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RURAL POVERTY DYNAMICS, AGRICULTURAL PRODUCTIVITY AND ACCESS TO RESOURCES

By

Paul Gamba
Elliot Mghenyi

Tegemeo Institute Of Agricultural Policy and Development, Egerton University.
P.O Box 20498 Nairobi.
Tel: 254 (20) 2717818
Email: info@tegemeo.org

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1. INTRODUCTION

The pursuance of Structural Adjustment Programmes (SAPS) in recent years has awakened most Governments, including Kenya's, to the increasing prevalence of rural poverty in their countries. In 2000, more than 45 percent of sub-Saharan Africa's population was estimated to be in poverty, and this situation has not improved in at least the last 15 years (World Bank, 2000).[1] While efforts have been made to track poverty levels through standard welfare monitoring surveys and the computation of statistics on poverty prevalence, depth and severity, such information rarely provides insights for the design of specific anti-poverty programmes.

Rising poverty levels have prompted the international community to develop and seek consensus on internationally agreed development goals to be pursued by governments. This has led to the adoption of the International Development Goals and consequently the United Nations endorsed Millennium Development Goals (MDGs).

At the same time, multilateral lending agencies also developed their own version of development goals that focus on poverty alleviation strategies. As a result, loan recipient governments have been required to develop Interim Poverty Reduction Strategy Papers (IPRSP) as a prelude to more elaborate Poverty Reduction Strategy Papers (PRSP) that together with other requirements form the basis of continued lending programmes. The need to provide indications of progress towards achievement of these objectives has given new impetus to re-examination of the adequacy of welfare monitoring surveys as currently conducted.

In order to fill this void, the Ministry of Finance through the PRSP secretariat and the Central Bureau of Statistics (CBS) have devised innovative systems to capture information pertinent to monitoring poverty over time. This system involves the development of monitoring and evaluation protocols and poverty mapping tools to areas experiencing high and severe poverty and the associated socio-economic groups. The poverty mapping concept has been applied in the current welfare monitoring survey in Kenya but was limited to Nairobi and its environs.

However, our understanding of "poverty dynamics", e.g., the extent to which poor households in one year remain poor in subsequent years as opposed to moving out of poverty, has not received commensurate attention from either the PRSP secretariat or the CBS. This can partly be attributed to the lack of appropriate panel data that tracks the poverty status of rural households over time in Kenya. This has also inhibited the ability to understand the reasons why some households that are below the poverty line in one period are able to climb out of poverty in subsequent periods, while others remain chronically mired in poverty. It should be noted that this problem is not peculiar to Kenya and is exhibited in a number of countries. Even the World Bank, which is renowned for its eminent work in the area of poverty dynamics has little relevant information on Kenya. The PRSP monitoring and evaluation exercise and the CBS poverty mapping process can be complemented by rigorous analysis of panel data to provide gainful insights into the dynamics of poverty in Kenya through the analytical methods utilized in this study.

[1] Uganda appears to be a notable exception, according to recent World Bank funded surveys (Kristjianson et al, forthcoming).

In its endeavours to contribute to the policy process in Kenya by strengthening the quantitative information base, Tegemeo Institute of Egerton University, with technical support from Michigan State University, conducted surveys of roughly 1,400 households in 1997 to 2000. This panel database was designed to provide panel data that could be used to monitor the progress of rural households and the agricultural sector over the years. In an effort to characterize rural poverty dynamics, panel data can provide insights unachievable through other means.

The objectives of this paper are threefold: First, we measure the prevalence of rural poverty in 1997 and 2000, based on the nationwide Tegemeo survey. Second, we categorize households according to whether they were above the poverty line in both 1997 and 2000, entered into poverty or exited from poverty between 1997 and 2000, or were above the poverty line in both years. Third, the paper identifies the household-level and community-level factors associated with rural poverty through econometric analysis. Lastly, we consider the implications of these results for the design of appropriate poverty reduction strategies. Such analysis is intended to guide donor programs and interventions designed to attack the roots of chronic poverty.[2] Characterization of poverty categories can also ensure that their relationship with access to physical and social capital, agricultural productivity growth and non-farm income are understood and utilized to ensure attainment of agreed poverty reduction objectives.

[2] For example, it is anticipated that a clearer understanding of the constraints impeding rural households expansion of crop income can help to guide USAID/Kenya's current maize, horticulture and dairy programs.

2. DEFINITION OF POVERTY

The CBS in the Economic Survey for year 2000 (GoK, 2000b) note that poverty is multi-dimensional and that its definition clearly depends on the perception of the society involved.

Sarlo (2001) provide dictionary definitions of poverty as "without or lack of basic necessities or deprived of basic needs or simply without luxuries" but proceeds to question these very definitions. He observes that it is indeed difficult to specify poverty for practical distinction, for instance in the case of attempting to locate poverty in the continuum of living standards or quantifying the magnitude of deprivation.

The Kenya Participatory Impact Monitoring (KEPIM) (2002) provides definitions from various communities that include lack of access to productive assets, lack of access to social services, dependency and inability to participate and lack of access to basic infrastructure.

Whether one perceives poverty as lack of necessities or as a particularly low position in the distribution of income, it is evident that poverty condition is known but difficult to generalise across societies or even countries.

A more concise definition of poverty therefore accounts for the given society and the lack of basic necessities considered minimally decent.

3. POVERTY AND WELFARE MEASUREMENT IN KENYA

Efforts to measure poverty and welfare in Kenya were initiated as early as 1972 by FAO using the Food Balance Sheet Studies (FAO, 1977). This was followed closely by the Integrated Rural Survey (Crawford and Thorbecke, 1975) which was the first documented attempt to estimate rural poverty in Kenya.

The common feature among the enumerated poverty measurements is the establishment of a poverty line and the subsequent computation of poverty incidences. Table 1 below shows the various attempts at measuring poverty in Kenya over the years. The table indicates that the prevalence of rural poverty appears to increase over the years and becomes alarming from 1992 onwards.

Table 1: Poverty Estimates

Year	Source	Poverty line	Poverty incidence
1972	Food Balance Sheet (1972-74)	2,137 calories	30 per cent of the population
1975	Integrated Rural Survey 1,1974/75 (IRS 1)	Kshs. 2,200 for small holder farmers	38.5 per cent
1980	IRS 1,1974/75 Small holder farmers	Kshs. 2,200	34.2 per cent of small holder farmers 29 per cent of population
1982	IRS 1, 1974/75 Nairobi HH Budget Survey 1974; Social accounting Matrix	Kshs. 2,269 small holder farmers; Kshs. 3836 urban households	33.1 per cent – small holder 15.3 per cent urban households
1980	IRS II, 1977	Kshs. 310 per adult equivalent Kshs. 1570 per household	25 per cent of hholds
1986	IRS II, 1977	Kshs. 310 per adult equivalent, adjusted for tastes and preferences.	38.6 per cent of small holder hholds
1981		Rural Households Kshs. 238 per month Urban Households Kshs. 208 per month	32 per cent of population
1987	National Accounts (1976)	Kshs. 1,000 per worker per month	40 per cent of population
1991	1981/82 Rural Household Budget survey and complementary statistics	Kshs. 3,167 for small holders	22 per cent
1994	1981/82 Rural Household Budget survey and complementary statistics	1981/82 Kshs.105.94; 1992 Rural Kshs. 484.98; 1992 Urban Kshs. 1,009.70	1981/82 – 47.89 per cent 1992 Rural 46.33, 1992 urban 29.29 per cent (Nairobi and Mombasa)
1997	WMS II 1994	Rural Kshs. 978.27 Urban 1,489.63	Rural 46.75 per cent Urban 28.95 per cent
2000	WMS III 1997	Rural Kshs. 1238.86 Urban 2648.04	Rural 52.93 per cent Urban 49.20 per cent

Source: GoK (2000a) Second Report on Poverty in Kenya: Volume II Poverty and Social Indicators.

The core programme on poverty and welfare measurement has been the Welfare Monitoring Survey (WMS) series that were prompted by pursuit of Structural Adjustment Programmes (SAPs) reforms at the behest of the World Bank and Intenational Monetary Fund in the late 1980's.

The WMS was an initiative to monitor the socio-economic effects of the SAPS and was designed to provide indications of the poverty levels within the country (GoK, 2000a).

As indicated in Table 1 above, the WMS series were conducted in 1992, 1994 and 1997 using the National Sample Survey and Evaluation Programme (NASSEP) III Frame. Whereas one would have expected comparability of the results over the years, (GoK, 2000a) attributes the non- comparability of the results to the different timing of survey administration, questionnaire content, sampling/non-sampling errors, general improvement of the survey instruments and geographical coverage. For purposes of quantifying poverty, the WMS measures absolute poverty at the household level as the total amount expended on food plus a minimum allowance for non-food items in Kenya Shillings (GoK, 2000b). This is then utilized to establish the Absolute Poverty line.

From the absolute poverty line, other measures such as food poverty and "hard-core" poverty lines are derived and expressed in the same currency. Food poverty lines for rural and urban areas are obtained using a specific food basket of goods consumed per month per adult equivalence. Hard-core poverty, by contrast, refers to those households whose total incomes cannot cover their basic food requirements. Absolute poverty lines are as previously shown in Table 1 but Food Poverty lines are shown in Table 2 below.

Table 2: Food Poverty Lines, in Kenya Shillings (Ksh) per person

	1992 WMS I	**1994 WMS II**	**1997 WMS III**
Rural	404.66	702.9	927.08
Urban	514.25	874.27	1253.9

Source: (GoK, 2000b): Economic Survey 2000

Limitations of Poverty Estimation Methods

The standard critique of poverty estimation methods emanates from the use of household consumption expenditure and income as the basis of computation.

Household consumption expenditure based methods are more favoured due to the common argument that households generally smoothen their consumption and consequently it is less susceptible to fluctuations. It is also argued that consumption expenditures are easier to track and therefore it is more precise as a measurement.

However, it is recognised that there are major problems as to the composition of the basket of goods and the pricing of those goods. This basket of goods can be based on WHO defined adult equivalent nutritional requirements but the issue of which commodities to include will still vary from country to country and even within countries.

Income based poverty measures are considered less precise because it is known that income values are generally not exact considering suspicions that respondents express. Income based poverty measures are therefore difficult to estimate and are most likely to bias poverty levels upwards i.e. overstate poverty incidences.

A more general critique is derived from the approach taken by the World Bank of establishing international poverty lines. Since these poverty measures are based on purchasing power parity exchange rates and country poverty lines which form the background to the now common $1/day poverty line, they are extremely vulnerable to exchange rate variations (Deaton, 2001).

Poverty lines and the corresponding poverty incidences are further criticised owing to their static nature. The contention that these statistics are derived from household surveys, which are basically cross-sectional, implies that the statistics are less useful in measuring changes in household welfare over time. The inadequacy of household based poverty measures implies that the efforts of governments and other development agents in addressing poverty reduction cannot be easily validated i.e. in the absence of a dynamic poverty measurement tool, it is difficult to state or measure the impact of PRSP however short-term.

Other measures of welfare have been developed but they present even greater challenges in terms of measurement because some of the components are not amenable to quantification. In recent years, prominence has been given to these welfare measures such as Human Development Index (HDI) and Participatory Poverty Assessments which attempt to incorporate key aspects of human well being in the measurement yardstick.

These controversies over poverty measurements not withstanding, we have chosen to utilise the WMS poverty line as the basis of our analysis in modelling poverty dynamics. The Absolute Poverty line is used to estimate poverty incidence depth and severity through the methodology developed by Forster, Green and Thorbecke (FGT), Forster *et al* (1984).

Another welfare measurement of interest that we use the Tegemeo data to compute is the Gini Coefficient. Gini coefficients show the level of inequality in the distribution of resources within a population, and range from zero (complete equality of income across all households) to one (extremely concentrated distribution of income). These computations are, in most cases static and do not therefore reveal issues that are inherently dynamic. It is consequently, expected that the examination of changes in the level of inequality as measured by income Gini Coefficients should be more informative.

Poverty Dynamics

It has become increasingly evident that the poor are indeed heterogeneous and that some element of dynamics does exist (Barrett, 2003). These developments have led to a scrutiny of poverty as determined by the duration spent under poverty. Further enquiries have been made to establish the determinants of exit or entry into poverty (Stevens, 1995; Davis and Stampini, 2002).

These developments have resulted in further categorisation of poverty into chronic and transitory. Chronic poverty is considered to be the component of total poverty that is static and transitory poverty is the component that is attributable to intertemporal variability (Jallan and Ravallion, 1996). The isolation of the process underlying chronic and transitory poverty is considered essential in understanding the

extent to which each poverty type may obscure the other or even distort the effects of government anti-poverty programmes.

Aliber (2000) emphasizes that chronic poverty exists when a household's or individual's poverty condition endures over a given duration. The specific duration that defines chronic poverty varies and depends on the available data, Researchers and analytical tools employed. The concept of chronic poverty has been expanded to include households/ individuals unable to emerge from poverty or lacking opportunities to improve their circumstances (Okidi and Mugambe 2002; Aliber 2001). Bird and Shepherd (2003) extend chronic poverty analysis by pursuing the relationship that exists between poverty and remote rural areas especially the effects of political exclusion. Sevous (1995) examine the persistence of poverty over individuals lifetimes through a hazard rate (spells) approach and a variance component model. These approaches are considered an improvement over the Bane and Ellwood (1986) study since they take into consideration multiple spells of poverty rather than focusing on a single spell.

Bigsten *et al* (2003) and Hadad and Ahmed (2003) provide an insight into transitory poverty by examining the characteristics of households that exit or enter poverty. Similarly, the pathways out of poverty are studied by Davis and Stampini (2002) and Krishna *et al* (2003).

McCulloch and Baulch (2000) provide a simulation of the impact of policy upon chronic and transitory poverty although they utilise the squared poverty gap measure which is more suited to severity rather than poverty levels. They conclude that different anti-poverty interventions may be needed to address chronic and transitory poverty.

It is evident that the analysis of poverty dynamic constitutes a significant aspect in understanding the persistence of poverty by providing the defining characteristics of those who remain persistently poor. This distinction and characterisation is particularly useful in developing/designing government anti-poverty programmes.

4. TEGEMEO PANEL DATA DESCRIPTION

The panel data used in the analysis was obtained through rural household surveys conducted in 1997 and 2000. These surveys covered 1441 households in both 1997 and 2000.

The questionnaire used to elicit information remained relatively stable over the two years except for adjustments to accommodate changing agricultural enterprise patterns. Being panel data, the same households were interviewed over the period. Standard proportional sampling using census data for rural divisions of the country formed the basis of extraction of the sample households. Administratively, the households spanned 24 districts, 39 divisions and 120 villages.

Due to the variation in agro-ecological patterns within the administrative units, our analysis stratifies households by agro-ecological zones. Consequently, some districts are divided into more than one agro-ecological zone. The stratification of households by agro-ecological zones provides results based on relative homogeneity of agricultural activities within zone. This process produced nine agro-ecological zones as specified in Table 1.

Table 3: Households interviewed in both 1997 and 2000

Zone	District	No. in District	No. in Zone
Northern Arid	Garrisa	3	
	Turkana	18	
	Total		**21**
Coastal Lowlands	Kilifi	54	
	Kwale	24	
	Total		**78**
Eastern Lowlands	Taita Taveta	9	
	Kitui	19	
	Machakos	22	
	Makueni	73	
	Mwingi	34	
	Total		**157**
Western Lowlands	Kisumu	102	
	Siaya	74	
	Total		**176**
Western Transitional	Bungoma	47	
	Kakamega	119	
	Total		**166**
High Potential Maize Zone	Bungoma	37	
	Kakamega	27	
	Bomet	40	
	Nakuru	108	
	Narok	25	
	Trans Nzoia	59	
	Uasin Gishu	94	
	Total		**390**
Western Highlands	Kisii	85	
	Vihiga	60	
	Total		**145**

Central Highlands	Meru	85	
	Muranga	72	
	Nyeri	102	
	Total		**259**
Marginal Rain Shadow	Laikipia	49	
	Total		**49**
Total			**1441**

Source: Tegemeo rural households surveys, 1997 and 2000.

5. ESTABLISHING POVERTY CATEGORIES

Incomes from farm and non-farm sources were computed from the 1997 and 2000 rural household survey data. The 1997 poverty line was then inflated to 2000 levels to compute a new poverty line for 2000.

The WMS poverty line for 1997 and the 2000 computed poverty line were utilized to establish rural households below and above the poverty line for 1997 and 2000 respectively. The rural income poverty incidence for 1997 was found to be 58% while that for 2000 was 61%. The computed rural income poverty incidences appear to be consistent with the widely held perception that poverty levels in the country have been increasing during the study period particularly in view of the loss of non-farm income from retrenchment programmes in the civil service and parastatals. The private sector also shrunk at the time due to capital flight, reduced capital inflows and relocation of investors attributed to the unfavourable economic and political climate.

Poverty categories were developed from the panel sample of rural households using a modified spell in poverty approach and defined as follows:

i) *Chronically poor* refers in this study to those households which fell below the poverty line in both 1997 and 2000. Our use of the term here does not imply that these households are necessarily consistently poor year in and year out, as we lack the multiple years of panel data required to determine this.

ii) *Transitorily poor* refer to those households that fell below the poverty line in either 1997 or 2000 but in not in both periods.

iii) *Non-poor* characterizes those households that did not fall below the poverty line in either year (1997 and 2000).

The foregoing categorization produced the results indicated in table 4 below.

Table 4: Poverty Categories

	Frequency	Percent
Non poor	470	33.7
Transitory poor	433	30.1
Chronic poor	535	37.2
Total	1437	100.0

On the whole it appears the income poor constitute a very large proportion of the rural households. The chronic poor form the largest proportion of the rural households at

37% compared to the other categories. This is in contrast to other developing countries with similar economic status (Hadad and Ahmed, 2003; Dercon and Krishnan, 2002).

Conventional poverty lines are generally based on "income" or "expenditure" measures. Recent studies have modelled household incomes as a somewhat random outcome of a household's asset endowment and the variable returns derived from them in any given year (Barrett, 2003). It is possible that asset levels provide a more stable indication of a household's "welfare" than income-based measures. To examine the extent to which alternative welfare measures provide a consistent picture, we compute the correlation coefficients for (a) total household income; (b) per capita household income, (c) household cash income; and (d) the value of all productive assets in the household, for both the 1996/97 and 1999/00 seasons. Results, displayed in Tables 5a and 5b, indicate a high degree of correlation among all indicators, all of which are significantly related at the 1 percent level of significance. However, as might be expected, the three income-based measures show a particularly high degree of correlation, whereas the Spearman correlation coefficient between the household asset variable and the household income variables are in the range of 0.44 to 0.45. For comparability with previous studies in Kenya, our analysis proceeds on the basis of the income measures, keeping in mind the partial degree of correlation between these measures and asset levels.

Table 5a. Correlation Coefficients of Indicators of Household Welfare, 1996/97 Season

	Total household income	Per capita household income	Household cash income
Per capita household income	.916		
Household cash income	.985	.908	
Total value of household assets	.553	.513	.515

Source: derived from the Tegemeo household surveys, 1996/97, and 1999.00

Table 5b. Correlation Coefficients of Indicators of Household Welfare, 1999/00 Season

	Total household income	Per capita household income	Household cash income
Per capita household income	.877		
Household cash income	.977	.866	
Total value of household assets	.530	.460	.530

Source: derived from the Tegemeo household surveys, 1996/97, and 1999.00

Spatial Distribution of Poverty Categories

Since the categorisation of poverty into "chronic," transitory and non-poor as above was performed without reference to either agro-ecological zones or the administrative districts, it is imperative to examine their distribution within these locations. The

spatial distribution of poverty by agro-ecological zones is therefore shown in Table 6 below.

Table 6: Distribution of Poverty Categories within Agro-ecological zones.

Zone		Non poor	Transitory poor	Chronic poor	Group Total
Coastal Lowlands	Count	12	40	27	79
	Percent within zone	15.2	50.6	34.2	100.0
Eastern Lowlands	Count	57	55	44	156
	Percent within zone	36.5	35.3	28.2	100.0
Western Lowlands	Count	16	39	120	175
	Percent within zone	9.1	22.3	68.6	100.0
Western Transitional	Count	37	69	59	165
	Percent within zone	22.4	41.8	35.8	100.0
High Potential Maize Zone	Count	151	94	140	385
	Percent within zone	39.2	24.4	36.4	100.0
Western Highlands	Count	15	43	81	139
	Percent within zone	10.8	30.9	58.3	100.0
Central Highlands	Count	166	61	31	258
	Percent within zone	64.3	23.6	12.0	100.0
Marginal Rain Shadow	Count	11	21	16	48
	Percent within zone	22.9	43.8	33.3	100.0
Group Total	Count	465	422	518	1405
	Percent within zone	33.1	30.0	36.9	100.0

Except for Central Highlands, all the other zones record chronic poverty levels well above 25% which implies that chronic poverty is predominant in the country. Western lowlands, Northern Arid, Western Lowlands and Western highlands record the highest levels of chronic poverty whereas transitory poverty is spread out over all the zones. The observation here is that poverty is not confined to specific zones irrespective of the agricultural potential of the area (zone).

To examine the spatial pattern of income poverty, we regress per capita incomes on geographic categorical variables of varying size. This is equivalent to an ANOVA test measuring the extent of inter-zone vs. intra-zone variation. When provincial-level dummy variables are used, the R^2 of these models is 0.06, indicating that roughly 94% of the variation in per capita incomes across these 1,400 rural households is explained by differences within the provinces rather than between them. When smaller geographic variables (districts) are used, the R^2 of these models only rises to the range of 0.14. And when using the smallest administrative unit available in the data set (villages), the R^2 of these models indicates 23.5% of the variation in per capita incomes across the sample can be explained by differences between villages. By far the most important factors associated with the variation in per capita incomes across the households in the sample are not related to village-specific factors such as rainfall, soil types, market access, etc. We believe that this is an important finding that is somewhat in conflict with conventional wisdom. There are indeed significant regional differences in incomes as shown in Table 6. But despite such regional differences, the largest source of variation in household incomes is to be found within villages, i.e., poverty is primarily an intra-village phenomenon which demands

strategies that identify and take into account household-level resources and characteristics.

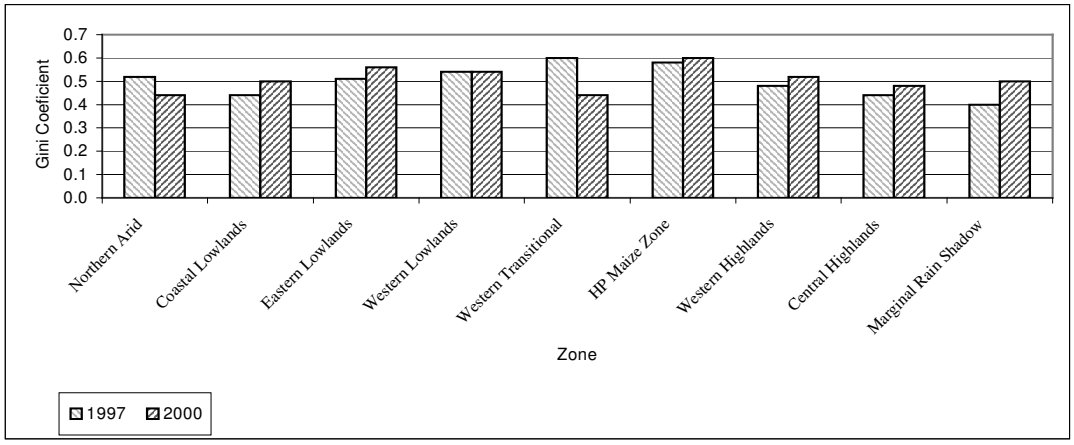
The presence of both transitory and chronic poverty in all areas of the country also implies that successful poverty reduction strategies must be developed to account for these two different types of poverty.

6. INCOME INEQUALITY

To examine the income distribution more carefully, we present various Gini coefficient estimates from the household data. According to Deininger and Squire (1996), the average income Gini coefficient in Sub-Saharan Africa, based on 40 surveys that passed their data-quality criteria, is 0.45, while it is 0.50 in Latin America, where income inequalities are generally considered to be relatively severe. We find Gini coefficients of 0.52 for Kenya in 1997 and 0.55 in 2000. This is considerably higher than the 0.37 Gini coefficient reported for Kenya's rural areas by Haggblade and Hazell (1988) in the 1970s. Moreover, the current Gini estimates from our sample are also generally higher than Haggblade and Hazell's estimates for rural Asia from the 1960s and 1970s (p. 23). This might be considered especially surprising given that our sample is confined to the small-scale farming sector and does not even count the large-scale farming sector. From these comparisons, it appears that the distribution of rural income appears to have widened over the past two decades, although differences in survey design and samples warrant caution in these comparisons. But at least there is *prima facie* evidence that income distribution may be worsening in these countries over time, and that rural income distribution is actually worse in Kenya in the late 1990s than in most of Asia at the time of the green revolution there.

We next examine income inequality within each agro-ecological zone studied as measured by the Gini Coefficients. The gini coefficients for each year are shown in Figure 1:

Figure 1: Gini coefficient for agro-ecological zones



The zone Gini coefficients are lower than that for the nationwide sample. This is because some of the income variation across zones is eliminated with examining inequality only within a given zone. Yet the level of income inequality within zones still appears to be quite high. The lowest Gini coefficient in 1997 is recorded by the Marginal Rain Shadow at 0.40 and Central Highlands at 0.44. Both years show high levels of income inequality with the highest level in 1997 and 2000 being in Western Transitional and High Potential Maize Zone respectively.

Figure 1 also reveals a worrying trend in that the income inequality for the agro-ecological zones shows an upward trend from 1997 to 2000. Except for Northern Arid and Western Transitional zones all the other zones record higher Gini coefficients in 2000 compared to 1997.

7. POVERTY AND ACCESS TO RESOURCES

Poverty and Access to Human Capital (Education)

Human capital in the form of education and skills contribute to poverty reduction efforts by providing the tools to identify and exploit economic opportunities (Bruno et al, 1998; World Bank 2000). Marenya *et al* (2003) also find a strong relationship between education, non-farm income and farm investments that over a long period of time contribute to significant reduction in poverty levels in western Kenya. It is however noted that the effects of investments in human resource development on poverty is manifested only in the long term, and thus should be viewed as a potential means to alleviate chronic poverty. Transitory poverty alleviation requires other types of public policy interventions.

The relationship between poverty and education distinctly emerges from the Tegemeo household survey data as shown in Table 6. The relationship between chronic poverty categories and years of education of the most highly educated adult member of the household is strongly inversely correlated. For example, over 60% of the households whose household head had no primary school education were below the poverty line in both 1997 and 2000. By contrast, less than 20% of the households that had household head with education beyond Form 4 were chronically poor. The major turning point at which education levels are associated with sharp reductions in chronic poverty occurs at fourth form level. It is instructive that this relationship is exhibited in both the 1997 and 2000 data.

The relationship between education and transitory poverty is much more unclear. In fact, the descriptive results in Table 7 suggest that education appears to make little contribution to a reduction in transitory poverty levels. This might be expected, considering that transitory poverty often reflects sudden natural shocks (weather related, death in the family, sudden loss of assets) that temporarily plummet households into poverty, as opposed to chronic inadequate household resources to earn a decent livelihood.

Table 7: Comparison of Poverty Categories by Education in 1997

		Non poor	Transitory poor	Chronic poor	Total
None	Count	6	8	15	29
	Percentage	20.7	27.6	51.7	100.0
Primary unfinished	Count	51	69	161	281
	Percentage	18.1	24.6	57.3	100.0
Finished primary	Count	96	109	158	363
	Percentage	26.4	30	43.5	100.0
Some Secondary	Count	66	79	95	240
	Percentage	27.5	32.9	39.6	100.0
Form 4	Count	177	131	90	398
	Percentage	44.5	32.9	22.6	100.0
Form 6 / Post secondary	Count	63	32	14	109
	Percentage	57.8	29.4	12.8	100.0
1st degree and above	Count	11	5	1	17
	Percentage	64.7	29.4	5.9	100.0

Total	Count	470	433	534	1437
	Percentage	32.7	30.1	37.2	100.0

Source: Tegemeo Household Surveys, 1997.

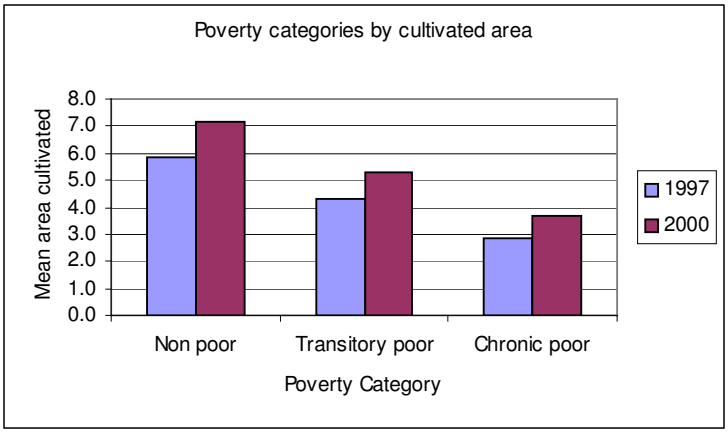
Poverty and Access to Land

Emerging evidence suggests that the poverty reducing effects of economic growth are influenced by the initial distribution of assets and the more general issues of inequality. For example, Ravallion and Datt (2002) found that the initial percentage of landless households significantly affected the elasticity of poverty to non-farm output in India. In a sample of 69 countries (Gugerty and Timmer, 1999) found that, in countries with an initial "good" distribution of assets, both agricultural and non-agricultural growth benefitted the poorest households slightly more in percentage terms. In countries with a "bad" distribution of assets, however, economic growth was skewed toward wealthier households, causing the gap between rich and poor to widen. It is especially noteworthy that in this latter group of countries, agricultural growth was associated with greater increases in inequality than was non-agricultural growth. This reverses what has been considered the more typical pattern, wherein agricultural growth is seen to contribute more to poverty reduction than growth outside the agricultural sector. These findings reinforce the idea that where access to land is highly concentrated and where a sizable part of the rural population lack sufficient land or education to earn a livelihood, then special measures will be necessary to tackle the problem of persistent poverty (Ravallion, 1997).

Access to land has always been a thorny issue in Kenya's history and agricultural production. The main concern has however been in regard to productivity rather than the distribution of land and its resulting effects on poverty. It is generally accepted that land markets in Kenya are ineffective and do not allow for the most productive to have access. At the same time, it is also recognised that Kenya's potential lies in intensive agriculture.

An examination of access to land by the different poverty categories in Kenya indicates that the area of land cultivated is strongly associated with household per capita income. Figure 2 shows that in both 1997 and 2000 the chronic poor cultivated less land.

Figure 2: Poverty Categories by Cultivated Area



source: Tegemeo Household Surveys, 1997 and 2000.

It is well recognized that severe land inequalities persist between Kenya's small-scale and large-scale farms. Yet the smallholder farm sector is typically characterized as small but relatively "unimodal" and equitably distributed land holdings situated within a "bi-modal" distribution of land between large-scale and small-scale farming sectors. Redressing these inequalities is likely to be an important element of an effective rural poverty reduction strategy in countries such as Zimbabwe and Kenya. Yet despite widespread acceptance that "pro-poor" agricultural growth is strongly associated with equitable asset distribution, little attention has been devoted to quantifying land distribution patterns within Kenya's small-scale farming sector.

Table 8 presents basic information on land access size and distribution within the smallholder farm sector. As shown in column b, average land holdings in the small farm sector is 2.7 hectares over the entire sample (both 1997 and 2000). However, mean farm size figures mask great variations in land access within the smallholder sector. After ranking all smallholders by household per capita land size, and dividing them into four equal quartiles, households in the highest per capita land quartile controlled 15 times more land per capita than households in the lowest quartile. For example, 1997 mean land access for the top and bottom land quartiles were 1.10 and 0.08 hectares per capita, respectively. The bottom 25 percent of small-scale farm households are approaching landlessness, controlling 0.08 hectares per capita, including rented land. We re-emphasize that these surveys contain only households engaged in agricultural production; households not engaged in farming are not in the sample.

Nevertheless, it is possible that the bottom land quartile may contain mostly "Sunday farmers" who are engaged primarily in off-farm activities for their livelihoods. To examine this possibility, we compute income shares from crop production, animal and animal-derived production, and off-farm income for each land quartile (Table 5). As expected, off-farm income shares are highest for the bottom land quartile and decline as landholding size rises. However, households in the bottom land quartile earn 50% of their total income, on average, from agriculture, despite their very small farms. The Ginis are comparable to those estimated for much of Asia during the 1960s and

1970s (Haggblade and Hazell, 1988). If land is allocated according to household size or labor availability, we should find more equal land distribution in household *per capita* or *per adult* land holdings than *per household* land holdings. This would imply that the Gini coefficients of land holding by per capita and per adult measures should be smaller than those of landholding per household. However, this is not the case, as can be seen in Table 8. The Gini coefficients of landholding size are virtually unchanged after accounting for family size in the estimates of land distribution inequality.

Households in densely populated areas generally have smaller per capita land sizes than households in less populated areas. Geographic factors obviously should affect land holding size but by how much? To investigate these questions, we employ a similar technique as before, regressing land per capita on geographic administrative units of differing size, using OLS. If all households in each province have the same amount of land per capita but there are differences between provinces, then provincial effects should explain the entire variation in per capita land holdings. On the other hand, if mean land holdings are the same across provinces, then the province variable should not explain any of the variation. Results indicate geographic differences at the district and village level explains only 15% and 33%, respectively, of the total variation in per capita landholding. Despite the low R^2s of these models, many of the district and village dummies are highly statistically significant, with mean landholding sizes often, but not always, inversely correlated with population densities and agro-ecological potential. Yet the bulk of the variation in landholding size is a within-village phenomenon. The inclusion of available household level information on mechanical and animal assets, education, family size and composition, and market access generated models that explain about 30 percent of the variation in per capita landholding sizes (Jayne et al., 2003).

Our point in highlighting the low explanatory power of these models is to show that most of the variation in household per capita landholding size within the smallholder farm sector must be contained in factors other than village-level differences and observed household level differences in assets and socio-demographic characteristics. Research in other disciplines has highlighted the importance of the period of the clan's settlement in a particular area in determining land allocated to the clan, which is subdivided among families within the clan (Kajoba, 1994; Block and Foltz, 1999). Late migrants into an area typically are eligible for relatively small tracts of land for subdivision within the areas controlled by their clans. Marrule (1998) argues that kinship ties and power relationships within traditional governance structures also partially explain the observed disparities in land allocation, variables that are not included in these models. These hypothesized processes are related to the recently emerging literature on kinship ties, trust, and social capital (e.g., Fafchamps, 1992; Platteau, 1994; Gabre-Madhin, 2001). In an attempt to test these hypotheses, Zulu et al. (2003) using nationally-representative small- and medium-scale farm survey data from Zambia, show that both the period of family settlement and the blood relationship between the male and female head-of-household's family and the local chief at time of the family's settlement are positively and significantly associated with currently landholding size. These emerging findings lead us to speculate that, more generally, there may be important institutional and governance factors operating within local systems for allocating land that may be accounting for at least some of

the unexplained variation in per capita landholding size within the smallholder farm sector.

The importance of these findings for rural growth and poverty alleviation strategies depends in part on the degree to which land allocation patterns influence household income and poverty. If non-farm activities are able to compensate for small landholdings and provide land-poor households with adequate alternative income sources, then disparities in land ownership should not necessarily be a policy problem. However, as we will examine in more detail later, the relationship between households' off-farm income, total income, and landholding size is very strong.

Table 8. Smallholder Land Distribution in Kenya , 1997 and 2000.

	(a)	(b)	(c)					(d)	(e)		
	sample size	Ave. landholding size including rented land	Household Per Capita Land Access					RELGAP[1]	Gini Coefficients		
			Ave.	Quartile 1					Land per household	Land per capita	Land per adult
				1	2	3	4				
		– ha –	– ha –	– ha –							
1997	1,380	2.65	0.41	0.08	0.17	0.29	0.73	1.59	0.55	0.56	0.54
2000	1,345	2.59	0.40	0.07	0.16	0.27	0.76	1.73	0.56	0.57	0.55

[1] RELGAP is the difference in mean land size between the first and fourth quartiles divided by the mean.

Source: Tegemeo Household Surveys, 1997 and 2000.

Education and cultivated area

The area cultivated by level of education of the household head is shown in Table 9. The overall trend seems to suggest that the area cultivated increases with the level of education attained by the household head. For now, we can only speculate about the direction of causality: do more educated households cultivate more land because they are more entrepreneurial and skilled, or are wealthier households with relatively large farms able to educate their members better? While the direction of causality is likely to flow in both directions, ongoing research is attempting to examine the entry points for poverty alleviation policy. At this stage, we simply note that education seems to be positively correlated with several important indicators of household welfare, and that raising poor childrens' access to education is likely to have beneficial effects on poverty alleviation and income distribution over the long run.

Table 9. Household Head Education by Mean Cultivated Area

	1997	2000
	Acres	Acres
None	4.70	4.69
Primary unfinished	3.81	5.09
Finished primary	4.24	5.39
Some Secondary	3.88	5.11
Form 4	4.49	5.11
Form 6 / Post secondary	5.95	6.44
1st degree and above	6.69	6.90
Table Total	**4.82**	**5.54**

Additional insights can be obtained by examining income levels disaggregated by the type of income, by education and landholding size categories. We rank all households in the sample by education of the most highly educated adult member, and by landholding size, and then create three education categories (low, medium and high) and four landholding size categories. The mean years of education of the three education terciles are 0.4 years, 5.4 years, and 10.8 years. The mean landholding sizes of the four land quartiles are 0.08, 0.17, 0.29, and 0.73 hectares per capita.

Table 10 shows the income levels (by source of income) for each of the 12 groups. Within each landholding size quartile, we find that mean per capita incomes are substantially higher for households in the highest education tercile than those in the first education tercile. This strengthens our earlier observations about the contribution of education to poverty alleviation, because these results persist even after holding landholding size relatively constant.

The results in Table 10 also show that per capita incomes rise substantially with each landholding size quartile. Households with highly educated member (mean 10.4

Table 10. Income Levels and Sources of Rural Households in Kenya, by Education and Landholding Size Category, 1997 and 2000 pooled data.

	Quartiles of Households Ranked by Landholding Size Per Capita											
	Smallest (mean 0.08 ha per capita)			Second Quartile (mean 0.17 ha per capita)			Third Quartile (mean 0.29 ha per capita)			Highest (mean 0.73 ha per capita)		
Education Group* (1=lowest; 3=highest):	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
sample size (n)	130	153	97	101	135	144	100	129	149	124	122	133
land access (average for 97 and 00)	0.41	0.55	0.58	1.06	1.17	1.17	1.49	1.90	1.87	3.73	3.77	3.78
land access per capita	0.06	0.08	0.08	0.17	0.17	0.17	0.29	0.29	0.29	0.81	0.68	0.72
female headed households (%)	12.31	13.07	7.22	30.69	13.33	5.56	17.00	17.83	7.38	25.81	17.21	3.76
Per capita income	162.02	142.56	234.63	158.90	238.70	281.17	285.77	258.38	362.61	363.25	466.76	468.50
crop income share (%)	27.60	31.14	28.06	35.64	39.04	32.24	31.44	42.71	36.62	43.22	45.56	35.11
livestock prod income share (%)	30.79	17.41	14.74	18.76	18.80	16.56	22.63	15.79	14.48	25.66	22.42	21.76
off-farm income share (%)	41.61	51.45	57.20	45.60	42.16	51.20	45.93	41.50	48.91	31.12	32.02	43.13
Of which: remittances	4.52	4.27	2.08	5.50	3.45	4.83	5.58	4.50	3.95	4.44	5.51	4.26
business income	15.37	16.66	18.42	16.13	18.56	13.57	16.53	15.80	12.01	14.45	13.71	10.30
non-ag wage labour	19.49	28.27	34.78	22.78	18.46	32.23	22.81	20.45	32.62	11.59	11.55	28.23
ag-wage labour	2.23	2.25	1.93	1.19	1.68	0.56	1.00	0.75	0.34	0.65	1.25	0.33
Crop income per hectare (US$)	554.99	597.99	820.67	345.00	560.44	551.35	304.90	386.89	467.79	211.75	322.04	260.81

Note: Mean years of education of the most highly educated adult member: Group 1 (0.26 years); Group 2 (5.4 years); Group 3 (10.8 years).
Source: Tegemeo Household Surveys, 1997 and 2000.

years of education) had lower per capita incomes as a group than households with adults possessing less than one year of education but in the third or fourth landholding size quartiles. In short, the greater land resources of these households allowed them to out-earn the land-constrained households with adults possessing 10 more years of education. These results show the predominant association between constrained landholding size and rural poverty.

The results in Table 10 also indicate how the sources of income change as education varies within each landholding size category. As education increases (from education group 1 to group 3), the income share of crops remains roughly constant, and the income share of livestock products declines. Among the most land constrained landholding quartile, the biggest difference between the most and least educated households is the share and magnitude of off-farm income – non-agricultural wage labour in particular. These results suggest that for households with inadequate access to land to earn a livelihood from agriculture, education is a major pathway out off poverty. Although it is a pathway that pays off only in the long-term, increased public investment now is likely to reap tangible benefits for poverty reduction 10-20 years down the road and for Kenya's long term development prospects.

Poverty and gender

Table 11. Mean Household Incomes by Gender of Household Head

	1997	2000
Male	130,526.5	164,892.6
Female	94,963.9	108,103.0

Differences in land access and education appear to be accounting for part of the income disparity between male-headed and female headed households. Jayne et al., (2003) found that female-headed (unmarried) households in Kenya have, on average, 1.03 hectares less land than male-headed households, which is a huge relative difference considering that mean farm size for the entire sample is 2.65 hectares. Female-headed households in which a male partner resides off-farm also tend to have less land than male-headed households, although the effect is weaker than for female-headed unmarried households. We also see in Table 10 that a much higher percentage of female-headed households fall into the lowest education category in every landholding size group.

Poverty and Land Tenure

As shown in Table 12, the proportion of households owning land with title deeds is inversely related to poverty, and the proportion of households owning land without title deed is positively related to poverty. The more common reason for this phenomenon is that the cost of processing land titles is prohibitively high and consequently inhibits the participation of the poor in land registration.

Table 12 Poverty Categories By Land Tenure in 1997

	Non-poor		Transitory poor		Chronic poor		Total	
	Freq	Col%	Freq	Col%	Freq	Col%	Tot Row	Tot Row%
Owned with title deed	249	39.3	183	28.9	202	31.9	634	100.0
Owned without title deed	163	28.7	174	30.7	230	40.6	567	100.0
Rented	6	31.6	10	52.6	3	15.8	19	100.0
Owned by parent/relative	50	25.9	58	30.1	85	44.0	193	100.0
Government/communal land/others	1	4.8	8	38.1	12	57.1	21	100.0
Total	469	32.7	433	30.2	532	37.1	1434	100.0

It is generally acknowledged that the easing of land title processing presents a dilemma for it can either result in reduced poverty levels or increased destitution. Where the proceeds from land sales are invested well the result could be reduction in levels of poverty but where it is not then the poverty levels are aggravated. The common observation is that the later case often prevails.

Poverty and Agricultural Credit

A larger percentage of the non-poor (42%) received agricultural credit compared to the transitory poor (27%) and chronic poor (16%) in 1997. The same trend was repeated in 2000. There is however a slight increase in those who receive agricultural credit within each category as shown in Table 13 below.

Table 13. Poverty categories by agricultural credit

		1997		2000	
		Number	Percent	Number	Percent
Non poor	Received credit	195	41.5	261	56.1
	No credit	275	58.5	204	43.9
		470	100.0	465	100.0
Transitory poor	Received credit	123	28.4	218	51.1
	No credit	310	71.6	209	48.9
		433	100.0	427	100.0
Chronic poor	Received credit	86	16.1	214	40.1
	No credit	448	83.9	320	59.9
		534	100.0	534	100.0

The pattern exhibited above brings to the fore the need to restructure the agricultural credit system to be more responsive to the needs of the rural poor. Only about 20 percent of the chronic poor -- *who probably need credit the most* -- are able to access it. This suggests that the existing agricultural credit system is unfavourable to the poor, and that efforts to develop financial products that suit the needs of relatively poor small-scale farmers may have higher payoffs both in terms of poverty alleviation and rural equity. However, this will need to be done in a way that does not erode the incentives to lenders. Suppliers of loan money base their lending decisions on the expected returns and risks of potential clients. The poor generally represent greater risk of default because they have less residual assets to draw on if weather vagaries make it difficult to repay loans through the sale of crop/livestock production. There is

potentially a useful role for the public sector to provide loans to farmers who meet certain poverty-based criteria, but the main challenge here is how to ensure high loan repayment and avoid strategic default to maintain the sustainability of the system.

A further disaggregation of those who received agricultural credit by agro-ecological zone and poverty category shows that the majority of those who received agricultural credit among both the non-poor and the transitory poor are located in the Central Highlands and High Potential Maize Zones – the most productive agricultural areas of the country. Among the chronic poor, Western Highlands had the highest percentage of those receiving agricultural credit (Table 14). The Coastal and Western Lowlands have the lowest percentage of those receiving agricultural credit within the zone.

Table 14: Received credit by zone and poverty categories in 1997

	Non poor	Transitory poor	Chronic poor	Total
	% of households receiving ag. credit			
Coastal Lowlands	0.5	3.3	2.3	1.7
Eastern Lowlands	6.7	8.9	11.6	8.4
Western Lowlands	1.5	1.6	4.7	2.2
Western Transitional	8.7	19.5	10.5	12.4
High Potential Maize Zone	15.4	16.3	15.1	15.6
Western Highlands	4.6	16.3	36.0	14.9
Central Highlands	62.1	33.3	19.8	44.3
Marginal Rain Shadow	0.5	0.8		0.5
Total	100.0	100.0	100.0	100.0

Source: Tegemeo Household Surveys, 1997

Poverty and Nominal Crop Land Productivity

Crop land productivity was computed using crop income and area cultivated for each of the poverty categories for 1997 and 2000.

Table 15: Poverty Category by Mean Crop Land Productivity

Poverty Categories	Mean Crop Land Productivity (Kshs)	
	1997	2000
Non-Poor	105,422	142,941
Transitory Poor	43,992	79,684
Chronic Poor	20,314	29,525

The above figure suggest that there is some potential for poverty reduction through improved crop productivity.

Nominal mean crop land productivity was also computed for the different agro-ecological zone and is shown in the table 16 below.

Table 16: Mean Crop Land Productivity in Kshs.

	1997	2000
Coastal Lowlands	14,475.35	41,041.49
Eastern Lowlands	30,533.61	70,085.56
Western Lowlands	16,544.12	24,791.10
Western Transitional	53,324.17	110,807.30
High Potential Maize Zone	94,187.68	93,609.26
Western Highlands	25,400.79	65,781.65
Central Highlands	80,916.79	125,373.2
Marginal Rain Shadow	19,808.99	15,864.96

The crop productivity figures appear to correspond to the poverty levels experienced in the agro-ecological zone. High Potential Zone, Central Highlands and Western Transitional have the highest crop land productivity and also have the lowest chronic poverty as compared to Western Lowlands, Eastern Lowlands and Marginal Rain Shadow.

These findings are consistent with Owuor (1999) who also report similar trends in fertiliser use across the agro-ecological zones.

Crop land productivity appears to be strongly correlated with receipt of agricultural credit. Those who received agricultural credit attain close to double the productivity attained by non-recipients.

Crop land productivity also increases with increasing levels of education of the household head particularly for the year 2000 where a clear picture emerges as shown in table 17.

Table 17: Productivity by Household Head Education

	1997	**2000**
None	55,621.27	58,380.94
Primary unfinished	47,352.37	76,524.18
Finished primary	50,993.84	85,066.58
Some Secondary	49,286.54	83,292.34
Form 4	69,215.65	81,328.08
Form 6 / Post secondary	87,484.81	107,407.90
1st degree and above	109,320.10	135,995.00

8. RURAL POVERTY DYNAMICS

To gain an insight into rural poverty dynamics, the transitory poor are further disaggregated into those entering poverty and those exiting poverty. This sub-categories of poverty are isolated by identifying those who were above the poverty line in 1997 but fell below the poverty line in 2000 (entry) and those who were below the poverty line in 1997 but were above it in 2000 (exits).

It is assumed that those entering poverty are just beginning an episode of poverty while those exiting are just beginning a non-poverty episode.

In order to provide a complete perspective of poverty dynamics, the distribution of all the categories and sub-categories within the agro-ecological zones is shown in table 18.

Table 18: Poverty Dynamics by Zone

		Non-poor in both years	Exit from poverty	Entry into poverty	Chronic Poor	Total
Coastal Lowlands	Count	12	13	27	27	79
	Percentage	15.2	16.5	34.2	34.2	100.0
Eastern Lowlands	Count	57	30	25	44	156
	Percentage	36.5	19.2	16	28.2	100.0
Western Lowlands	Count	16	18	21	120	175
	Percentage	9.1	10.3	12.0	68.6	100.0
Western Transitional	Count	37	58	11	59	165
	Percentage	22.4	35.2	6.7	35.8	100.0
High Potential Maize Zone	Count	151	59	35	140	385
	Percentage	39.2	15.3	9.1	36.4	100.0
Western Highlands	Count	15	33	10	81	139
	Percentage	10.8	23.7	7.2	58.3	100.0
Central Highlands	Count	166	42	19	31	258
	Percentage	64.3	16.3	7.4	12.0	100.0
Marginal Rain Shadow	Count	11	14	7	16	48
	Percentage	22.9	29.2	14.6	33.3	100.0
Total	Count	465	267	155	518	1405
	Percentage	33.1	19.0	11.0	36.9	100.0

A comparative analysis of the poverty entry and exit columns shows that the majority of the agro-ecological zones registered more entries into poverty than exits from poverty. This may explain why the incidence of poverty increased between 1997 and 2000.

Western Transitional Zone has the largest proportion of households (35%) exiting poverty. 58 households in this zone climbed over the poverty line between 1997 and 2000, while only 11 households in this zone descended into poverty in 2000 after having been above the poverty line in 1997. The Western Highlands Zone also registered a decline in transitory poverty, 23.7% exited poverty while only 7.2% entered into poverty. But several zones recorded an alarming increase in poverty between 1997 and 2000, in particular Coastal Lowlands, Eastern Lowlands, Western Lowlands, and the High-Potential Maize Zone. Among the districts, Kakamega,

Nyeri, Bungoma and Kisii have the largest proportion exiting poverty while Nakuru, Uasin Gishu, Kisumu and Makueni have the largest proportions entering poverty.

Changes in Poverty and Cultivated Area.

The area under cultivation by the different poverty categories generally increased in 2000.

Table 19: Mean Area Cultivated by Change in Poverty

	Mean Cultivated Area	
Poverty Categories	1997	2000
Non-Poor	7.43	5.89
Exits	5.07	3.85
Entries	5.65	5.19
Chronic Poor	3.67	2.91

It would appear that exiting poverty is not directly related to the acreage under cultivation. The computations above indicates that those exiting poverty had a lower mean cultivated area a fact that seems to point towards productivity changes.

Crop Land Productivity by Changes in Poverty

Poverty dynamics is closely related to crop land productivity as indicated in Table 20.

Table 20: Crop Land Productivity by Poverty Dynamics

	Mean Crop Productivity (Nominal)	
Poverty Categories	1997	2000
Non-Poor	105,422.50	142,941.80
Exits	29,255.53	104,225.30
Entries	69,687.28	37,637.90
Chronic Poor	20,314.79	29,525.78

The transitory poor who exited poverty attained a much higher crop land productivity against their counterparts who entered poverty in 2000.

The converse is also true in that those who exited poverty had a lower crop land productivity in relation to those who entered poverty in 1997.

The foregoing observation implies that productivity is a major determinant in exiting or entering poverty or remaining chronically poor.

9. DETERMINANTS OF RURAL CHRONIC POVERTY

To establish the factors that influence rural chronic poverty, a Probit model is used for analysis. In this case the dependent variable takes on a value of one if Chronic poor and zero otherwise.

The descriptives for the dependent and explanatory variables are provided in Appendix I.

Probit Model Estimation Results

The estimation results as indicated in table 21 indicate that initial assets, the number of female and male household members aged between 17 and 39, the number of household members aged over 40, the total acreage cultivated, the distance to a tarmac road and the highest education of male household members are negatively related to chronic poverty. These variables therefore reduce the probability of being chronic poor in the rural households. The change over from a female household head to a male household head also appear to reduce the chances of chronic poverty.

In terms of resource endowments, initial assets, total acreage cultivated and highest level of education of male household members are found to significantly influence a household's poverty category by reducing the probability of chronic poverty. These factors should provide avenues for intervention through anti-poverty programmes.

Changes in these same variables also significantly influence Chronic Poverty.

Table 21: Probit Model Estimation Results

Probit Estimates		Number of obs =	1338.00000
		LR chi2(43) =	483.73000
		Prob > chi2 =	0.00000
Log Likelihood = -676.452		Pseudo R2 =	0.26340

Pov	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
agehh97	0.42686	0.47163	0.91000	0.36500	-0.49752	1.35124
ageh97sq	-0.10034	0.14630	-0.69000	0.49300	-0.38709	0.18641
femhhd97	0.19280	0.12658	1.52000	0.12800	-0.05529	0.44089
asset97	-0.00001	0.00000	-7.04000	0.00000	-0.00001	-0.00001
F1739_97	-0.54836	0.24987	-2.19000	0.02800	-1.03809	-0.05862
m1739_97	-0.04170	0.12167	-0.34000	0.73200	-0.28017	0.19677
ov40_97	-0.34923	0.22223	-1.57000	0.11600	-0.78478	0.08633
un16_97	0.04823	0.11666	0.41000	0.67900	-0.18042	0.27688
feduc97	0.07597	0.07094	1.07000	0.28400	-0.06308	0.21502
meduc97	-0.07747	0.04388	-1.77000	0.07700	-0.16348	0.00853
tacr97	-0.08768	0.01727	-5.08000	0.00000	-0.12154	-0.05383
Deathml	0.25500	0.32655	0.78000	0.43500	-0.38503	0.89503
Deathfl	0.25038	0.42181	0.59000	0.55300	-0.57636	1.07711
Dtmroad	-0.00874	0.00686	-1.27000	0.20300	-0.02219	0.00472
Kilifi	-0.03156	0.27840	-0.11000	0.91000	-0.57722	0.51410
Kwale	-1.03206	0.43241	-2.39000	0.01700	-1.87957	-0.18455
Taita	0.61239	0.56575	1.08000	0.27900	-0.49646	1.72123
Kitui	2.09886	0.51706	4.06000	0.00000	1.08543	3.11228

Mach	1.06442	0.36591	2.91000	0.00400	0.34724	1.78159
Mak	-0.34878	0.27028	-1.29000	0.19700	-0.87852	0.18097
Meru	-1.86400	0.37458	-4.98000	0.00000	-2.59817	-1.12983
Mwing	0.99015	0.33461	2.96000	0.00300	0.33432	1.64598
Kisii	0.51682	0.25930	1.99000	0.04600	0.00860	1.02504
Kisum	0.45327	0.25411	1.78000	0.07400	-0.04477	0.95131
Siaya	0.61336	0.26201	2.34000	0.01900	0.09984	1.12688
Bungoma	-0.06349	0.25058	-0.25000	0.80000	-0.55462	0.42763
Kkmega	0.13518	0.22829	0.59000	0.55400	-0.31227	0.58262
Vihiga	0.18830	0.27754	0.68000	0.49700	-0.35566	0.73227
Muranga	-0.32138	0.25866	-1.24000	0.21400	-0.82834	0.18558
Nyeri	-0.96906	0.25848	-3.75000	0.00000	-1.47568	-0.46244
Bomet	-0.03292	0.30685	-0.11000	0.91500	-0.63432	0.56849
Nakuru	0.19100	0.24756	0.77000	0.44000	-0.29421	0.67621
Narok	1.20922	0.44936	2.69000	0.00700	0.32850	2.08995
Tnzoia	-0.02366	0.27108	-0.09000	0.93000	-0.55497	0.50765
Ugishu	0.01672	0.25034	0.07000	0.94700	-0.47394	0.50737
ast0097	0.00000	0.00000	-3.29000	0.00100	0.00000	0.00000
f1739097	0.12871	0.04860	2.65000	0.00800	0.03346	0.22397
m1739097	0.07932	0.04621	1.72000	0.08600	-0.01125	0.16990
ov400097	-0.09980	0.08905	-1.12000	0.26200	-0.27434	0.07473
un160097	-0.05199	0.05049	-1.03000	0.30300	-0.15095	0.04696
tacr0097	-0.03493	0.00971	-3.60000	0.00000	-0.05396	-0.01590
fem_2_ml	-0.22612	0.15328	-1.48000	0.14000	-0.52654	0.07429
ml_2_fem	0.10107	0.26758	0.38000	0.70600	-0.42337	0.62551
_cons	0.21597	0.42250	0.51000	0.60900	-0.61212	1.04406

Note: 12 failures and 0 success completely determined

CONCLUSIONS AND IMPLICATIONS FOR POLICY

The study offers the following lessons from a Policy perspective:

1. Poverty reduction cannot be attained in the absence of a strong and sustained pro-poor economic growth. The country's poor and non-poor are closely associated with agriculture and the greatest gains on poverty reduction can be achieved through stimulating an efficient agricultural sector. This is further reinforced by the observation that the periods of highest economic growth in Kenya coincided with the periods when agriculture was most vibrant.

2. The country has a large population under chronic poverty as opposed to other regions of the world. This observation in itself implies that for anti-poverty programmes to achieve the intended, they have to be designed and implemented in a manner that takes into account the large presence of the chronic poor. Anti-poverty programmes that favour the chronic poor require programmes that address mean income growth as opposed to transitory poverty that requires programmes that smooth mean incomes over time.
   Generic anti-poverty programmes are likely to benefit the transitory poor more than the chronic poor. However, a blend of anti-poverty programmes that provide for both chronic and transitory poverty is imperative.

3. The poor are generally distributed all over the country to the extent that even areas thought to be exclusively non-poor still show elements of chronic poverty. It

would therefore be prudent to recognize that poverty in Kenya is an intra-village phenomenon rather than an inter-village issue. This implies that poverty traps take on a rather different dimension from the conventional which seem to associate poverty to spatial location.

4. The design and implementation of anti-poverty programmes' Monitoring and Evaluation tools can substantially benefit from the categorisation and characterisation of poverty levels and the corresponding analytical tools. The process of examining poverty dynamics can enrich the PRSP's M&E initiative in the short term and the Poverty Eradication Plan in the Long term especially through the development of sustained and consistent data bases that can elicit the desired information. This also calls for the strengthening of Poverty dynamics analytical capacity in the various Government organs vested with the responsibility of monitoring poverty levels and evaluating anti-poverty programmes.

5. Effective anti-poverty programmes have to account for the following which have significant effects on chronic poverty and transitory (exit or entry) into poverty:

i) Anti-poverty measures directed towards improving Agricultural productivity are likely to reduce chronic poverty and influence movement out of poverty
ii) Education, in as far as it influences agricultural productivity plays a significant role in poverty reduction. It should, however be noted that there exists a turning point in the effect of education on agricultural productivity and consequently poverty reduction. It appears that completion of secondary school education has the closest association with maximum poverty reduction and exit from poverty.
iii) The agricultural credit system requires restructuring to be accessible to the poor. Credit has also been shown to be closely associated with high agricultural productivity and movement out of poverty.

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Appendix I

Description of Variables

Variable	Description Defn/Unit	Standard deviation	25th percentile	50th percentile	75th percentile
pov	hhs below poverty line in both 97 and 2000 unit-dummy	0.49741	0	0	1
lowquart	hhs in bottom qu income quartile in 97 and 2000 unit-dummy	0.30772	0	0	0
incdiff	change in income between 97 and 2000 unit-kshs	160710.1586	-37248.8382	12022.0672	64604.5587
rise	hhs improving from lower income quartile to higher quartile btwn 97 and 2000 unit-dummy	.34254	.0000	.0000	.0000
fall	hhs declining from higher income quartile to lower quartile btwn 97 and 2000 unit-dummy	.36852	.0000	.0000	.0000
deathfl	hhs incurred a female hh head or spouse death (16-59 years) between 1997 and 2000 unit-dummy	.09568	.0000	.0000	.0000
deathml	hhs incurred a hh head male death (16-59 years) between 1997 and 2000 unit-dummy	.11542	.0000	.0000	.0000
agehh97	age of household head in 97 unit-number	.477	1.00	2.00	2.00
agehh00	age of household head in 2000 unit-number	13.865	42.00	52.00	63.00
Ageh97sq	age of household head in 97 sqaured unit-number	1.51244	1.0000	4.0000	4.0000
Ageh00sq	age of household head in 2000 sqaured unit-number	1570.37828	1764.0000	2704.0000	3969.0000
Femhh97	female headed households in 97 unit-dummy	.45861	.0000	.0000	1.0000
Femhhd00	female headed households in 2000 unit-dummy	.35566	.0000	.0000	.0000
Fem_2_ml	hhs changing from being female headed in 97 to male headed in 2000 unit-dummy	.38047	.0000	.0000	.0000
Ml_2_fem	hhs changing from being male headed in 97 to female headed in 2000 unit-dummy	.15134	.0000	.0000	.0000
Asset00	asset values in 2000 unit-kshs	125959.8433	7200.0000	25325.000	68150.000
Asset97	asset values in 1997 unit-kshs	183747.43669	8625.0000	30000.0000	67875.0000
Ast0097	change in asset values btwn 97 and 2000	163452.6793	-19600.000	.0000	13000.000

	unit-kshs				
F1739_00	number of female hh members btwn the age of 17 and 39 in 2000 unit-number	.96415	.0000	.0000	1.0000
F1739_97	number of female hh members btwn the age of 17 and 39 in 1997 unit-number	.46800	.0000	.0000	.0000
F1739097	change in number of female hh members btwn the age of 17 and 39 btwn 1997 and 2000 unit-number	.91005	.0000	.0000	1.0000
F1739_00	number of male hh members btwn the age of 17 and 39 in 2000 unit-number	1.01621	.0000	.0000	1.0000
F1739_97	number of male hh members btwn the age of 17 and 39 in 1997 unit-number	.63618	.0000	.0000	.0000
F1739097	change in number of male hh members btwn the age of 17 and 39 btwn 1997 and 2000 unit-number	.99460	.0000	.0000	1.0000
0v40_00	number of hh members over 40 years old in 2000 unit-number	.48339	.0000	.0000	.0000
0v40_97	number of hh members over 40 years old in 1997 unit-number	.25115	.0000	.0000	.0000
0v400097	change in number number of hh members over 40 years btwn 1997 and 2000 unit-number	.49898	.0000	.0000	.0000
Un16_00	number of hh members under 16 in 2000 unit-number	.83057	.0000	.0000	1.0000
Un16_97	number of hh members under 16 in 1997 unit-number	.45085	.0000	.0000	.0000
Un160097	change in number of hh members under 16 btwn 1997 and 2000 unit-number	.90712	.0000	.0000	1.0000
Feduc00	highest level of education for female hh members in 2000 unit-number of years	5.184	.00	.00	9.00
Feduc97	highest level of education for female hh members in 1997 unit-ascending categories based on no. of years	1.411	.00	.00	.00
Meduc00	highest level of education for male hh members in 2000 unit-number of years	5.466	.00	5.00	11.00
Meduc97	highest level of education for male hh members in 1997 unit-ascending categories based on no. of years	1.889	.00	.00	.00
Tacr00	total acres cultivated in 2000 unit-number	5.37894	1.9725	3.3300	5.7910
Tacr97	total acres cultivated in 1997	3.79624	1.7500	3.0000	5.0000

	unit-number				
Tacr0097	change in total acres cultivated btwn 1997 and 2000 unit-number	5.20658	-.9500	.2500	1.7587
Dev9697	deviations of rainfall in 1996/97 from the mean of btwn 1996 and 2001 unit-millimetres per year	183.52717	-275.9600	-211.3000	-98.8700
Dev9900	deviations of rainfall in 1999/2000 from the mean of btwn 1996 and 2001 unit-millimetres per year	193.85901	-282.2200	-139.0000	-63.4700
dtmroad	distance from tarmaced road in 97 unit-kilometres	9.65074	2.0000	5.0000	11.0000
Rain0097	Change in annual rainfall between 1997 and 2000 unit-millimetres per year	389.68126	-315.8000	-73.9000	20.8000