FACTORS INFLUENCING TRANSIENT POVERTY AMONG AGRO-PASTORALISTS IN SEMI-ARID AREAS OF KENYA

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ABSTRACT

In Africa, many pastoral households are increasingly settling in response to curtailed mobility and shrinking grazing areas. Households in pastoral areas are characterised by few resources, low income, low level of human and social capital, and limited access to markets and service institutions like credit institutions, extension and plant protection. This study was conducted to determine the factors that influence transient poverty among agro-pastoral communities in semi-arid areas of Kenya using the Njemps Flats in Baringo district as a representation of the study area. The land-use practice in the Njemps Flats is livestock and crop production (agro-pastolism). Regression techniques were used to determine the relationship between poverty and hypothesized explanatory variables. The number of livelihood sources, household size, distance to the nearest market, ownership of enclosures and household herd size were the most influential factors that determined poverty among agro-pastoral communities. The number of livelihood sources, education level of the household head, relief food, extension service and distance to the nearest markets were positively related to per *capita* daily income. A negative relationship was observed between per *capita* daily income and household size. Since poverty shows declining with positive influential factors, reduction of transient poverty can be achieved through enhancing and providing of livelihood alternatives to reduce over-reliance on livestock and land as primary sources of livelihood.

Key Words: Education, extention service, relief food

RÉSUMÉ

En Afrique, tant de ménages pastoraux deviennent de plus en plus sédentaires en réponse à la restriction de leur mobilité et la réduction de la taille des fermes. Les ménages se touvant dans des milieux pastoraux sont caractérisés par d'insuffisantes resources, revenus bas, un niveau bas du capital humain et social et un accès limité au marché et aux services institutionnels tels que la vulgarisation et la protection des cultures. Cette étude était menée pour déterminer les facteurs qui influencent la pauvreté parmi les communautés pastorales en régions semi-arides du Kenya utilisant les habitations de Njemps en district de Baringo comme milieu représentatif de la région d'étude. Le système d'utilisation des terres y est dominé par l'élevage et la production agricole (agri-pastoralisme). Les techniques de regression étaient utilisées pour déterminer la relation entre la pauvreté et les variables explicatoires hypothétisées. Les sources de revenus, la taille du ménage, la distance du marché le plus proche, l'appartenance des biens et le nombre du bétail constituaient des facteurs qui ont les plus d'influence sur la détermination de la pauvreté parmi les communautés agro-pastorales. Sources de revenue, niveau d'éducation du responsable du ménage, nourriture pour soulagement, service de vulgarization et distance ds marchés les plus proches étaient positivement associés au revenue journalier par personne. Une relation négative était observée entre le revenu journalier par personne et la taille du ménage. Etant donné que la pauvreté décroît avec des facteurs d'influence positive, sa réduction peut être accomplie en améliorant et en fournissant d'autres sources de gagne-pain pour réduire la dépendance sur l'élevage et la terre comme sources de bien-être familial.

*Mot Cl*és: Education, service de vulgarisation, nourriture de soulagement

INTRODUCTION

In Africa, many pastoral households have increasingly settled in response to the problem of curtailed mobility and shrinking grazing areas. Households in marginal pastoral areas are characterised by few resources, low income, low level of human and social capital, and limited access to markets and service institutions like credit institutions, extension and plant protection (Ogato *et al.*, 2009). Crop and livestock production are the main income sources in addition to other non-farm income sources such as selling labour, charcoal and seasonal migration (Rutten, 1992). Pastoral household income areas is characterised by seasonal fluctuations, which force people to engage in many activities like selling firewood and charcoal. This results in environmental degradation and rural-urban migration, and hence curtailed development (Sandford, 1983).

Poverty tends to be more prevalent in the arid and semi-arid lands (ASALs) than in the higher potential regions of East Africa (Little *et al.,* 2008). Finding ways to improve the food and nutrition security of household and alleviate poverty in the dry lands has, therefore, become a key policy issue (Nyariki *et al.*, 2002). Therefore, strategies to reduce the number of people directly dependent upon the primary resources of the ASALs, and improve the productivity of those resources must be sought urgently.

Poverty is not static, households often move in and out of poverty from time to time. This is unsurprising in East Africa, given that economies of East African countries mainly depend on land based production systems and are affected by seasonality and highly variable climatic conditions. Changes in poverty status can be due to economic cycles and shocks, such as poor weather, loss of employment, or loss of a major income earner through death, injury or long illness. In addition, institutions for income and consumption smoothing in these economies are either inadequate or are absent altogether (Kristjanson *et al.*, 2009). Nonetheless, some households do manage to escape poverty, while others remain in poverty for extended periods of time. Understanding what factors drive household movements in and out of poverty is extremely important for the design of poverty reduction strategies, and is still an open area for research (Suri *et al.*, 2008). However, in order to address poverty among the agro-pastoral communities, governments, non-governmental organisations and international agencies must understand more clearly the geo-physical, economic and cultural environments within which they live as well as their livelihood systems (Campbell, 1999).

This study was conducted to determine the factors that influence transient poverty among agro-pastoral communities in semi-arid areas of Kenya, using Larger Baringo district as a case study, with aim of informing policy formulation with respect to factors influencing transient poverty among households in pastoral areas.

MATERIALS AND METHODS

The research area. The study was carried out in the Njemps Flats in the larger Baringo district in Kenya which falls within agro-climatic zones IV and V (Wasonga *et al.,* 2011). The area is located between 00° 30' N and longitude 36° 00' E in the Rift Valley province of Kenya. The Njemps Flats is classified as lower midland livestock-millet zone, which is best suited for livestock production (Herlocker *et al.*, 1994). The area receives an average annual rainfall of about 500 mm and experiences hot and dry periods with an annual mean temperature above 30 $^\circ$C (Tokida, 2001). The soils in the Njemps Flats are generally shallow silt loam to clay loam, with low organic matter (Johhansson and Svensson, 2002). The main sources of water in the area are rivers Pekerra, Molo and Endao (seasonal), which drain into Lake Baringo. The vegetation is dominated by Acacia and ephemeral herbaceous species (Marangu *et al.*, 2008).

The main land-use practice in the Njemps Flats is livestock and crop production. Sedentary agro-pastoralism is the main land-use on the west, south and eastern part of the study area; while semi-nomadic pastoralism dominates on the northwestern and northern parts (de Groot *et al.*, 1992). Livestock production provides 75% of the district's total income. Although pastoralism is the main source of livelihood in the Njemps Flats, low livestock production due to range

degradation and frequent drought has led to an increasing number of households engaging in crop farming (Johansson and Svensson, 2002).

Sampling procedure. Simple random sampling procedure was used to obtain responds to participate in the study. The decision on the sampling procedure steamed from the fact that agro-pastoral communities in the study area are deriving their income from the same sources (mostly crops cultivation and livestock production), hence there were no major differences regarding their economic activities, thus, the population was considered to be homogenous. A sample size of 125 households, randomly selected, was attained. A semi-structured questionnaire was used to collect relevant data.

The hypothesized variables. This study adopted a conceptual framework developed by Reardon and Vosti (1995). The assumption is that a household's objective is to maximise food security and other livelihood objectives, subject to a set of natural resources, human capital and on-farm and off-farm physical and financial capital, as well as a set of external conditioning factors. Poverty was considered to be the product of the deprivation of basic resources for production and the reason behind that is livelihood security and poverty in the rangeland were a function of pastoral coping strategies among other variables that determined access to factors of production and assets.

This study assumed a set of factors that influenced poverty status of pastoral households. Some of these variables were inherent in the production system, such as, herd size, distance to pasture, distance to the water point and distance to nearest market. Other variables were external for example extension services, remittances and food relief. The variables are discussed in details below.

Poverty incidence. Per *capita* daily income divided by Poverty line (US$ 1). The higher the poverty index the richer the household.

Per *capita* daily income. The per *capita* daily income based on adult equivalents was used as

a depended variable in this study. The first step in the computation of per *capita* daily income involved the determination of annual household income. The annual household income was obtained by aggregation of yearly sales of farm produce, livestock, livestock products, value of produced goods consumed at home, wage of employed household head, and remittances from members of households employed elsewhere. To obtain a household's daily income, the annual household income was divided by the number of days in a year (365). This was further divided by the total household adult equivalents to arrive at per capita daily income. The level of a household's income is a major determinant of food security (Nyariki *et al.*, 2002), livelihood security and, therefore, a measure of poverty level. Households with high per *capita* income were expected to be food secure than those with low income levels. The per *capita* daily income was used to determine whether a household is living below or above the poverty line. Poverty line is the level of income below which one is considered poor - it is the poverty threshold, the minimum level of income deemed necessary to achieve an adequate standard of living in a given country (RoK, 2000).

Education of household head. The level of education attained by the head of a household was expected to influence access to information, decision making, income and consequently livelihood security of a household. Poverty of a household, whether transient or chronic, was therefore, expected to decrease as level of education of its head increases. This is because educated household heads are likely to have higher income earning potential and more alternative income earning opportunities. According to Wasonga (2009), education provides an opportunity for pastoral households to diversify their livelihood portfolios especially through employment as a source of wage and remittances. The level of education of a household head was assigned a value of 1 if never attended school, 2 if attained primary education, 3 for secondary education, and 4 if attained secondary education.

Household size. The size of a family was assumed to be directly proportional to its demand for food

and income to secure other necessities. This study considered the size of a household as the sum total of a pastoralist, his spouse, offsprings and dependants present at the time of interview. The number of persons comprising a household was converted to adult equivalents, based on the gender and the age, the men where categories in several groups. The concept of adult equivalents assumes that life-cycle stages have an important influence on the needs of members or individuals of the same household.

Relief food. Relief food was food that a household acquired from sources outside their main livelihood activities, normally from the government, the United Nations Organisations, non-governmental organisations (NGOs) or religious organisations. Dependency on relief food indicates poverty, a decline in human support capacity of the land and non-functioning pastoral mitigation strategies. Reliance on relief food was considered a dummy variable where the value of 1 was assigned to household that received relief food and 0 to those that did not receive relief food.

Remittances. Employment outside the pastoral sector is one important way of diversifying sources of livelihood in pastoral areas. It is important to note that although some pastoralists are currently living off-pastoral sector for various reasons such as employment, by tradition, most of them remit part of their wages to their families back home. This favourably alters such households' resource base. Wage transfers received from employed members is assumed to ease the dependency on livestock, crops cultivation and land resource base and reduce poverty. Household receiving remittances are therefore expected to be less dependent on livestock for their needs, and more secure in food and other needs than their counterparts that do not receive remittances. This variable was given value of 1 if household received wage transfers from its member employed elsewhere and 0 if they did not receive remittances.

Number of livelihood sources. The pastoral communities in arid and semiarid Africa primarily raise livestock to produce milk for household consumption (Ellis and Swift, 1998). These livestock also provide a means for wealth accumulation, meat production, and cultural expression. However, due to high risk and uncertainty that characterise pastoral production systems, pastoralists normally rely on fall-back livelihoods to cushion them from natural shocks such as droughts (Herlocker, 1999). Cultivation of crops, for example, is one of the major strategies used by the pastoralists to supplement milk and meat during bad seasons (Sikana and Kerven, 1991). Other alternative livelihoods include honey production, trading and charcoal burning, among others. Expanding livelihood portfolios in ways that encourage local growth linkages is usually meant to augment subsistence from livestock. Therefore, households that have alternative livelihoods are expected to be richer and more food secure than their counterparts that depend on livestock and/or crop cultivation alone.

Extension services. Extension services cover information delivery and training in new technology. These services are usually provided by the government, NGOs and traditional institutions. The extension services are expected to influence critical decisions concerning production, sale and the whole process of income generation activities, and consequently livelihood security of households. Households' members who had a chance to be trained or receive information are less likely to be poor compared to those without access to such information. This is because those who plan their activities according to the extension information have higher chances of making the right decisions at the right time, and therefore, reducing risk and uncertainties associated with production. Extension service was considered a dummy variable where the value of 1 was assigned to household that received on farm information and 0 to those that did not receive information.

Distance to the nearest market. The rising impoverishment of pastoral communities has been linked to the settlement of pastoralists around water resources, trading centres and other social services and amenities (Farah *et al.,* 2003). The argument is that due to diminishing grazing land

and restricted mobility, pastoralists tend to settle and when they do so, they degrade the range thereby compromising range productivity (Roth and Fratkin, 2005). Consequently, land degradation leads to poor livestock productivity, insecure pastoral livelihoods and ultimately impoverishment (Wasonga, 2009). Generally, trading centres are expected to provide market outlets for both livestock and their products, as well as other produce, thereby influencing households income status.

Data analysis. Data analysis involved descriptive statistics and regressions. Regression models were constructed for both discrete and binary dependent variables to determine which fit the data set better, as this could not be determined *á priori*.

Model specification. An Ordinary Least Squares (OLS) regression technique was used to determine the relationship between poverty and the hypothesized explanatory variables. In order to eliminate multicollinearity, a correlation analysis was conducted to identify variables, which were significantly correlated (correlation coefficient, $r \geq 0.5$) prior to performing a multiple linear regression. Pairs of variable with highly significant correlation coefficients were scrutinised and either of them dropped depending on their influence (t-value) on the regressand. Variables with higher t-values (more influence on the dependent variable) were retained for the Ordinary Least Squares (OLS) regressions. A general equation for a multiple linear regression (OLS) given k variables (a regressand and (k-1) regressors) was specified as:

$$Y_i = \beta_1 + \beta_2 X_{1i} + \beta_3 X_{2i} + ... + \beta_k X_{ki} + \mu_i$$

Where Y is the dependent variable, $X1,...,Xk$ is a set of explanatory variables, i denotes ith household, μ is the error or disturbance term associated with the model, and â1,...,âk are coefficients representing parameters estimators of the variables in the model.

A series of multiple regressions were conducted using per capita daily income as the regressand until the best fit of the model was attained. The criteria for determining the variables that best defined the estimated model (goodness of fit) was based on the coefficient of determination (R^2); adjusted R^2, F statistic, significance of explanatory variable (t-value), the sign or direction of influence of the independent variables, and the number of significant explanatory variables in the model.

Binary regression is the most suitable method for analysing discrete binary data in which the dependent variable evokes a yes or no response (Farah *et al.*, 2003). These are techniques for estimating the probability of an event (such as poverty incidence) that can take one of two values (poor or not poor). The basic difference between Logit and Probit models is that Logit assumes a cumulative logistic distribution, while Probit model assumes cumulative normal distribution. The logit model was chosen because the properties of estimation procedures are more desirable than those associated with the choice of a uniform distribution (Pindyck and Rubinfeld, 1991). Besides, the Logit model is computationally easier than the Probit to evaluate the poverty incidence. In the logit regression model, parameters are determined through maximum likelihood estimation (MLE) procedure.

RESULTS AND DISCUSSION

A household was defined as 'all people who live under one roof and are subject to decisions made by the household head.' A household head was defined as one who owns and controls the major resources in a household, makes important decisions in a household and provides the basic needs for the household members.

Table 1 shows descriptive statistics associated with the explanatory factors in the sedentary agro-pastoral land-use system. These results indicate that average daily income for the poor was lower than their counterparts. Non-poor households were more educated than the poor ones. Poor households had smaller hards (5.73 TLUs) and more members (7.89 AEs) than their non-poor counterparts with an average of 10.82 TLUs and 5.41 AEs, respectively. This, however, corroborates the findings of Farah *et al.* (2003) who reported a reduced labour availability for herding following sedentarisation of pastoralists around small-scale irrigation schemes in Northern

TABLE 1. Hypothesized variables to be used in the models

Variable	Average recorded	
	Poor	Non-poor
1. Per capita daily income	Average daily income is US$. 0.67 per households	Average daily income is US$.1.54 per households
2. Gender of household head	82% are male headed	56% are male headed
3. Age of household head	73.7% are between 30 – years	68.7% are between 30 – years
4. Education of household head	54.9% are none educated.	76.8% are none educated.
5. Household size	Average household size is 6.89	Average household size is 5.41
6. Heard size	Average herd size is 5.73 TLU	Average herd size is 10.82 TLU
7. Enclosure ownership	38.8% did not own enclosure	93% own enclosure
8. Relief food	58% receive relief food	45.9% did not received relief food
9. Remittances	88.4% did not receive wage transfer	86% did not receive wage transfer
10. Extension services	98.2% receive extension services	76.9% receive extension services
11. Distance to market	Average distance to market is 4.02 km	Average distance to market is 6.72km
12. Number of livelihood sources	Mean number of livelihood sources is 2	Mean number of livelihood sources is 3

TLU = Total Livestock Unit

Kenya. Poor households had less sources of livelihood (average of 2) than non-poor households (average of 2). Poorer household (88.4%) received remittances than their non-poor counterparts (86%). These results suggest that the number of livelihood sources education and age of the household head, family size and remittances are some of the key determinants of transient poverty among the agro-pastoralists.

Ordinary Least Squares (OLS) and binary logistic regression models.   Table 2 presents the result of OLS and by the corresponding t-values. Six out of the eight explanatory variables were significant. The adjusted R^2 value of 0.511 shows that about 51% of the total variation in per *capita* daily income was explained by the explanatory variables. The F-statistic was significant at 5% level and, therefore, indicated that the independent variables as a group had a significant influence on the output. Table 3 presents the result of Binary logistic analysis. In this model, the poverty incident was used as a regressand. The model parameter estimates were jointly significantly different from zero as shown by the Chi-square statistic. The significance of individual variables was tested by the Wald statistic.

The OLS results indicate that distance to the nearest trading centre, dependency on relief food, extension services and number of livelihood sources showed positive and significant ($p < 0.05$) influence on per capita daily income. Household size had a negative and significant ($p<0.05$) influence on poverty, implying that larger households were poorer than smaller ones. This was attributed to higher demand on limited resources in larger families than smaller ones. Education level of household head, showed positive but insignificant ($p<0.05$) influence on poverty. This may likely be attributed to lack of herding labour in households whose heads are educated. This often than not results in small household herd sizes and limited mobility, low productivity and, therefore, impoverishment of such households.

Binary estimate results, indicate that the level of education attained by a household head, number of livelihood sources, herd size and distance to the nearest market had positive and significant ($p<0.05$) influence on poverty incidence, as represented by poverty index. Household size and remittances had a significant ($p< 0.05$), but negative effect on household poverty incidence. These results imply that households that keep more livestock are not likely to be poor. Contrary to OLS model relief food had a negative but insignificant effect on poverty incidence under sedentary agro-pastoral land use system.

TABLE 2. Ordinary Least Squares estimation: Factors influencing transient poverty in semi-arid areas in Kenya

Model	β	SE	t
Constant	-153.931	52.213	-2.948**
Education of household head	9.551	5.126	1.863*
Household size	-14.091	3.188	-4.419**
Distance to nearest market	2.828	.617	4.583**
Relief food	54.983	13.264	4.145**
Extension services	207.032	34.609	5.982**
Number of livelihood sources	13.074	10.888	2.065**
Enclosures ownership	22.429	10.863	1.201
Remittances	-7.947	10.515	-.756

Significant at 5%; *Significant at 10%; $R^2 = 0.543$; Adj. $R^2 = 0.511$; F = 17.68; N = 125

TABLE 3. Logit estimation: Factors influencing transient poverty

Model	β	SE	Wald	Exp (β)
Constant	1.537	2.506	.376	4.649
Education of household head	.867	.347	6.253**	2.379
Household size	-.720	.227	10.032**	.487
Remittances	-2.578	1.041	6.133**	.076
Relief food	-1.232	.761	2.618	.292
Herd size of household	.036	.013	7.697**	1.037
Number of livelihood sources	1.076	.312	11.911**	2.933
Distance to nearest market	.116	.044	6.933**	1.122
Age of household head	.530	.656	.652	1.699

Significant at 5%; *Significant at 10%; Chi-square = 85.878; -2log-likelihood = 65.981; N = 125

The number of alternative sources of livelihood plays a significant role in determining a household's poverty as represented by per *capita* daily income and, therefore, whether a household is poor or not. The higher the number of livelihood sources of a given household, the higher the per *capita* income, and, therefore, the lower the poverty level (Mango *et al.*, 2004; Ngugi and Nyariki, 2005; Wasonga, 2009). This observation is also supported by the Binary estimate which indicates that the number of livelihood sources is positively and significantly influencing poverty incident.

The OLS and Binary estimates indicated that the distance to the nearest market showed positive and significant influence on the per *capita* daily income and poverty index respectively. This may be because agro-pastoralists often settle around these centres and therefore, easily access the markets to sell their produce and other services that enhance production and therefore, income. Moreover, the proximity to trading centres can encourage small businesses which can increase the households' per *capita* daily income. These results are, however, contrary to the findings of Muyanga (2008) that despite the confounding interactions between distance to markets and poverty components, the relationships between the two are not statistically significant in the rural areas of Kenya. The current study shows that the nearer a household is to a trading centre, the higher the per *capita* daily income and thus, the lower the poverty. Similarly education of household head had a positive and significant (P<0.10) influence on poverty incidence and per *capita* daily income, this implies that education become important as pastoralists settle, thereby,

making education necessary for creating non-pastoral opportunities and diversification of economy in general.

Household size has a negative and significant coefficient for both models, implying that larger households are poorer than smaller ones. This concurs with Place *et al*. (2003) that chronically poor households are likely to be large. They argue that as household size expands, households experience reduced expected chronic poverty, reaching a minimum threshold (three members), then thereafter, chronic poverty increases. This result confirms the findings of Nyariki *et al*. (2002), Krishna *et al*. (2004), and Kristjanson *et al*. (2004), that high burdened household is more likely to drift into chronic poverty. Nyariki *et al*. (2002) observed an inverse relationship between household size and calorie consumption in the semi-arid Makueni district of Kenya. They ascribed this to a possible higher dependency ratio in poorer households due to larger number of children, and likely underestimation of household sizes due to migration of members seeking off-farm employments. They pointed out that such households would actually have more off-farm earnings than their neighbours without migrants.

The OLS model, showed that relief food has positive and significant (P< 0.05) influence on poverty, suggesting that households that depend on relief food are better off than those which do not receive food aid. This may be so because the latter spare their limited resources to acquire other basic needs other than food. This result is, however, contrary to the finding of Wasonga (2009) that households that rely on relief food are poorer than those that do not. He argued that it is mostly the households with limited food and income that would rely on relief food for their survival. Access to extension services showed positive and significant (P< 0.05) influence on the per *capita* daily income. This suggests that households with access to technical advice and information tend to realise higher production and therefore more income than those that do not access extension services.

However, the Binary logistic model revealed that herd size had a positive and significant influence on poverty incidence (P<0.05), implying that households with smaller herds were likely to be poorer, than the households with larger livestock herds. On the contrary, remittances negatively influenced poverty incidence (P<0.05), implying that households that depended on remittances were poorer than their counterparts, which did not rely on these social and financial supports.

CONCLUSION

The findings of this study reveal that, there are many factors that influence transient poverty among agro-pastoralists in semi-arid of Kenya, the main one being diversification. Generally, households in the dry-lands diversify their sources of income to reduce the risk of production failure by spreading the risk across different activities. The high dependency on relief food among poor pastoralists is mainly attributed to no or fewer alternative sources of livelihood in the former than their counterparts. It can be concluded that households with fewer alternative livelihood options are likely to fall into poverty.

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