table 8 Categorization of regions into zones

S/N	Name of zone	Region
1	Lake zone	Mwanza Shinyanga Kagera Mara
2	Eastern zone	Dar Es Salaam Pwani Morogoro
3	Central zone	Dodoma Singida
4	Northern zone	Kilimanjaro Arusha Tanga Manyara
5	Southern East zone	Lindi Mtwara
6	Southern Highland zone	Mbeya Ruvuma Iringa
7	Western zone	Tabora Kigoma Rukwa

Sources; Author's arrangement as per URT

Categorization of regions into zones is based on similar multiple characteristics of regions, particularly location and weather. For instance, the Eastern and South East zones are tropical with temperatures averaging about 27° C, rainfall varying from 100 to 193 cm and high humidity. The central zone is hot and dry, with rainfall from 50 to 76 cm, with sizeable daily and seasonal temperature variations. High moisture is the main feature of Lake Zone.

Our results show that, a land, hoe and poultry were some of the productive assets which were owned at most in all zones while a bed, house and chair owned at most in terms of durable-consumer assets. Zones 2 and 5 were found with less ownership of livestock and plough (livestock is less than 17% and plough is only 0.2%). Plough ownership is sequentially associated with the ownership of livestock and donkey. However, all zones experienced less ownership of key productive assets such as a tractor, harrow, trailer, cart, spraying machine, wheel barrow and sewing machine. For example, the maximum ownership of a tractor is 1% (zone 1). From appendix C, zones 2, 3, 5 and 7 experienced a negative means of asset indexes. The magnitudes of a negative average asset index for zones 5 and 2 are higher compared to other zones (-0.586 and -0.426). If other things remain equal, we could say that zones 2 and 5 owned less number of assets or assets with low economic status compared to other

zones (see appendix C). Thus, these zones have a low economic or asset status. The Tanzania regional poverty and welfare ranking supports our findings. "According to the composite ranking; Dodoma, Kagera, Lindi, and Coast regions are ranked the most deprived"[9]. Dodoma is found in zone 3, Lindi zone 5 and Coast region is found in zone 2. Moreover, Singida (zone 3), Kigoma and Rukwa (zone 7) and Mtwara (zone 5) are among the poorest regions in Tanzania (Bagachwa, 1994: 6).

4.5 Comparing stability of the households ranking using the asset index and income data

A comparison between an asset index and income in classifying households being below or above the poverty line is also investigated. Since we do not have an official or common asset poverty line and value of assets, we grouped the sample size into three asset index quintiles and treat a first quintile as a quintile with the households who are living below poverty line. Based on this assumption, the households in the first quintile classified by an asset index were assumed as the poor and we could be able to compare with those who classified by the standard measure (1$ per day). Table 9 (for pooled data set) reveals that about 33.33% of households were classified as the poor and 66.67% as rich by asset index while 31.48% were classified as the poor and 68.52% as rich by income measure. This means that the household's asset poverty exceeds the official poverty rate. Similar findings were reported by Cramer (2003) and Caner and Wolff (2004) though our results show small magnitude in terms of difference.

Also, we ranked the households into five quintiles by using both the asset-based index and standard measures (monthly household's income). The monthly per capita income and mean value of the asset index were used to rank households into quintiles. Table 10 reports the number and percentage of households that were classified into the same socio-economic status when both livelihood measures were used. Normally, households found in quintile one are considered as the poorest and those in the fifth as the richest (Vyas and Kumaranayake, 2006: Chuma and Molyneux, 2008). From Table 10, the difference between the households ranked as the poorest and richest appears to be bigger when households are ranked on basis of an asset index in the initial period (31) and smaller (2) when ranked on the basis of income. It is contrary in the final period[10]; 9 households on basis of an asset index and 13 on basis of income indicator. On basis of asset index (see table 10, final change), the poorest was increased by 0.85% and the richest was decreased by 1.42% while on the basis of income measure, the poorest was increased by 0.51% and the richest was decreased by 0.50%. Based on this trend, we would argue that households are more assets poor than income poor.

9 http://www.tanzania.go.tz/poverty.html#Regional%20Poverty%20and%20Welfare%20Ranking accessed on 17/10/2010

10 Initial period refers to 1991/92 and final period is 2007

However, the ratios between the lowest and highest quintiles (Q1/Q5) as indicated in the final change in table 10, revealed that the income ratio was higher than an asset index ratio (-1.50 Vs -0.60). Thus, income indicator is more volatile compared to an asset indicator. Appendix F shows sensitivity of cohorts ranked by both asset index and income measures. Almost, all measures show similar trend of ranking with variations between 1 and 28 households over time (plus or minus). A number of households ranked as poor by asset index were 1740 while by income were 1752. For rich, 1724 were ranked by asset index and 1737 by income measure. From table 10 and appendix F, income ranked large number of households as rich compared to asset index.

Table 9 Proportion of households classified as poor and rich by using both asset-based index and official poverty measures

Asset index:	Number of households	%
Poor	1,760	33.33
Non-Poor	3,520	66.67

Income:	Number of households	%
Poor	1,662	31.48
Non-Poor	3,618	68.52

Sources; Author's computation using HBS data set from NBS, Tanzania

Table 10 Number of households classified into similar socio-economic status quintiles when asset and income data set are used

Asset Index								
	1991/92		2000/2001		2007		Final change	
Quintiles	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
1 (Poorest)	330	18.75	411	23.35	345	19.60	15	0.85
2	328	18.64	376	21.36	324	18.41	-4	-0.23
3	342	19.43	353	20.06	359	20.40	17	0.97
4	399	22.67	296	16.82	396	22.50	-3	-0.17
5(Richest)	361	20.51	324	18.41	336	19.09	-25	-1.42
						Q1/Q5	-0.60	-0.60

Income								
	1991/92		2000/01		2007		Final change	
Quintiles	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
1 (Poorest)	359	20.40	336	19.09	368	20.91	9	0.51
2	342	19.43	370	21.02	337	19.15	-5	-0.28
3	354	20.11	362	20.57	341	19.38	-13	-0.73
4	344	19.55	352	20.00	359	20.40	15	0.85
5(Richest)	361	20.51	340	19.32	355	20.17	-6	-0.34
						Q1/Q5	-1.50	-1.50

Sources: Author's computation using HBS data set from NBS, Tanzania;

4.6 The reliability of the asset-based index

In this part we will test or examine the performance and reliability of the asset index in poverty ranking[11]. The assessment is very crucial when there is a complete lack of values of assets, income and expenditure data in the survey, as in our case. We will check or test whether the asset index produces apparent demarcations across the poor, the middle and the rich households for each variable incorporated in the index. Secondly, we will examine whether the index gives reasonable comparison with other indicators we know, such that they are correlated to household's characteristics such as age, quintile and location.

4.6.1 Internal coherence of the asset-based index

From appendix B, we can see the gap in the mean value of the asset index between the two quintiles; highest (rich) and lowest (poorest) quintiles. The gap is relatively large. For example, the gap is 0.09 units for land in 1991/92, 0.15 units in 2000/01 and 0.17 in 2007. Also, the gap is 0.45 units for plough in 1992, 0.34 units in 2000/01 and 0.39 units in 2007. As we move from the lowest to the highest group, a household would have to acquire more assets that would increase its score on the asset index. In other words, the mean value for all variables increases systematically as we move from the left to the right column in each year. This is predominantly the case for assets that we know are usually not owned by the poor, but by the rich; such as a tractor, harrow, trailer and cart. Thus, the asset index is internally coherent across the poorest, middle and rich households for almost all variables. Internal coherence contrasts the mean value for each asset variable by household's socio-economic class such as quintiles. Filmer and Pritchett (2001); McKenzie (2003) and Vyas and Kumaranayake (2006) assessed internal coherence of the asset-based index in their studies and found mean asset ownership differed systematically by socio-economic classes.

Like any other indicators, comparison by age groups is almost quite clear particularly when we infer to asset life cycle hypothesis. We would expect an individual to acquire more assets as his/her age increases. In our case, we find the first two years of birth and age groups (young adulthoods) with the lowest asset ownership, relatively increases as age increases. Also, aged households experienced a decreasing asset ownership. Moreover, average asset ownership differs markedly across the quintiles and zones (see appendix C and tables 6 & 7). For instance, some of the assets are not common in zone 5 such as plough, tractor, trailer and harrow, but these assets are common in quintile 5. We would then expect quintile 5 with few households from zone 5. Tabulation of quintile 5 shows only 5.7% of the total households from zone 5 are found in quintile 5 or are regarded as rich.

[11] Performance assessment is based on Filmer and Pritchett (2001)

4.6.2 Robustness of an asset- based index

The asset index creates very comparable categorization when different sub-sets of groupings are used in its construction (Filmer and Pritchett, 2001). In table 4, we computed an asset index when all asset variables were used together. In this part, we constructed an asset index of asset variables separately (productive and durable assets). Tables 10 and 11 provide scoring factors and summary statistics for productive and durable assets separately. In these two tables, we find similar distribution of weights in each asset. For example, as we move from zero to one, a household that owns a tractor has an asset index higher by 6.325 units in 1991/92, 3.339 units in 2000/01 and 15.472 units in 2007 than one that does not. The higher the units over other assets, is similar to the results which we have seen in table 4 above. The only difference is noted for plough and some durable assets (see table 10 and 11). Also, distribution of means of asset index overtime was found very similar except for durable assets in year 2007.

Table 11 Scoring factors and summary statistics for the productive assets

		1991/92			2000/01			2007		
Variables	FS	Mean	Std. Dev.	FS/SD	Mean	Std. Dev.	FS/SD	Mean	Std. Dev.	FS/SD
Land	0.182	0.910	0.287	0.634	0.861	0.346	0.525	0.881	0.324	0.562
Livestock	0.387	0.488	0.500	0.775	0.409	0.492	0.788	0.449	0.498	0.778
Poultry	0.232	0.628	0.483	0.481	0.620	0.485	0.479	0.724	0.447	0.520
Hoe	0.132	0.903	0.295	0.445	0.901	0.299	0.439	0.891	0.311	0.423
Plough	0.412	0.149	0.357	1.155	0.114	0.318	1.294	0.109	0.312	1.321
Wbarrow	0.226	0.041	0.198	1.138	0.033	0.179	1.263	0.015	0.123	1.834
Donkey	0.184	0.051	0.220	0.835	0.036	0.186	0.990	0.035	0.183	1.006
Sprayingm	0.188	0.048	0.214	0.879	0.032	0.176	1.073	0.033	0.179	1.055
Tractor	**0.369**	**0.003**	**0.058**	**6.325**	**0.013**	**0.111**	**3.319**	**0.001**	**0.024**	**15.472**
Trailer	0.299	0.009	0.095	3.145	0.013	0.114	2.629	0.001	0.034	8.860
Harrow	0.248	0.006	0.079	3.146	0.011	0.106	2.339	0.001	0.034	7.359
Beehive	0.116	0.047	0.211	0.551	0.050	0.218	0.533	0.049	0.217	0.535
Sewingm	0.217	0.035	0.183	1.183	0.056	0.229	0.944	0.043	0.203	1.065
Cart	0.330	0.031	0.173	1.914	0.028	0.166	1.986	0.031	0.174	1.897
Asset index		**0.084**	**1.310**		**-0.002**	**1.784**		**-0.082**	**1.164**	

*The largest Eigenvalue, λ of the first principal component is 2.088 and proportion of variance explained is 0.149. *FS=factor score and SD= standard deviation*

Sources: Authors' computation using HBS from NBS, Tanzania.

Table 12 Scoring factors and summary statistics for the consumer durables

		1991/92			2000/01			2007		
Variables	FS	Mean	Std. Dev.	FS/SD	Mean	Std. Dev.	FS/SD	Mean	Std. Dev.	FS/SD
Bicycle	0.355	0.333	0.471	0.752	0.420	0.494	0.718	0.430	0.495	0.716
Radio	0.460	0.398	0.490	0.939	0.499	0.500	0.919	0.622	0.485	0.948
Chair	0.400	0.835	0.371	1.078	0.749	0.434	0.922	0.764	0.425	0.941
Bed	0.372	0.858	0.349	1.066	0.874	0.331	1.123	0.906	0.292	1.276
Cupboard	0.294	0.532	0.499	0.588	0.220	0.415	0.708	0.131	0.337	0.871
Table	0.527	0.664	0.472	1.116	0.636	0.481	1.096	0.644	0.479	1.101
House	0.012	0.814	0.389	0.030	0.886	0.317	0.037	0.910	0.287	0.041
Asset index	**2.051**	**0.051**	**1.428**		**-0.087**	**1.469**		**0.036**	**1.395**	

The lagest Eigenvalue, λ *of the first principal component is 2.051 and proportion of variance explained is 0.293.*FS=factor score and SD= standard deviation*

Sources: Authors' computation using HBS data set from NBS, Tanzania.

Also, sub-asset index produced quite similar categorizations of zones as full index does. Table 13 below shows the distribution of means of asset index by years of study in each zone. In this table, we find quite similar signs of asset index in each zone. Zones 1, 4 and 6 were found with positive asset index while zones 2, 3, and 5 were found with negative signs over time. However, zone 7 was found with a mixture of negative and positive signs of asset index. In general, zones 7, 2 and 6 performed well in terms of asset accumulation over time. Therefore, we find similar ranking of zones using sub-asset indexes and full index (see appendix C and table 13).

Table 13 Distribution of means of asset index by years of study and zones

Year	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7
Year1	0.537	-0.678	-0.126	0.327	-0.202	0.021	-0.157
Year2	0.312	-0.262	-0.163	0.407	-0.766	0.063	-0.393
Year3	0.298	-0.428	-0.33	0.243	-0.68	0.187	0.152
			Change				
Y2-Y1	-0.225	0.416	-0.037	0.08	-0.564	0.042	-0.236
Y3-Y2	-0.014	-0.166	-0.167	-0.164	0.086	0.124	0.545
Y3-Y1	**-0.239**	**0.25**	**-0.204**	**-0.084**	**-0.478**	**0.166**	**0.309**

*1991/92 = Year1= Y1; 2000/01 = Year2 = Y2 2007 = Year3 = Y3

Sources: Authors' computation using HBS data set from NBS, Tanzania.

Another robustness test of asset based index is the distribution of means of asset variables and asset index by regions instead of zones. Appendix D reports similar summary statistics for almost all regions as reported in appendix C and table 13. Almost, all regions that were found with low assets ownerships and low asset index in appendix C and table 13, were reported similar in appendix D.

4.7. Discussion

The main objective of this paper is to examine the trend of the rural household's asset dynamics in Tanzania from 1991/92 to 2007. Inconsistence in accumulation or de-accumulation of some assets over time is likely attributed by a number of difficulties in adapting the current system of mode of production, the so called neoliberal capitalism. Implementation of neoliberal and Washington Consensus policy in Tanzania, like many other countries started in early 1990s. One of the areas which strolled severe impact to rural households is cost sharing in all social services such as health and education. It is worth noting that, large part of cost sharing, if not all was covered by rural households through selling a certain share of their productive assets. Also, part of agricultural products were no longer used to generate more asset stock because more cash or resources were required to cover additional costs which were initially covered by the government free of charge. Usually, coping mechanism and consumption smoothing against shocks in rural areas is done through asset selling, particularly productive assets. In this period, the world market also experienced low price for cash crops and hence low income for those rural households who were initially depending on cash crops as a source of cash income. Another aspect which is closely related to this poor performance of asset development is demographic aspect within households. For instance, land and livestock are two major assets which experienced more division among the members of the households particularly sons immediately after marriage.

Distribution of assets by poverty dynamics indicates that, land ownership was higher in 1991/92; declined in 2000/01 and then increased in 2007 just below that of 1991/92 (except for 20% rich group). Arguably, costs sharing could have forced rural poor households to sell part of their land though the land itself could remain in the same location. Good performance for rich group implies that poor rural households tend to sell their assets to rich households. Also, average household size (demographic factor) in 1990s was 7 and 5 in early 2000s. Land fragmentation was therefore a fundamental concern in rural areas. Moreover, off-farming activities in rural areas were less developed. An increase of land ownership in 2007 was probably due to the income boom that was generated from the mineral sector and foreign aid, particularly through general budget support. Between 2000 and 2007, real GDP growth increased from 6.0% in 2001 to 7.1% in 2007(at 2001 constant price) and the government tends to reduce some of cost sharing in health and education services, especially for vulnerable groups such as women and children[12]. The income boom enabled some of households to buy an extra land from those who suffered from cash shortage or to acquire a new land from those areas which were unoccupied. Land shortage in rural areas of Tanzania is a recent observable fact and is geared by the market economy, political policies, population growth and land degradation. Thus, those who have money can easily access land either by buying from the poor during crisis or clearing unoccupied areas. Also, average family size decreased from 5 in 2000/01 to 4.6 in

[12] Poverty and Human Development Report, 2009 pg 4

2007. Development of off-farming activities and other coping mechanisms such as remittances were among other factors which assumed to have played a positive role in an increase of land ownership in 2007.

The livestock ownership was a mixture of decrease and increase in some regions. For regions such as Manyara (zone 4), Dodoma and Singida(zone3) and Shinyanga and Mara (zone1), households still retain a big number of livestock because of prestige and status. Mostly, livestock and poultry keeping are associated with the theory of asset stratification i.e. accumulation of assets is merely for status and prestige. If all other things remain constant, one could conclude that households who own a large number of livestock have better social welfare than households who do not. However, conversion of livestock into material wellbeing depends much on critical understanding of households and cultural aspects rather than livestock itself.

An increase of livestock ownership in some areas like zone 6 and 7 and simultaneous decrease in zone 3 and 1 is due to a combination of two main factors. There is a continuous movement of nomadic people from poor grazing areas or dry areas to some areas where they could find good pasture and water. Regions like Dodoma and Singida (zone 3) and Shinyanga (zone 1) are semi-desert and livestock farming becomes less productive. Therefore, pastoralists tend to move in search for good pastures and water in zone 6 and 7. Secondly, the historical notion of local asset ownership may have been changed due to globalization. Farming activities like outdoor livestock keeping require vast land for grazing. If the size of land is keeping reducing over time, the practice of this type of farming will then be discouraged and hence less accumulation of livestock as a major productive asset. Thus, off-farming activities and other related coping mechanisms may force rural people to be less concerned about the accumulation of local assets especially livestock. However, persistent shocks such as drought, flood (El nino, 1997/98), crops and livestock diseases and poor price of agricultural by products are key aspects which can be associated with this poor performance of asset accumulation. For rich households, persistent shock is an opportunity; and for social protection, shock is danger (see asset performance by rich group in table 7). Nevertheless, location of a household determines asset accumulation and ownerships as livestock keeping not common in zone 2 and 5; simply because of weather and culture[13]. There is a larger body of evidence indicating that concentration of poverty occurs in specific geographical areas (Alber, 2001: Bird, Hulme, Moore and Shepherd, 2008).

In our study, we have seen good performance of poultry keeping across all classifications and years of study. Unlike livestock keeping, poultry keeping does not need vast land, not time consuming, yet the local breed is still outdoor and more resistance to diseases. A household may prefer this type of farming because it is cheap, not vulnerable to flood and drought and not difficult to access its market. In line with poul-

[13] Heterogeneity of agro-ecological zones, access to infrastructure and services, formal and informal institutions, etc. between and within the countries indicates that the area-or region-specific approaches are more appropriate (Siegel, 2005).

try keeping performance, bicycle ownership was also good over years. In rural areas, people do not own cars and public transport does not exist in many of the rural areas of a country like Tanzania. The only option for rural households is to own bicycle as one of major means of transport and father to facilitate off-farming activities.

Moreover, ownership of plough, tractor, trailer, harrow and cart remained a big challenge in all household's classifications and years of study[14]. Owning land without these assets implies farming practices in rural Tanzania is merely for subsistence since ownership of a hoe is consistent with land ownership. The Tanzania Poverty and Human Development Report (2009) indicate that, the proportion of income resulting from agricultural sector decreased from 60% in 2000/01 to 50% in 2007. One could say that, diversification of income activities are growing in rural areas; but to what extent does this notion tells the fact? This is a new area that needs further research if we want to know the future of rural household's life in Tanzania. Even so, agriculture will remain a critical sector of Tanzania's economy because the sector produces tradable goods for domestic and foreign markets, and most of urban Tanzanians spend a large proportion of their incomes on food especially staple foods, and the sector makes available market for local non-farming activities. Modernization of the rural farming in which 95% of Tanzania's food is growing under traditional rain-fed farming is an enduring challenges that facing the country. Agricultural Green Revolution in rural Tanzania cannot be attained if majority of rural households will continue practicing agriculture without plough, tractor, trailer, harrow and cart. "In the rural areas of Tanzania, the structural issues in agriculture can be attributed to rural chronic poverty,.....the majority of farmers own small plots of land and apply traditional farming techniques of rain-fed cultivation"[15].

Our findings also indicate that, land, hoe, poultry and livestock are some of the productive assets which are owned at most by rural households in Tanzania. Some of the limitations in this study are absence of asset values, quality and access across regions and years of study. Since regions tend to differ, it is likely that asset values, quality and access may differ also i.e. from one region to another. For example, zone 4 and 6 have good access to market because of good infrastructure network hence asset values might be higher than other areas. It was argued that, location plays a bigger role in terms of opportunities available to households such as infrastructures, access to social and economic services, weather and topography. Households who are living in dry and marginalized areas, with lack of physical and social infrastructures as well as poor environments are disadvantaged to accumulate more assets ((Bird, Hulme, Moore and Shepherd, 2008).

Production and accumulation of assets may vary subject to adverse weather conditions, low soil fertility, minimal use of modern farm inputs, environmental degradation, significant crops loss, least value addition and product differentiation, and inadequate food storage and conservation that result in momentous commodity price

[14] As such, household assets are considered the "driver" of sustainable growth and poverty reduction (Siegel, 2005).

[15] *http://www.jica.go.jp/activities/issues/poverty/profile/pdf/tanzania_e.pdf* accessed on 17/10/2010

fluctuation. Access to markets is another obstacle that small farmers have to overcome. Rural producers are usually faced with poor infrastructure network to reach markets, barriers in accessing markets due to inadequate resources, lack of information, few support machinery such as credit and insurance and limiting policies[16].

A key thing is to establish a pathway out of poverty, a strategy in which existing optimal options inevitably lead to the accumulation of sufficient productive assets so that a household can rationally anticipate gaining an investable excess higher than consumption needs, allowing continued accumulation and stable growth in most welfare measures (Barrett, 2004). With all these limitations and without thorough understanding of economics of rural poor households; land, hoe, poultry and livestock may not provide substantial contribution in lifting people out of poverty. In principal, these assets are meagre. A rural household who owns key assets such as a tractor, trailer, harrow, cart, land, livestock, poultry and plough can be a superior indicator of wellbeing in its own right.

Though the correlation between using the asset index and income to identify the poor and rich is moderate, it is difficult to draw a conclusion on which measure is the best because two measures are measuring two different things even if they have forward and backward linkages. The asset index can be interpreted as it tends to be poor proxy for short term household income and may be superior proxy for long term or permanent income (Falkingham and Nanzie, 2001). In practical sense, income is normally under reported, particularly in rich families and conversion of assets into money terms is difficult (subsistence economy) and prone to measurement errors. Therefore, measurement errors affect the degree of correlation between the asset based index and household income. Since rural poor in developing countries depend much on subsistence economy, it is worth to examine their welfare based on asset indicators rather than income.

[16] Productivity suffers too because, when people do not have access to credit or insurance so as to enable them to move consumption across periods, hey inevitably find alternative markets through which they can get costly quasi-credit (Barrett, 2004).

Chapter Five: Conclusion

The motivation for this paper is to examine household's asset dynamics in rural Tanzania by using an asset-based approach as an alternative tool to measure poverty. Being one of the asset-based approaches, we employed Principal Component Analysis in computing households' asset indices. Complexities in using standard measures to classify household's welfare positions particularly in developing countries is the main reason for using asset based approach in this study. Over time, households' experienced poor performance of asset accumulation, location matters in asset accumulation and asset based method is reliable for poverty ranking in rural areas. Findings from this study can be a good starting point for future improvement of alternative indicators to measure household's wealth and welfare in Tanzania, specifically for rural poor where the economy is largely subsistence.

Results of this study show that, the asset index has the potential for giving option living standard rankings of the rural households. The index is explicitly consistency and can generate clear demarcations of living standards among different household by cohorts, poverty quintiles and regions or zones. Ranking of households into poverty dynamics by cohorts is clearly reflecting the asset life cycle hypothesis. It was found that, households with superior economic position are liable to own assets with a higher factor scores while households with low economic position own those assets with a low factor scores. Categorization and classification of households based on their asset indices provide basic information for further policy interventions. Yet, it is vital to recognize that use of the asset index is a bit limited to providing comprehensive comparative analysis of social welfare; for instance, the individuality of those households in the first quintile (poor standard of living) against those in the fifth quintile (good standard of living) of classification. The index might say nothing about absolute poverty level. Furthermore, the indices are incomplete to be used for examining progress in poverty reduction over time since there may be a momentous progress in household ownership of the index components, which may not essentially be converted into social welfare. Missing values and quality of assets limiting us to draw specific conclusion that, those zones for instance with higher asset index enjoy better life than others.

Generally, Tanzanian rural households are likely to face severe poverty and might be trapped under poverty if fundamental policy and program interventions are not undertaken. For example, having a piece of land and hoe cannot guarantee a household to produce for self-sufficient and generate surplus for further accumulation of assets as well as better life. This combination of assets cannot serve as the key engine of poverty reduction in the rural economy. A particular set of assets is more productive only if combined with others, and their succession can also be significant. The type and nature of the assets owned by rural households are more crucial when we are analyzing causality and interventions towards poverty reduction. Besides of thinking to identify a certain types of firms or projects that could promote the economic growth and poverty reduction in rural areas, it is then recommended to undertake thorough study on the nature, quantity, quality and efficiency of asset variables required by different types of households in different geographical locations to practice their crucial advantages in generating sustainable growth and improving welfare

(Siegel, 2005). The assets forward looking strategy can help institutions to describe or identify key public, private and civil society's functions in building and strengthening asset bases.

The existence of asset poverty quintiles makes it important to establish a significant differentiation between cargo nets for instance, that intended to make possible the exit from chronic poverty or safety nets support above the threshold to keep households from becoming chronically poor in the wake of adverse risks. Who is to get what support, where, how and when is depending on the classification and categorization of poor rural households. For example, poorest and middle poor could be given a cargo net support just to assist them moving from low initial stage of asset ownership and rich households could be given safety nets support. Effective safety net initiatives can provide significant benefits for those households who are facing unexpected shocks (Barrett and McPeak, 2004). So far, all classifications of households in this study have significant inference in terms of policy design. Location and distribution of assets is crucial in determining and shaping institutions to serve. Groups that lack assets usually tend to lack safety, influence, freedom, confidence and a stake in a society and hence hindering the capability of institutions to perform their important and necessary coordination. With clear classifications, it is possible to formulate policies that increase influence and access to assets (World Bank, 2002c).

Reliability, coherent and robustness of asset based index in analysing, understanding, classifying and ranking households into different socio-economic status structures the overall development strategies and specific policy and investment options in terms of household's assets. If policy makers are to successfully broaden asset accumulation and asset ownership, policy design must be extended, strengthened, and directed toward those households with the greatest need. For poor country like Tanzania where income and expenditure data are unreliable and expensive to collect, asset-based approach can be used as a proxy for poverty analysis and policy interventions. Mckenzie (2003) argued that there are a number of hypothetical issues of attention in which asset inequality is more significant than consumption or income inequality; hence an asset-based inequality measure may be favoured in empirical examinations. Since there is no method that is perfect under all circumstances, policy and decision makers have to carefully consider which measures and indicators they use are reliable and stay loyal to its primary aim of improving the welfare of the most deprived households.

References

Aliber, M. (2001): An overview of the incidence and nature of chronic poverty in South Africa. CPRC working paper no. 3: IDPM, Manchester: University of Manchester.

Attanasio, O.P. 1993: An analysis of life-cycle accumulation of financial assets. Ricerche Economiche (1993) 47, 323-354. Stanford University, CA, U.S.A.

Bagachwa, M.S. (Ed). 1994: Poverty Alleviation in Tanzania: Recent Research Issues, Dar es Salaam, and DUP.

Basu, S., Pascali, L., Schiantarelli, F. and Serven, L. 2010: Productivity, Welfare and Reallocation: Theory and Firm-Level Evidence; Policy Research Working Paper 5226; The World Bank Development Research Group Macroeconomics and Growth Team, March 2010.

Barrett, C.B. 2004: Rural poverty dynamics: development policy implications; Agricultural Economics (2004) 43-58.

Barrett, C.B. and McPeak, J.G. 2004: Poverty Traps and Safety Nets; June 2004 final version.

Bird, K., Hulme, D., Moore, K. and Shepherd, A. 2008; Chronic Poverty and Remote Rural Areas, CPRC Working Paper No 13, Chronic Poverty Research Centre (ISBN Number 1-904049-12-5).

Caner, A. and Wolff, E. N. 2004: Asset Poverty in the United States: Its Persistence in an Expansionary Economy: The Levy Economics Institute of Bard College: *Public Policy Brief*: No. 76, 2004.

Carter, M.R. and May, J. 1999: Poverty, Livelihood and Class in Rural South Africa; *World Development* 27, 1:1-20.

Carter, M.R and May, J. 2001: One kind of freedom: the dynamics of poverty in post-apartheid South Africa, *World Development*, 29, pp.1987-2006.

Carter, M. R. and Barrett, C. B. 2006: The economics of poverty traps and persistent poverty. An asset-based approach', *Journal of Development Studies*, 42:2,178-199.

Chuma, J. and Molyneux, C. 2008: Estimating inequalities in ownership of insecticide treated nets: does the choice of socio-economic status measure matter? *Health Policy and Planning* 2009: 24:83-93.

C'ordova, A. 2008: Methodological Note: Measuring Relative Wealth Using Household Asset Indicators. Americas Barometer Insight, No.6. LAPOP, Vanderbilt University.

Cramer, R. 2003: The Misleading Way We Count the Poor: Alternatives to Our Antiquated Poverty Measure Should Consider Assets: New America Foundation: Asset Building Program: Issue Brief #3.

Deaton, A. 1985: "Panel Data from Time- Series of Cross-Sections", *Journal of Econometrics*, vol. 30, pp.109-126.

Dercon, S. 1998: "Wealth, Risk and Activity Choice: Cattle in Western Tanzania" *Journal of Development Economics* 55, no, 1, 1-42.

Falkinham, J. And Namzie, C. 2001: Identifying the poor: A critical view of alternative approaches, London, London School of Economics.

Filmer, D. and Pritchett, L.H. 2001: Estimating Wealth Effects Without Expenditure Data-Or Tears; An application to Educational Enrolments in States of India; *Demography,* Volume 38, Number 1, February 2001, pp. 115-132 (Article).

Haddad, L., and Ahmed, A. 2003: "Chronic and Transitory Poverty: Evidence from Egypt, 1997-99". *World Development* 31, no 1, 71-85.

Haveman, R. and Wolff, E.N. 2000: Who are the asset-poor? Levels, trends and composition, 1983-1998 (CSD Working Paper 00-12). St Louis. MO: Washington University, Canter for Social Development.

Household Budget Survey, 2007; Final Report, 2007: National Bureau of Statistics, Tanzania.

Hulme, D., Moore, K. and Shepherd, A. 2001: Chronic Poverty: meanings and analytical frameworks. CPCR Working Paper No. 2. Manchester and Birmingham, Chronic Poverty Research Centre.

Hulme, D. And Shepherd, A. 2003: "Chronic Poverty and Development Policy". *World Development*, 31, No. 3, 399-665.

Hulme, D. and McKay, A. 2005: Identifying and Measuring Chronic Poverty: Beyond Monetary Measures. CPRC-IIPA Working Paper 30.

McKenzie, D.J. 2003: Measure inequality with asset indicators. BREAD Working Paper No.o42 Cambridge, MA: Bureau for Research and Economic Analysis of Development, Centre for International Development, Harvard University.

McKenzie, D. J. "Measuring inequality with Asset Indicators" *Journal of Population Economics* 18, No.2 (2005): 229-60.

Midgley, J. 2003: Assets in the Context of Welfare Theory: A Developmentalist Interpretation. Working Paper No. 03-10.

Moser, C. 1998: The Asset Vulnerability Framework: Reassessing Urban Poverty Reduction Strategies', *World Development,* vol. 26, PP. 1-19).

Moser, C. and Felton, A. 2007: The Construction of an Asset Index Measuring Asset Accumulation in Ecuador, Global Economy and Development, The Brookings Institution, 1775 Massachusetts Avenue, NW, Washington DC, 20036, USA, CPRC Working Paper 87.

Naschold, F. 2009: "Poor stays poor". Household asset poverty traps in rural semi-arid India. Cornell University: Department of Applied Economics and Management; 313a Warren Hall, Ithaca, NY 14853, fn23@cornell.ed.

Oliver, M. L. and Shapiro, T.M. 1995: *Black Wealth/White Wealth: A New Perspective on Racial Inequality*. New York, NY: Routledge.

Piachuad, D. 1987: "Problems in the definition and measurement of poverty." *Journal of Social Policy 16: 147-164*.

Poverty and Human Development Report, 2009: Research and Analysis Working Group: United Republic of Tanzania; Ministry of Finance and Economic Affairs.

Rakodi, C. 1995b: "The Household Strategies of the Urban Poor: Coping with Poverty and Recession in Gweru, Zimbabwe", *Habitat International* 19 (4): 447–72.

Ruggles, P. and Williams, R. 1989: "Longitudinal Measures of Poverty: Accounting for Income and Assets over Time." *Review of Income and Wealth* 35: 225–243.

Sahn, D. and Stifel, D. 2003: 'Exploring Alternative Measures of Welfare in the Absence of Expenditure Data', Review of Income and Wealth, 49/4: 463-489.

Schultz T.W. 1980: The Economics of Being Poor. *The Journal of Political Economy, Vol. 88, No. 4 (Aug., 1980), pp. 639-651*Published by: The University of Chicago Press Stable URL: http://www.jstor.org/stable/1837306Accessed: 05/09/2010.

Sen, A. 1999: *Development as freedom*. New York Anchor Books..

Shapiro, T. M. 2004: *The Hidden Cost of Being African American: How Wealth Perpetuates Inequality*. New York, NY: Oxford University Press.

Sherraden, M. 1991: *Assets and the Poor: A New American Welfare Policy*. Armonk, NY: M.E. Sherpe.

Shimeles, A. and Thoenen, R. 2005: Poverty profiles. A methodological note on measuring poverty: Working Paper; ESPD/NRP/04/05: Poverty and Social Policy Team Economic and Social Policy Division: United Nations Economic Commission for Africa.

Siegel, P. B. 2005: Using an Asset-Based Approach to identify Drivers of Sustainable Rural Growth and Poverty Reduction in Central America: A Conceptual Framework. World Bank Policy Research Working Paper 3475.

Smith, L. I. 2002: A tutorial on Principal Components Analysis.

National Strategy for Growth and Reduction of Poverty (NSGRP), 2005: The United Republic of Tanzania, Vice President Office.

Vyas, S. and Kumaranayake, L. 2006; Construction of socio-economic status indices: how to use principal components analysis; HIV Tools Research Group, *Health policy and Planning* 21: 459-68. Health Policy Unit, Department of Public Health and Policy London School of Hygiene and Tropical Medicine, London, UK.

Wertheim, S. 2008: Local Asset Poverty Index for Illinois. San Francisco: Asset Policy Initiative of California.

World Bank. 2002c: World Development Report 2003: Sustainable Development in a Dynamic World: Transforming Institutions, Growth and Quality life. Overview Draft, Washington, D.C.

Yunju, N., Huang, J. and Sherraden, M. 2008: "Asset Definitions" In Asset Building and Low-Income Families, edited by Signe-Mary McKernan and Michael Sherraden. Washington, DC: Urban Institute Press.

http://www.illinoisassetbuilding.org/data/assetpoverty/accessed on 10/11/2010

http://www.tanzania.go.tz/poverty.html#Regional%20Poverty%20and%20Welfare%20Ranking accessed on 17/10/2010

http://www.jica.go.jp/activities/issues/poverty/profile/pdf/tanzania_e.pdf accessed on 17/10/2010

Appendixes

Appendix A: Distribution of means of asset variables by cohorts

Years of birth→ 1977-1973				1972-1968			1967-1963			1962-1958			1957-1953		
Years of study→	1991/92	2000/01	2007	1991/92	2000/01	2007	1991/92	2000/01	2007	1991/92	2000/01	2007	1991/92	2000/01	2007
Age group→	15-19	24-28	30-34	20-24	29-33	35-39	25-29	34-38	40-44	30-34	39-43	45-49	35-39	44-48	50-54
Variable	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Land	1.000	0.852	0.878	0.853	0.807	0.869	0.919	0.852	0.899	0.895	0.814	0.911	0.929	0.825	0.863
Livestock	0.571	0.419	0.435	0.353	0.372	0.390	0.503	0.422	0.475	0.468	0.392	0.516	0.520	0.492	0.432
Poultry	0.286	0.596	0.670	0.544	0.623	0.750	0.622	0.614	0.732	0.644	0.598	0.714	0.657	0.612	0.734
Hoe	1.000	0.897	0.878	0.868	0.897	0.881	0.881	0.883	0.905	0.925	0.854	0.906	0.909	0.891	0.878
Plough	0.000	0.099	0.139	0.132	0.076	0.097	0.130	0.099	0.117	0.127	0.141	0.156	0.146	0.137	0.086
Wbarrow	0.000	0.025	0.022	0.015	0.022	0.025	0.070	0.045	0.022	0.052	0.020	0.005	0.047	0.044	0.000
Donkey	0.143	0.034	0.061	0.044	0.031	0.034	0.054	0.022	0.011	0.045	0.060	0.047	0.059	0.038	0.000
Sprayingm	0.000	0.030	0.048	0.044	0.022	0.013	0.059	0.031	0.022	0.030	0.035	0.010	0.028	0.033	0.022
Tractor	0.000	0.005	0.000	0.000	0.009	0.000	0.000	0.013	0.000	0.004	0.015	0.000	0.004	0.016	0.000
Trailer	0.000	0.000	0.000	0.000	0.009	0.000	0.005	0.013	0.006	0.011	0.020	0.000	0.004	0.027	0.000
Harrow	0.000	0.010	0.000	0.000	0.000	0.004	0.011	0.013	0.000	0.000	0.035	0.005	0.008	0.011	0.000
Beehive	0.000	0.054	0.043	0.029	0.036	0.051	0.038	0.045	0.050	0.041	0.055	0.057	0.051	0.044	0.043
Sewingm	0.000	0.054	0.039	0.029	0.036	0.034	0.059	0.058	0.045	0.026	0.075	0.052	0.028	0.071	0.058
Cart	0.000	0.020	0.057	0.015	0.022	0.042	0.038	0.027	0.022	0.030	0.045	0.031	0.031	0.038	0.007
Bicycle	0.143	0.414	0.465	0.309	0.435	0.386	0.395	0.462	0.447	0.296	0.472	0.484	0.327	0.404	0.424
Radio	0.429	0.483	0.683	0.353	0.480	0.551	0.400	0.547	0.648	0.345	0.477	0.677	0.445	0.536	0.626
Chair	0.857	0.803	0.748	0.794	0.771	0.716	0.849	0.735	0.799	0.831	0.729	0.745	0.827	0.716	0.734
Bed	0.857	0.867	0.917	0.779	0.892	0.856	0.876	0.883	0.944	0.861	0.910	0.906	0.870	0.880	0.914
Cupboard	0.714	0.222	0.143	0.426	0.206	0.127	0.551	0.274	0.112	0.472	0.231	0.156	0.535	0.208	0.158
Table	0.714	0.704	0.661	0.588	0.610	0.589	0.692	0.668	0.687	0.652	0.658	0.615	0.693	0.639	0.662
House	0.571	0.897	0.887	0.735	0.861	0.915	0.778	0.892	0.950	0.813	0.844	0.901	0.835	0.880	0.928

Sources: Author's Computation using HBS data set from NBS, Tanzania.

Appendix A (Cont.....): Distribution of means of asset variables by age groups

Years of Birth →	1952-1948			1947-1943			1942-1938			1937-1933			1932-1928		
Years of study→	1991/92	2000/01	2007	1991/92	2000/01	2007	1991/92	2000/01	2007	1991/92	2000/01	2007	1991/92	2000/01	2007
Age group→	40-44	49-53	55-59	45-49	54-58	60-64	50-54	59-63	65-69	55-59	64-68	70-74	60-64	69-73	75-79
Variable	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Land	0.905	0.860	0.869	0.921	0.928	0.890	0.893	0.901	0.901	0.933	0.935	0.841	0.902	0.894	0.940
Livestock	0.508	0.408	0.414	0.517	0.435	0.532	0.497	0.351	0.475	0.407	0.355	0.378	0.510	0.364	0.640
Poultry	0.656	0.650	0.724	0.547	0.674	0.725	0.638	0.577	0.762	0.637	0.624	0.683	0.755	0.621	0.820
Hoe	0.889	0.943	0.897	0.901	0.906	0.881	0.910	0.910	0.911	0.911	0.935	0.878	0.922	0.924	0.960
Plough	0.196	0.121	0.069	0.143	0.130	0.138	0.147	0.126	0.129	0.111	0.118	0.085	0.186	0.136	0.120
Wbarrow	0.042	0.019	0.000	0.030	0.029	0.009	0.017	0.045	0.050	0.015	0.032	0.000	0.049	0.045	0.020
Donkey	0.021	0.032	0.028	0.059	0.036	0.092	0.051	0.054	0.050	0.037	0.011	0.024	0.078	0.030	0.020
Sprayingm	0.053	0.057	0.041	0.099	0.043	0.028	0.028	0.045	0.059	0.030	0.022	0.037	0.059	0.015	0.040
Tractor	0.000	0.019	0.007	0.005	0.022	0.000	0.006	0.009	0.000	0.000	0.000	0.000	0.010	0.015	0.000
Trailer	0.011	0.013	0.000	0.025	0.022	0.000	0.011	0.000	0.000	0.000	0.000	0.012	0.010	0.015	0.000
Harrow	0.011	0.006	0.000	0.020	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.015	0.000
Beehive	0.048	0.045	0.055	0.054	0.051	0.046	0.068	0.045	0.059	0.037	0.075	0.073	0.039	0.091	0.040
Sewingm	0.058	0.070	0.048	0.034	0.022	0.028	0.028	0.045	0.059	0.022	0.075	0.024	0.000	0.076	0.040
Cart	0.026	0.051	0.028	0.054	0.014	0.046	0.011	0.027	0.040	0.000	0.022	0.000	0.059	0.000	0.020
Bicycle	0.397	0.439	0.407	0.374	0.428	0.367	0.288	0.342	0.416	0.304	0.376	0.378	0.324	0.500	0.460
Radio	0.402	0.478	0.566	0.433	0.507	0.624	0.390	0.541	0.614	0.356	0.495	0.524	0.392	0.576	0.740
Chair	0.847	0.771	0.786	0.818	0.754	0.780	0.887	0.667	0.822	0.793	0.699	0.720	0.794	0.803	0.860
Bed	0.873	0.885	0.924	0.837	0.783	0.862	0.836	0.820	0.911	0.844	0.914	0.890	0.873	0.848	0.940
Cupboard	0.561	0.261	0.124	0.532	0.217	0.119	0.503	0.117	0.168	0.570	0.172	0.073	0.549	0.258	0.160
Table	0.651	0.631	0.662	0.675	0.601	0.606	0.633	0.559	0.634	0.622	0.624	0.573	0.657	0.712	0.700
House	0.804	0.873	0.897	0.818	0.935	0.862	0.836	0.901	0.921	0.844	0.903	0.890	0.794	0.970	0.940

Sources: Author's Computation using HBS data set from NBS, Tanzania.

Appendix A (Cont.....): Distribution of means of asset variables by cohorts

Years of Birth→	1927-1923			1922-1918			1917-1913			1912-1908		
Years of study	**1991/92**	**2000/01**	**2007**	**1991/92**	**2000/01**	**2007**	**1991/92**	**2000/01**	**2007**	**1991/92**	**2000/01**	**2007**
Age group→	**65-69**	**74-78**	**80-84**	**70-74**	**79-83**	**85-89**	**75-79**	**84-88**	**90-94**	**80-84**	**89-93**	**95-99**
Variable	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Land	0.905	0.895	0.958	0.889	1.000	1.000	1.000	0.700	1.000	0.600	0.600	0.750
Livestock	0.476	0.395	0.458	0.533	0.500	0.400	0.500	0.300	0.333	0.200	0.200	0.250
Poultry	0.631	0.789	0.833	0.533	0.611	0.650	0.571	0.800	1.000	0.600	0.600	0.750
Hoe	0.929	0.868	0.917	0.867	1.000	0.900	0.857	0.800	1.000	0.800	0.800	0.750
Plough	0.155	0.105	0.000	0.311	0.222	0.200	0.107	0.200	0.000	0.000	0.000	0.250
Wbarrow	0.024	0.053	0.000	0.089	0.111	0.050	0.036	0.000	0.000	0.000	0.000	0.000
Donkey	0.107	0.053	0.042	0.044	0.056	0.050	0.000	0.200	0.000	0.000	0.000	0.000
Sprayingm	0.071	0.053	0.125	0.022	0.000	0.050	0.071	0.000	0.000	0.200	0.200	0.000
Tractor	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Trailer	0.012	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Harrow	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.000	0.000	0.000	0.000
Beehive	0.036	0.053	0.042	0.044	0.000	0.050	0.071	0.100	0.000	0.000	0.000	0.250
Sewingm	0.048	0.000	0.042	0.044	0.167	0.000	0.071	0.000	0.000	0.000	0.000	0.000
Cart	0.036	0.000	0.000	0.044	0.111	0.050	0.000	0.100	0.000	0.000	0.000	0.000
Bicycle	0.298	0.211	0.333	0.333	0.167	0.450	0.393	0.400	0.333	0.000	0.000	0.500
Radio	0.393	0.421	0.583	0.422	0.389	0.550	0.464	0.500	0.000	0.600	0.600	0.250
Chair	0.786	0.789	0.875	0.933	0.889	0.700	0.964	0.700	0.667	0.800	0.800	0.250
Bed	0.810	0.921	0.875	0.956	0.778	0.950	0.929	0.900	0.667	1.000	1.000	0.750
Cupboard	0.619	0.237	0.167	0.556	0.167	0.050	0.643	0.400	0.000	0.800	0.800	0.000
Table	0.679	0.553	0.625	0.689	0.722	0.700	0.821	0.500	0.667	0.600	0.600	0.250
House	0.881	0.868	0.917	0.867	0.889	1.000	0.714	0.900	1.000	0.800	0.800	0.750

Sources: Author's Computation using HBS data set from NBS, Tanzania.

Appendix B Ownership of assets by socio-economic status quintile

	Quintile means- 40% poorest						Quintile means-40% middle poor						Quintile means-20% rich					
	1991/91		2000/01		2007		1991/91		2000/01		2007		1991/91		2000/01		2007	
Variables	Mean	SD.	Mean	SD.	Mean	SD.	Mean	SD.	Mean	SD.	Mean	SD.	Mean	SD.	Mean	SD.	Mean	SD.
Land	0.866	0.341	0.798	0.402	0.804	0.398	0.929	0.257	0.903	0.297	0.918	0.274	0.958	0.201	0.950	0.219	0.973	0.162
Livestock	0.256	0.437	0.171	0.377	0.179	0.383	0.526	0.500	0.506	0.500	0.511	0.500	0.870	0.336	0.856	0.352	0.907	0.291
Poultry	0.443	0.497	0.462	0.499	0.507	0.500	0.721	0.449	0.733	0.443	0.862	0.345	0.811	0.392	0.831	0.376	0.910	0.286
Hoe	0.883	0.322	0.852	0.355	0.838	0.369	0.922	0.268	0.934	0.248	0.907	0.291	0.907	0.291	0.966	0.183	0.976	0.153
Plough	0.030	0.171	0.018	0.132	0.011	0.104	0.102	0.303	0.123	0.328	0.077	0.267	0.479	0.500	0.354	0.479	0.389	0.488
Wbarrow	0.003	0.053	0.001	0.034	0.004	0.064	0.021	0.144	0.010	0.100	0.003	0.053	0.155	0.362	0.160	0.367	0.066	0.248
Donkey	0.036	0.186	0.013	0.113	0.032	0.175	0.051	0.220	0.039	0.193	0.021	0.145	0.082	0.274	0.091	0.288	0.069	0.254
Sprayingm	0.013	0.113	0.004	0.059	0.005	0.074	0.030	0.170	0.018	0.135	0.027	0.163	0.155	0.362	0.132	0.339	0.105	0.307
Tractor	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.129	0.069	0.254	0.003	0.055
Trailer	0.000	0.000	0.000	0.000	0.001	0.037	0.004	0.065	0.002	0.041	0.000	0.000	0.037	0.188	0.069	0.254	0.003	0.055
Harrow	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.038	0.000	0.000	0.000	0.000	0.028	0.166	0.063	0.243	0.006	0.077
Beehive	0.047	0.212	0.035	0.185	0.030	0.171	0.041	0.199	0.047	0.212	0.054	0.227	0.056	0.231	0.094	0.292	0.081	0.273
Sewingm	0.000	0.000	0.002	0.049	0.003	0.052	0.021	0.144	0.013	0.115	0.016	0.125	0.130	0.336	0.276	0.448	0.189	0.392
Cart	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.099	0.015	0.122	0.003	0.053	0.132	0.339	0.129	0.335	0.159	0.366
Bicycle	0.093	0.290	0.169	0.375	0.159	0.366	0.363	0.481	0.563	0.496	0.494	0.500	0.746	0.436	0.818	0.386	0.886	0.318
Radio	0.106	0.308	0.226	0.418	0.312	0.464	0.505	0.500	0.679	0.467	0.794	0.405	0.761	0.427	0.890	0.313	0.940	0.238
Chair	0.699	0.459	0.603	0.490	0.541	0.499	0.913	0.281	0.854	0.354	0.903	0.297	0.949	0.220	0.940	0.237	0.958	0.201
Bed	0.717	0.451	0.783	0.413	0.812	0.391	0.948	0.223	0.948	0.222	0.963	0.190	0.958	0.201	0.981	0.136	0.994	0.077
Cupboard	0.273	0.446	0.059	0.236	0.047	0.211	0.654	0.476	0.277	0.448	0.140	0.348	0.803	0.398	0.542	0.499	0.293	0.456
Table	0.370	0.483	0.390	0.488	0.335	0.472	0.834	0.372	0.820	0.384	0.825	0.380	0.907	0.291	0.947	0.225	0.937	0.243
House	0.726	0.446	0.848	0.360	0.860	0.347	0.848	0.359	0.901	0.299	0.938	0.241	0.921	0.270	0.962	0.191	0.958	0.201
	Asset index		**<= -0.378**				**<= 1.232**						**>1.232**					

Sources: Author's Computation using HBS data set from NBS, Tanzania

Appendix C Scoring factors and summary statistics of asset variables by zones

	Zone 1				Zone 2				Zone 3				Zone 4			
Variable	**FS**	**Mean**	**SD**	**FS/SD**	**FS**	**Mean**	**SD**	**FS/SD**	**FS**	**Mean**	**SD**	**FS/SD**	**FS**	**Mean**	**SD**	**FS/SD**
Land	0.181	0.854	0.353	0.513	0.045	0.790	0.408	0.110	0.076	0.931	0.253	0.301	0.097	0.914	0.280	0.347
Livestock	0.306	0.564	0.496	0.617	0.092	0.148	0.356	0.259	0.310	0.483	0.500	0.619	0.161	0.669	0.471	0.342
Poultry	0.212	0.709	0.455	0.466	0.112	0.570	0.496	0.226	0.222	0.661	0.474	0.469	0.162	0.698	0.459	0.353
Hoe	0.132	0.891	0.312	0.423	0.070	0.854	0.354	0.198	0.042	0.933	0.250	0.169	0.006	0.897	0.304	0.018
Plough	0.281	0.228	0.420	0.670	0.482	0.002	0.042	11.472	0.331	0.178	0.383	0.865	0.065	0.123	0.329	0.197
Wbarrow	0.188	0.040	0.196	0.955	0.092	0.007	0.084	1.098	0.159	0.012	0.111	1.441	0.223	0.060	0.238	0.934
Donkey	0.105	0.026	0.160	0.659	0.036	0.016	0.125	0.289	0.163	0.076	0.265	0.614	-0.129	0.109	0.311	-0.416
Sprayingm	0.194	0.046	0.210	0.922	0.270	0.016	0.125	2.159	0.050	0.007	0.084	0.591	0.183	0.053	0.224	0.816
Tractor	0.195	0.010	0.102	1.919	0.479	0.005	0.073	6.593	0.058	0.002	0.042	1.383	0.156	0.004	0.060	2.591
Trailer	0.157	0.009	0.093	1.685	0.461	0.005	0.073	6.352	0.022	0.012	0.111	0.203	0.105	0.011	0.104	1.013
Harrow	0.062	0.007	0.083	0.743	0.332	0.009	0.094	3.549	-0.001	0.002	0.042	-0.033	0.151	0.006	0.077	1.952
Beehive	-0.014	0.019	0.137	-0.098	-0.014	0.026	0.161	-0.087	0.088	0.138	0.345	0.254	-0.020	0.083	0.276	-0.074
Sewingm	0.187	0.056	0.230	0.813	0.167	0.049	0.217	0.771	0.202	0.035	0.185	1.092	0.262	0.058	0.234	1.123
Cart	0.255	0.045	0.208	1.227	0.031	0.005	0.073	0.430	0.196	0.035	0.185	1.061	0.221	0.053	0.224	0.983
Bicycle	0.301	0.545	0.498	0.604	0.138	0.360	0.480	0.288	0.375	0.321	0.467	0.803	0.258	0.262	0.440	0.585
Radio	0.301	0.551	0.498	0.606	0.101	0.601	0.490	0.207	0.342	0.407	0.492	0.694	0.417	0.524	0.500	0.833
Chair	0.242	0.760	0.427	0.566	0.106	0.769	0.422	0.251	0.253	0.810	0.393	0.643	0.308	0.796	0.403	0.765
Bed	0.233	0.866	0.341	0.683	0.069	0.931	0.253	0.270	0.298	0.864	0.343	0.868	0.291	0.889	0.314	0.927
Cupboard	0.240	0.387	0.487	0.493	0.077	0.261	0.440	0.176	0.213	0.256	0.437	0.488	0.263	0.398	0.490	0.537
Table	0.323	0.678	0.467	0.690	0.111	0.661	0.474	0.233	0.364	0.437	0.497	0.733	0.410	0.691	0.462	0.886
House	0.160	0.865	0.342	0.469	0.111	0.815	0.389	0.286	0.069	0.873	0.333	0.207	0.043	0.900	0.300	0.142
The largest Eigenvalue → 2.653 **Average asset index → 0.396**					**The largest Eigenvalue → 2.660** **Average asset index → -0.424**				**The largest Eigenvalue → 2.802** **Average asset index → -0.207**				**The largest Eigenvalue → 2.639** **Average asset index → 0.325**			
Proportion of variance explained by 1st PC → (0.126)					**(0.127)**				**(0.133)**				**(0.126)**			

Appendix C (Cont.....) Scoring factors and summary statistics of asset variables by zones

	Zone 5				Zone 6				Zone 7			
Variable	FS	Mean	SD	FS/SD	FS	Mean	SD	FS/SD	FS	Mean	SD	FS/SD
Land	0.268	0.913	0.282	0.952	0.096	0.880	0.326	0.294	0.101	0.915	0.280	0.361
Livestock	0.256	0.161	0.368	0.696	0.215	0.455	0.498	0.431	0.303	0.441	0.497	0.610
Poultry	0.292	0.597	0.491	0.595	0.107	0.659	0.474	0.225	0.251	0.643	0.479	0.524
Hoe	0.239	0.866	0.341	0.701	0.061	0.925	0.263	0.231	0.127	0.913	0.282	0.450
Plough	n/a	0.000	0.000	n/a	0.247	0.100	0.300	0.823	0.272	0.144	0.352	0.774
Wbarrow	n/a	0.000	0.000	n/a	0.274	0.039	0.193	1.421	0.071	0.022	0.148	0.478
Donkey	-0.041	0.005	0.072	-0.565	0.006	0.016	0.125	0.049	0.087	0.035	0.184	0.474
Sprayingm	0.032	0.031	0.174	0.183	0.140	0.061	0.240	0.582	0.102	0.024	0.153	0.669
Tractor	n/a	0.000	0.000	n/a	0.382	0.009	0.095	4.021	0.131	0.003	0.053	2.475
Trailer	0.029	0.002	0.042	0.689	0.355	0.009	0.095	3.739	0.107	0.004	0.065	1.645
Harrow	0.077	0.005	0.072	1.066	0.383	0.009	0.095	4.033	0.050	0.004	0.065	0.766
Beehive	0.013	0.010	0.102	0.124	0.002	0.033	0.179	0.008	0.087	0.053	0.225	0.388
Sewingm	0.173	0.014	0.117	1.476	0.329	0.043	0.203	1.616	0.123	0.041	0.198	0.623
Cart	-0.029	0.002	0.042	-0.694	0.133	0.010	0.101	1.321	0.188	0.042	0.201	0.937
Bicycle	0.340	0.359	0.480	0.707	0.239	0.356	0.479	0.499	0.387	0.466	0.499	0.775
Radio	0.318	0.436	0.496	0.640	0.235	0.515	0.500	0.470	0.328	0.465	0.499	0.658
Chair	0.421	0.696	0.460	0.915	0.125	0.874	0.332	0.376	0.250	0.749	0.434	0.577
Bed	0.092	0.948	0.222	0.415	0.126	0.880	0.326	0.386	0.308	0.807	0.395	0.778
Cupboard	0.252	0.220	0.415	0.607	0.213	0.243	0.429	0.496	0.241	0.206	0.405	0.596
Table	0.424	0.625	0.485	0.876	0.195	0.779	0.415	0.469	0.397	0.564	0.496	0.801
House	0.185	0.898	0.303	0.611	0.060	0.852	0.355	0.169	0.045	0.885	0.319	0.142
The largest Eigenvalue → 2.315 **Average asset index → -0.586**					**The largest Eigenvalue → 3.060** **Average asset index → 0.094**				**The largest Eigenvalue → 2.604** **Average asset index → -0.155**			
Proportion of variance explained by 1st PC → (0.129)					**(0.146)**				**(0.124)**			

Sources: Author's Computation using HBS data set from NBS, Tanzania.

Appendix D Distribution of means of asset variables and asset index by regions

Variable	Dodoma	Arusha	Kilimanjaro	Tanga	Morogoro	Pwani	Dar es Salaam	Lindi	Mtwara	Ruvuma
Land	0.937	0.906	0.894	0.936	0.898	0.777	0.501	0.908	0.918	0.900
Livestock	0.421	0.775	0.760	0.479	0.214	0.080	0.117	0.096	0.224	0.488
Poultry	0.595	0.624	0.717	0.667	0.680	0.540	0.273	0.628	0.568	0.665
Hoe	0.927	0.911	0.858	0.929	0.921	0.826	0.701	0.837	0.895	0.919
Plough	0.149	0.310	0.024	0.000	0.000	0.004	0.000	0.000	0.000	0.000
Wbarrow	0.009	0.089	0.114	0.007	0.000	0.004	0.039	0.000	0.000	0.062
Donkey	0.079	0.197	0.020	0.086	0.026	0.009	0.000	0.007	0.003	0.019
Sprayingm	0.003	0.052	0.079	0.041	0.019	0.013	0.013	0.021	0.041	0.119
Tractor	0.003	0.014	0.000	0.000	0.004	0.009	0.000	0.000	0.000	0.000
Trailer	0.006	0.019	0.004	0.011	0.004	0.009	0.000	0.004	0.000	0.004
Harrow	0.003	0.014	0.004	0.000	0.011	0.004	0.013	0.011	0.000	0.000
Beehive	0.117	0.150	0.028	0.041	0.053	0.004	0.000	0.021	0.000	0.023
Sewingm	0.041	0.085	0.075	0.030	0.023	0.031	0.195	0.014	0.014	0.042
Cart	0.035	0.089	0.012	0.034	0.000	0.004	0.026	0.000	0.003	0.000
Bicycle	0.339	0.263	0.232	0.243	0.327	0.339	0.532	0.323	0.395	0.408
Radio	0.453	0.446	0.665	0.494	0.451	0.683	0.883	0.475	0.398	0.500
Chair	0.835	0.704	0.909	0.843	0.820	0.701	0.792	0.688	0.704	0.785
Bed	0.861	0.756	0.949	0.933	0.917	0.933	0.974	0.957	0.939	0.935
Cupboard	0.307	0.469	0.551	0.326	0.124	0.371	0.416	0.191	0.248	0.281
Table	0.459	0.563	0.846	0.757	0.594	0.710	0.753	0.574	0.673	0.715
House	0.873	0.878	0.906	0.895	0.820	0.835	0.740	0.894	0.901	0.885
Asset index	**-0.211**	**0.479**	**0.640**	**-0.027**	**-0.524**	**-0.417**	**-0.101**	**-0.667**	**-0.509**	**0.045**

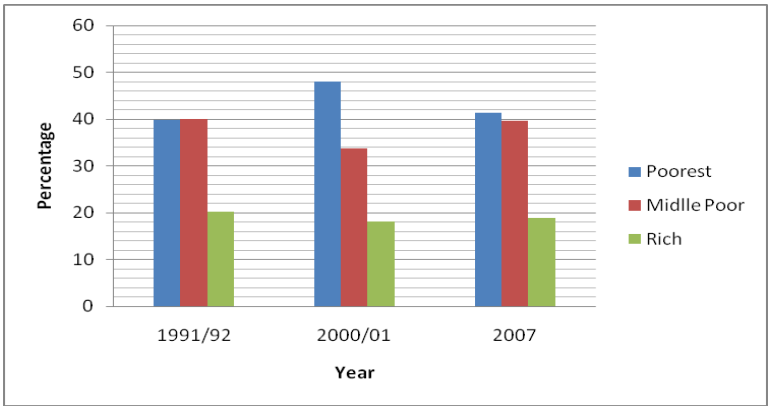
Sources: Author's Computation using HBS data set from NBS, Tanzania.

Appendix D (Cont...) Distribution of means of asset variables and asset index by regions

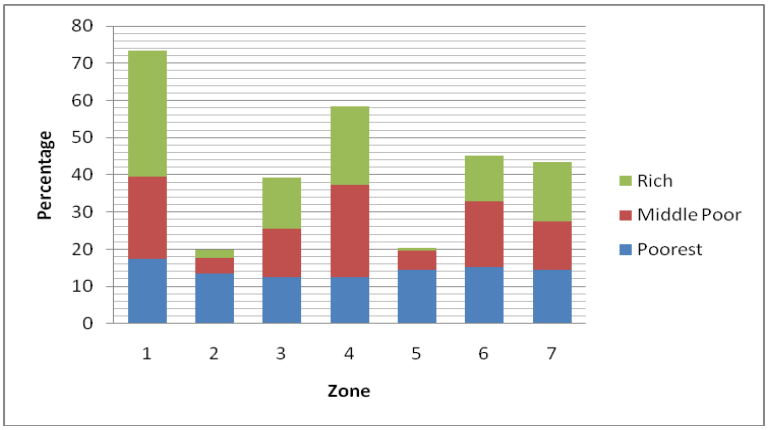
Variable	Iringa	Mbeya	Singida	Tabora	Rukwa	Kigoma	Shinyanga	Kagera	Mwanza	Mara	Manyara
Land	0.878	0.865	0.924	0.870	0.922	0.960	0.852	0.932	0.761	0.895	0.926
Livestock	0.380	0.497	0.562	0.379	0.447	0.508	0.585	0.579	0.516	0.580	0.726
Poultry	0.586	0.721	0.745	0.688	0.687	0.560	0.752	0.626	0.669	0.773	0.905
Hoe	0.936	0.920	0.940	0.916	0.894	0.924	0.910	0.915	0.869	0.874	0.884
Plough	0.136	0.147	0.215	0.221	0.218	0.004	0.376	0.000	0.166	0.322	0.316
Wbarrow	0.024	0.034	0.016	0.032	0.017	0.016	0.039	0.055	0.035	0.035	0.000
Donkey	0.020	0.009	0.072	0.028	0.089	0.004	0.029	0.000	0.022	0.049	0.211
Sprayingm	0.041	0.034	0.012	0.028	0.000	0.036	0.084	0.043	0.025	0.031	0.021
Tractor	0.007	0.018	0.000	0.004	0.006	0.000	0.029	0.000	0.000	0.010	0.000
Trailer	0.007	0.015	0.020	0.004	0.011	0.000	0.013	0.000	0.000	0.021	0.011
Harrow	0.003	0.021	0.000	0.007	0.006	0.000	0.016	0.000	0.006	0.003	0.011
Beehive	0.020	0.052	0.163	0.035	0.050	0.076	0.006	0.068	0.003	0.010	0.200
Sewingm	0.044	0.043	0.028	0.039	0.017	0.060	0.035	0.098	0.045	0.056	0.032
Cart	0.014	0.015	0.036	0.102	0.006	0.000	0.138	0.009	0.016	0.007	0.137
Bicycle	0.332	0.337	0.299	0.642	0.369	0.336	0.698	0.421	0.503	0.528	0.389
Radio	0.519	0.525	0.351	0.491	0.436	0.456	0.482	0.566	0.599	0.559	0.400
Chair	0.919	0.905	0.777	0.733	0.788	0.740	0.720	0.596	0.780	0.916	0.568
Bed	0.915	0.804	0.869	0.930	0.737	0.716	0.859	0.791	0.863	0.937	0.905
Cupboard	0.231	0.224	0.191	0.302	0.168	0.124	0.334	0.489	0.331	0.423	0.032
Table	0.827	0.785	0.410	0.628	0.559	0.496	0.579	0.621	0.659	0.853	0.379
House	0.807	0.868	0.873	0.867	0.883	0.908	0.836	0.923	0.850	0.864	0.947
Asset index	**0.041**	**0.181**	**-0.202**	**0.254**	**-0.266**	**-0.542**	**0.683**	**-0.004**	**0.092**	**0.747**	**0.126**

Sources: Author's Computation using HBS data set from NBS, Tanzania.

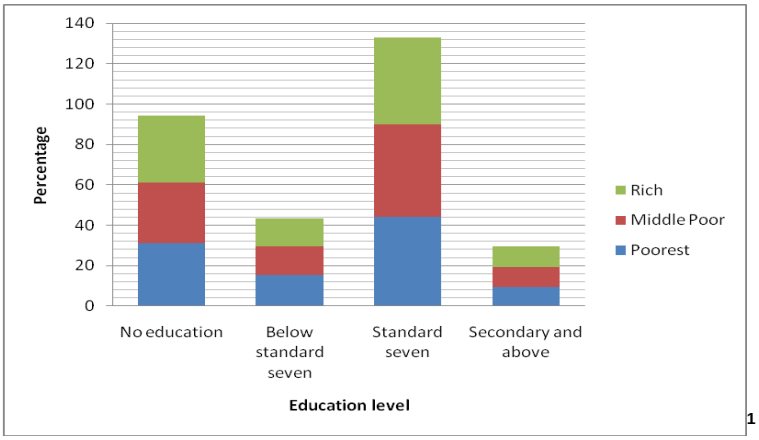
Appendix E-1 Incidence of rural household's poverty by quintile



Appendix E-2 Incidence of rural household's poverty by zones



Appendix E-3: Incidence of rural household's poverty by education level



[1]

[1] *All figures (appendix E) were constructed by author using HBS data set from NBS, Tanzania*

Appendix F Number of households classified into similar quintile when asset based index and income data sets are applied

Asset based index

	Quintile 1			Quintile 2			Quintile 3		
Year of Birth	**1991/92**	**2000/01**	**2007**	**1991/92**	**2000/01**	**2007**	**1991/92**	**2000/01**	**2007**
1973-1977	3	5	1	2	2	0	2	6	0
1968-1972	34	33	15	17	42	23	17	23	22
1963-1967	59	79	53	59	66	68	68	64	65
1958-1962	86	85	73	112	74	69	69	61	88
1953-1957	75	83	93	90	85	77	89	64	66
1948-1952	52	65	50	64	52	61	73	65	68
1943-1947	66	70	47	62	59	73	75	64	72
1938-1942	60	51	44	66	40	49	51	51	46
1933-1937	49	47	45	51	45	47	35	41	53
1928-1932	36	47	33	26	41	32	40	26	44
1923-1927	29	37	25	28	23	41	27	29	35
1918-1922	14	17	35	10	20	22	21	23	25
1913-1917	6	14	9	9	15	17	13	6	24
1908-1912	2	5	8	3	8	7	0	4	9
Total	**571**	**638**	**531**	**599**	**572**	**586**	**580**	**527**	**617**

Income indicator

	Quintile 1			Quintile 2			Quintile 3		
Year of Birth	**1991/92**	**2000/01**	**2007**	**1991/92**	**2000/01**	**2007**	**1991/92**	**2000/01**	**2007**
1973-1977	4	4	0	2	7	0	1	2	1
1968-1972	21	39	16	18	33	19	29	26	25
1963-1967	51	66	55	69	68	68	65	75	62
1958-1962	81	69	70	89	65	69	97	86	91
1953-1957	96	76	89	90	73	90	68	83	57
1948-1952	66	74	67	56	53	43	67	55	69
1943-1947	63	71	60	66	64	60	74	58	72
1938-1942	60	44	51	60	64	45	57	34	43
1933-1937	48	38	55	42	59	43	45	36	47
1928-1932	37	40	37	31	38	39	34	36	33
1923-1927	31	27	39	33	35	32	20	27	30
1918-1922	16	19	24	13	18	27	16	23	31
1913-1917	7	10	17	12	9	17	9	16	16
1908-1912	0	5	8	1	3	8	4	9	8
Total	**581**	**582**	**588**	**582**	**589**	**560**	**586**	**566**	**585**

Sources: Authors computation using HBS data set from NBS, Tanzania