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The Role of Land Reform in Reducing Poverty Across Nepal

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THE ROLE OF LAND REFORM IN REDUCING POVERTY ACROSS NEPAL

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Abstract

Land is the main source of income and consumption for Nepalese people. This study analyses the economic relationship between access to land and poverty in Nepal by establishing the link between land and consumption as well as land and income. A generalised additive model and OLS demonstrate that greater access to land for the poor increases income and consumption and thereby reduces poverty. The significant marginal value of land of both consumption and income implies that an effective land reform policy could well be the most effective approach to alleviate rural poverty. However, land reform must come as part of a larger overhaul.

Cluster analysis shows that land reform should target appropriate subgroups within the community in order to differentiate those who would make use of the extra land from those who would not and so applying strategies to each one. It reveals the importance of subgroups in determining an appropriate strategy for tackling poverty. Three distinct groups are found within our dataset that explain most of the variation.

THE ROLE OF LAND REFORM IN REDUCING POVERTY ACROSS NEPAL

1. INTRODUCTION

In recent years poverty elimination has become the most important development objective. Combating rural poverty by providing greater access to land for poor households in developing countries is becoming increasingly common (Deininger, 2003; Binswanger et al., 1995; Dorner, 1992) as inequality in the distribution of production inputs, especially agricultural land seems to be the main cause of rural poverty and income disparity. Indeed, policies to grant secure access to land for the rural poor can greatly increase the welfare of the poor (Ciamarra, 2004). A successful redistributive land reform may increase small household production and contribute directly and immediately to reduce poverty and economic inequality. As stated by Dorga (2002) if the aim is to reduce poverty, the more important concern is not how much production will increase but on whose fields this production will increase. When production increases on the fields of poor farmers, this will certainly help reduce poverty.

Among the range of policies discussed to alleviate poverty, there is now growing literature recommending improved access to land to the rural poor (Carter, 2003; Deininger, 2003; de Janvry et al, 2001). Conventional re-distributive policies such as the re-distribution of agricultural land through a land reform program would have a direct impact on the incomes of the poor who benefit from these transfers. Deininger (2003) lends support to the land reform schemes emphasising the important role that better management of land and other factors in providing more stable and higher incomes.

Redistributive land reform has been an increasingly important strategy for both poverty alleviation and socio-economic development (Binswanger et al., 1995; Griffin et al., 2002). Consequently, large-scale initiatives exist to implement land reform (Deininger, 2003).

However, in many countries large tracts of productive land lie idle while at the same time small peasants survive on marginal and often on environmentally fragile lands (Heath and Binswanger 1996). The poor distribution of productive resources in general and land in particular has been identified one of the root causes of economic stagnation in many developing countries (Deininger, 2003) including in Nepal. The one time redistributive land reform has been particularly effective and politically powerful in addressing this (*ibid*.).

What land reform implies in practice always depends on the context and particular circumstances but the primary motivation of land reform is to reduce poverty by reducing the financial inequality (Lipton, 1974). The impetus for land reform is then the possibility of improved social justice and equity. Consider John Locke (1976):

> "Though the earth and all inferior creatures be common to all men, yet every man has a "property" in his own "person." This nobody has any right to but himself. The "labour" of his body and the "work" of his hands, we may say,

are properly his. Whatsoever, then, he removes out of the state that Nature hath provided and left it in, he hath mixed his labour with it, and joined to it something that is his own, and thereby makes it his property."

Locke's philosophical idea is that everybody should have a God given right to property for their support and convenience which is essentially acquired by the application of their labor. Nobody has a right to take their property away for any reason without consent. He argues an issue of basic human rights. After all, access to land leads to access to shelter, food, employment and improved livelihood amongst other things (Ghimire, 2001). Given that equity is a key factor in battling poverty (Barraclough, 2001) and that it can also increase social welfare (Sen, 1999 and Tendulkar and Jain, 1995), Locke's thoughts seem justified.

Empirical studies in a variety of countries have identified a positive association between access to land and income (e.g. Jayne, et al., 2002; Carter and May, 1999 Bouis and Haddad, 1990). Besley and Burgess (2000) provide evidence of how specific aspects of the land reform legislation in India have helped reduce poverty and Lopez and Valdes (1997) found that land plays an important role in determining the per capita income of farming households in El Salvador and Paraguay. This effect of income on access to land via land reform programs has been documented in studies for Taiwan, Zimbabwe, and the Philippines (Hoddinott et al., 2000) as well as many others (Finan et al., 2005, De Janvry and Sadoulet, 1999, Grootaert et al., 1997, Gunning et al., 2000, Scott, 2000).

An effective land reform program must boost efficiency and promote equity and so land ownership should be targeted towards those who use it most productively. As discussed earlier similar studies have been conducted earlier relating access to land and poverty using different methodologies in many developing countries. However, these studies have been conducted in a piecemeal basis. For instance, a recent study conducted by Finan et al. (2005), covers only limited geographical area. The data they have used is 1997-98 survey conducted for targeted poor rural communities. The analysis they have made focuses on the value of land for this particular segment of the rural population that lives in marginal communities. However, there is an absence of solid empirical evidence that look into approaches measuring the potential of land in reducing poverty which embraces a holistic and nationwide data that can capture the real problem scenario and results that comes afterwards can reveal the real ground reality besetting the poverty and inequality problem associated with land distribution issues. Therefore, in order to inform the policy making processes for land reform, contributions are still required to the literature and research in developing countries like Nepal. Against this background, using NLSS data undertaken in 2003, this study shows for the first time how access to land reduces poverty measuring the marginal poverty reduction value of land in Nepal.

Section 2 begins with brief discussion pertaining to poverty, inequality and land reform in Nepalese context followed by considering conflicting ideas of land reform in section 3. Section 4 discusses measurement of poverty. Section 5 provides data description while Section 6 looks at the construction of model variables. Section 7 provides theoretical model while Section 8 provides Empirical model. Empirical results are provided in section 9 and section 10 closes with the conclusion.

2. POVERTY, INEQUALITY AND LAND REFORM IN NEPAL

The eradication of poverty is the biggest challenge faced by policy makers in Nepal. Poverty is increasingly concentrated among small farmers and agricultural labourers (WB, 2006). Present socio-economic structure of the country reveals that land is the main property and source of income for the majority of Nepalese people (*ibid*). Land reform is important also in the context of incipient industrial and commercial sectors which at present cannot cater for the rapidly growing population. In this respect, increase in agricultural productivity through secure access to land can potentially be one of the most effective approaches to alleviate rural poverty.

Over the last decade aggregate poverty reduced significantly from 42% to 31%. However, the decline was slow in rural areas compared to urban areas and is still high at 35% (WB, 2006). Whilst overall growth increased and overall poverty reduced, the Gini coefficient increased from 34.2 to 41.4, indicating a rise in inequality as the growth was seen most evident in the rich community. The country's GDP may be constrained by unequal land distribution. For nearly one third of total agricultural land is occupied by 7% of upper households whereas nearly 20% lower households have to survive with less than 3% of total agricultural land (CBS, 2004a).

Land is often misallocated which then hampers agricultural development and perpetuates rural poverty. Those who have land don't know how to use it most effectively and those who know how to use it, don't have it. Consequently, the agricultural productivity of the country is much lower compared to other countries in the region (WB, 2006). These all suggest that there is potential for increasing farm production three to four-fold through land and agrarian reform (NPC, 1998). So, proper policy programme to transfer agricultural land from unskilled to skilled farmers through effective land reform program may be an important instrument to alleviate poverty and disparity.

In past fifty years, there have been many attempts to a redistributive land reform program to alleviate poverty and inequality, but without success. The land reform program of 1964 had heightened social and psychological consequences, but had little impact on agrarian structure (Regmi, 1978). The government confiscated and redistributed only a very small fraction of land above the ceiling compared to its expectation.[1] In 1994 the High Level Land Reform Commission submitted the *Badal Commission Report* to implement land reform; however no steps were taken to do so. In 2001, another land reform program with a revolutionary tag was announced. The focus of the program was to amend the Land Act 1964 in order to reduce the legal size of land holding per family.[2] But Thapa (2001) points out that this was merely a political ruse as the political pronouncement was made without weighing up of socioeconomic implications, and exclusive of any schemes and information of land appropriation and redistribution. In conclusion, there has been little progress in the last fifty years in land reform.

3. THE LAND REFORM CONTROVERSY

Increasing access to land through land reform program is confronted with the following important issues.

Firstly, some economists argue that the abolition of poverty can come only from development, not from redistribution (Boulding, 1968). They argue that redistribution wastes resources (Okun, 1975) but instead we should try to make everybody richer. This type of development strategy may be applicable to some developing countries but it does not seem appropriate in Nepal as it has few resources that are favourable to development. For example, Nepal faces much higher transport costs being land-locked (WB, 2007). Its only access to the sea is through India and so it depends on India greatly who in practice dictate its economy (Blaikie et al., 1980). Further, factors such as its mountainous terrain make internal trade harder and so the dreams of authors such as Boulding and Okun seem unrealistic.

Secondly, it is argued that in developing countries where average land size is already small (such as in Nepal), land reform is not an important issue - for where land is already scarce in quantity, there is little to redistribute. However, the greater is the scarcity of land, the stronger the need for an equitable distribution of land. For example, the successful land reform program of Taiwan, South Korea and Japan shows that the scarcity of land was in fact an important justification for redistribution. However, the average land per worker was 0.62 hectares in Taiwan and 0.3 hectares in South Korea before land reform (Griffin et al, 2002).

Thirdly, there are others who argue for a communal farming system. They argue that this type of system in principle contributes to equity, efficiency, agricultural growth and a reduction in rural poverty (Mao, 1971). However, this argument has become politically discredited (Griffin et al., 2002). Indeed, the Chinese communal farming system has been shown to be highly inefficient (Khan, 1983). The emphasis now in the former communist countries, where communal system was widely adopted, is on de-collectivizing and privatising state and collective farms.

Fourthly, there are some arguments in favour of land tenure reform in lieu of redistributive land reform. However, Griffin et al. (2002) consider that land tenure reform will either have no significant effect or make matters worse. The case for land reform rests not on the existence of defective tenure contacts but on the concentration of land ownership rights and the inefficiency, inequality and poverty which this creates. The core of land reform is thus a redistribution of property rights in cultivable land.

Finally, land reforms sometimes confront the long entrenched view that large-scale, commercial agriculture is more productive and that the reforms fragment land into unproductive, small units. However, various studies show that small farms have higher total factor productivity than large and hence utilize resources more efficiently (Binswanger et al., 1995; Heltberg, 1998). We will seek to establish whether this is so.

4. MEASUREMENT OF POVERTY

Looking over the prevailing definitions of poverty, it is a common practice that a household is considered to be poor if it falls under a given level of welfare threshold. In this connection, it is worthwhile to discuss briefly how the welfare level can be conceptualized. Broadly, three main approaches can be viewed for assessing welfare. One of them is welfarist approach in which welfare is solely compared on individual utility levels depending on the assessment of the individuals themselves (Ravallion, 1994). The approach has been criticized because this uses subjective judgement to obtain social welfare functions (Sen, 1998). Despite this, economists particularly in research works have extensively used the welfarist approach.

The second approach to assess welfare is capability approach. The capability approach links poverty to health, nutrition and education. According to Sen, commodities are not seen as "ends", but as "means" to fulfil desired activities (Sen, 1993; 1987b; 1987a). The author does not believe the value of the possession of commodities that an individual commands is a good measure so much as a lack of capability. The capability approach focuses on human freedoms required to live a decent life and view poverty as the failure for achieving basic capabilities, which is 'the ability to satisfy certain crucially important functioning up to certain minimally adequate levels' (Sen, 1993 p. 41). Theoretically, this provides a more satisfactory definition to poverty, as this embodies the lives people actually survive and the freedoms they enjoy (Ruggeri Laderchi, Saith and Stewart, 2003). In practice, however, to compute actual poverty, a measure needs to develop in order to estimate wellbeing. The UNDP has attempted to construct a Human Poverty Index based on the capability approach, incorporating longevity, knowledge and a decent standard of living (*ibid*).

The third approach used to assess poverty is the basic needs approach, which is widely applied in many developing countries. This approach concerns on the fulfilment of basic human needs. Streeten et al. (1981) argue that emphasis on primary health care, basic education, nutrition, and sanitation not only contributes directly to the alleviation of poverty and the reduction of fertility, but more importantly it directly and indirectly also improves productivity and accelerates economic growth. Choosing the food energy requirement and making an allowance for non-food consumption are the two problems associated with this approach because in due course of time these requirements may differ across individuals and different places (Ravallion and Bidani, 1994). Despite these problems, the approach has been widely applied in developing countries by international development assistance agencies.

In Nepal, poverty lines are constructed using the third method (CBS, 2004b; WB, 2006). The recent poverty lines were constructed for six geographical regions to measure poverty status in the country adjusting the differences in cost of living in different regions. Then consumption and income aggregates were derived from the NLSS data to compare them with poverty lines. It was calculated in four steps as follows.

First, the spatial and inter-temporal food price indices were derived to ascertain the corresponding food poverty line components. In the second stage, the spatial and inter-temporal non-food price indices were derived for the corresponding non-food poverty line components. In the third step, the food and non-food poverty line components were aggregated. Finally, overall total poverty lines were compared with

nominal consumption/income aggregates derived from the survey data to categorize the population into poor and non-poor groups. A detailed procedure followed to construct the poverty line is found in CBS (2004b) and World Bank (2006).

5. DATA DESCRIPTION

The data for this study were taken from the Nepal Living Standards Survey 2003/04 (NLSS II) conducted by Central Bureau of Statistics (CBS), Nepal, with assistance from the World Bank and the UK Department for International Development (DFID). The NLSS II was the follow up of NLSS I (1995/96) which followed the Living Standard Measurement Survey (LSMS) methodology.[3] The reason for launching the second round of survey was to monitor the ongoing progress and evaluate the impact of various government policies and programs including the Tenth Development Plan (2002-07) with the sole objective of poverty alleviation.

6. CONSTRUCTION OF MODEL VARIABLES

This section briefly discusses choice of variables for the analysis.

6.1 Dependent Variable

Consumption and income are widely used as the monetary indicators of poverty. Consumption measures a household's welfare in relation to meeting current basic needs. Consumption being a smoother measure of welfare, it may be a better reflector of a family's long-term welfare (Ravallion, 1996; Deaton, 1997). Consumption can be viewed as realized welfare. Income on the other hand is a measure of potential welfare. However, households sometimes may reluctant to report their true income.

In a predominantly subsistence economy such as Nepal, where much of the household income comes from agriculture, calculating actual income may be problematic. Moreover, income can be sensitive to shocks and potentially volatile (Finan *et al.*, 2005). So, in the context of developing countries, consumption is preferred to measure poverty rather than income (Deaton, 1997). Nonetheless, income can be useful in order to analyse welfare in terms of monetary sources (CBS, 2004b). In this study, both consumption as well as income is used to estimate the poverty reduction effect of the marginal value of land.

6.2 Explanatory Variables

Using a variety of methodologies, several researches have been conducted in many developing countries but only a few studies explore the determinants that cause poverty. However, there are similarities in the use of explanatory variables as Table 1 shows. All of these variables including regional variables are included in this part of the empirical model. The regional variables are geographical regions, which are customarily divides the country into three ecological regions according to the agro - climatic zones depending on the height of these regions viz., *Terai* (plain), hill and mountain.[4]

7. THEORETICAL MODEL

The theoretical model for establishing a link between improved access to land and poverty reduction in a given setting rests on understanding the operation of the land and labour markets in that context. Binswanger and Elgin (1988) have shown that even when rural factor markets are competitive and operate efficiently, the rural poor will have limited access to land. The competitive market outcome is that poor people whose incomes are at the subsistence margin are unable to purchase land at a competitive price due to the "fundamental financing problem of poor people" (Carter and Mesbah, 1993). They are unable to reduce their consumption below the subsistence margin in order to finance land purchases at competitive market rates of interest even though the land purchase would be profitable for them.

The situation of the poor gets further disadvantaged with market imperfections. Factor market imperfections lead to differences in the returns to land at different levels of the farm size and they are expected to be quite widespread in rural Nepal. Further details on a farm-household model with market imperfections can be found from Carter and Mesbah (1993), Eswaran and Kotwal (1986) and Feder (1985). The specific role of land market imperfections has been formalized in several models of the farm household by introducing credit constraints which are based on the amount of land owned. More recently, such a modelling framework has been applied by Finan et al. (2005) to show how the marginal returns to land can vary in a non-linear way with farm size and hence how such a pattern gives rise to a strong relationship between poverty reduction and land reform that increase the access of the poor to land.

Following Carter and Mesbah's work (1993), the model has been formalized on the specific role of land market imperfections of the farm household by introducing credit constraints which are based on the amount of land owned. The marginal value of land with respect to consumption or income may vary with the land endowment in a nonlinear way. Without knowing what the underlying frictions of our environment are, and hence the shape of the relationship between land and consumption and income, we relax the functional form for land and compare the results to those of the OLS.

The theoretical background behind this model is that agricultural production typically involves a period of several months between the time the inputs are purchased and the time the output is marketed. In many developing countries, due to their limited land, small farms have no access to credit, marketing and technology services (Fan and Chan-Kang, 2005). Due to asymmetric information, problem of collateral and high fixed costs of lending, formal rural credit markets do not function properly in many developing countries (Stiglitz and Weiss, 1981). In poor agrarian economies, credit is invariably rationed to the ability to offer collateral. Private Banks may lend to people who can offer transferable property rights (land) as collateral (DFID, 2007). Collateral increases the expected return of the lender because it partly or fully shifts the risk of loss of the principle from lender to borrower (Binswanger et al., 1989). Furthermore, poor people often find themselves unable to secure loans due to the high cost of handling small loans and a perceived high risk of default. Financiers are reluctant to provide crop and livestock insurance cover for small farmers (Adams, 2000). The amount of credit a farmer can obtain therefore largely depends on the amount of land he owns and thus his ability to offer collateral. Binswanger and Siller (1984) offer an insightful analysis of how different ownership of collateral (i.e. land) determines

differential access to credit and gives rise to credit-rationing in an agrarian setting. Eswaran and Kotwal (1986) show that access to credit is functionally equivalent to ownership of the means of production. They explain that the amount of working capital to which a farm has access is typically determined by the assets it possesses, mainly the amount of land he owns. Binswanger and Rosenzweig (1986) point out that financial institutions routinely require collateral in the form of land as a condition for offering loans. Kevane (1996) and Heltbery (1998) have also shown that credit depends on land ownership. Feder (1985) argued that if availability of credit is dependent on the amount of land owned (and if the performance of hired labor is affected by supervision from family members) then a systematic relationship between farm size and productivity prevails. The model explains how credit market imperfections affect the farm size-productivity relation. The lack of liquidity limits the ability of farmers to hire labour, purchase cash inputs, and also hire in land during the planting seasons. Access to credit thus plays an important role in a farmer's decision.

Our model explains that income (Y) is the function of labour (L_f), input (X), Land (H) and other social and economic factors (z) i.e.

$$Y= PT(L_f,X,H;z)$$

where P is the exogenous market price.

The model assumes that cost of production (qX) is the function of initial capital (K), borrowed money $\Gamma(T)$ at interest rate i, and income from hiring out labour (L_s).

So,

$$qX \leq K+ i\Gamma(H)+ L_s.$$

Where q is the input price.

The model further assumes that

$\overline{L}$ (total labour) $= L_f + L_s$ (on-farm plus off-farm employment)

$L_s = w\Omega(L_s) = $ number of days employed times rate of wages.

The household's optimization problem is then to choose time allocation and purchased inputs to maximize its income:

$$\max_{L_s,L_f,X} pT(L_f,X,H;z) - qX + w\Omega(L_s) - i(qX - K - w\Omega(L_s)) \qquad (1)$$

Given the constraints,

$$L_s + L_f \leq \overline{L} \qquad\qquad (1a)$$

$$qX \leq K + w\Omega(L_s) + \Gamma(H) \qquad\qquad (1b)$$

$$L_s \geq 0, \; L_f \geq 0 \qquad\qquad (1c)$$

Following Finan et al. (2005), in order to find the stationary point of (1) and therefore its maximum, we use the Lagrangian multipler on constraint (1b), λ, to give

$$Y = pT((L_f X, H, z) - qX + w\Omega(L_s) - i(qX - K - w\Omega(L_s)) + \lambda(k + w\Omega(L_s) + \Gamma(H) - qX) \qquad (2)$$

Then, by considering the first order derivatives, we derive the equation for Y below.

$$Y = pT(L_f^*, X^*, H; z) - q(1+i)X^* + w(1+i)\Omega(L_s^*) + iK \qquad (3)$$

Equation (3) can then be differentiated to illustrate how the expected marginal value of land may vary with the land endowment in a non-linear manner (Finan et al., 2005).

8. EMPIRICAL MODEL

8.1 ORDINARY LEAST SQUARES (OLS)

Our production model implies that any return to the productive assets of the household should influence the household's consumption/income revealing they are indicators of poverty. Independent variables considered will include household demographic, constraints on factor use, as well as regional factors that capture employment opportunities and market integration.

From Equation 4, the estimating equation for household consumption and income may be specified as an ordinary OLS with control variables alongside land as our independent variables. As our data covers the whole of Nepal, both poverty and land were highly negatively skewed so they were log-transformed to fit the data better. Thus marginal values were no longer the expected increase in income/consumption for 1 extra unit of land as this depends on the value of z but the expected percentage rise for 50% increase in land. Consider the following:

$$\ln(y_1) = \alpha + x\beta + \gamma \ln(z) \qquad\qquad (4)$$
$$\ln(y_2) = \alpha + x\beta + \gamma \ln(1.5z) \qquad\qquad (5)$$

So (5)-(4) gives
$$\ln\left(\frac{y_2}{y_1}\right) = \gamma \ln(1.5)$$

This is independent of z as desired and so gives us an answer for the marginal value for the whole dataset independent of land size. The percentage increase is therefore $100(1.5^\gamma - 1)$ whereas for other factors in our model the percentage increase is given by $100(e^\beta - 1)$ by similar algebra.

8.2 GENERALISED ADDITIVE MODEL (GAM)

Robinson (1988) comments that statistical inference on multidimensional random variables commonly focus on approaches that are either linear or nonparametric. Finan et al. (2005) select a semi-parametric approach in order to model the data:

$$y = \alpha + x\beta + g(z) + \varepsilon$$

where

y is a measure of household welfare,

x is the set of control variables,

z is the household's vector of land endowed,

α is constant term

β is a vector of our parameters of interest.

ε is the error term distributed normally.

However, this is a generalised additive model (GAM) and we will therefore model it as such with marginal values calculated directly from the model using predicted values and the approximate standard errors attached (approximate as based on the Taylor series expansion – Wood, 2006). Finan et al. (2005) used a smoothing spline (LOESS) in their analysis to estimate the shape of land as splines are the smoothest interpolators however, we preferred cubic smoothing splines as they minimise the noise best. For a more detailed discussion of the importance of smoothing splines and the superiority of cubic splines, see Wood (2006).

9. RESULTS

9.1 Estimation of Consumption Equation

Table 2 presents the parameter estimates for the marginal value of consumption. The estimated regression coefficients measure the change in household consumption from a change in explanatory variables. As the dependent variable is in natural log form, the estimated regression coefficients measure the percentage change in household consumption for an increase in the explanatory variable.

The coefficient estimates of the GAM procedure are very similar to the estimates of the OLS regression. This suggests that land is orthogonal to the other covariates.

9.2 Estimation of Income Equation

Table 2 shows the results when income is the dependent variable. As in the case of consumption, the coefficient estimates of the GAM procedure are very similar to the estimates of the OLS regression.

9.3 Interpretation

These coefficients are quite similar to those of consumption suggesting our model is robust. We now consider the implications of these findings.

Land is significant and positive and we also observe that household characteristics, complementary assets, and contextual circumstances greatly influence the income generating potential of land.

Education is important as expected as educational disparity is quite prevalent in Nepal. We have measured the effect of number of household member's education level in four categories namely, number of family members 10 years or less school education, SLC (School Leaving Certificate-GCSE equivalent), Inter (A level equivalent), and Bachelor degree (B.A.) and above. The coefficients for these variables infer the contribution in household consumption in which a household member who has completed these education level as compared to a similar household in which no household member has attained such educational level, all other things being equal. Consumption significantly increases with higher education. Having a member of the household who has passed SLC instead of 10 years or less education raises consumption an extra 10% (9%) from the OLS (GAM). The key difference seems to be between those who then go on and have Inter as well. Here the increase is an expected 19% (19%) or 23% (23%) for income. The more adults and the more educated the adults, the less likely that a household will be poor.

Distance of the land to road, primary school and health-post/hospital were included as a measurement of infrastructures. The supposition is that as the distance increases, the costs of household raises and hence consumption level decreases. Reducing the time that rural households take to reach these locations should lead to improvement in consumption. The regression shows that the distance to primary school and health-post/hospital is significant whereas the distance to a road is not. Having a house twice as far away from a hospital as another house reduces consumption by 9%.

Also, those who live in the hills are more likely to have greater income and consumption than those in the *Terai* and mountains. The *Terai* land is supposed more fertile and the general expectation is that households living in *Terai* have more income and higher consumption. However, the result clearly reveals that people living in the hills have higher level of income and consumption. The reason behind may be that households living in hill have other income sources such as government jobs, employment in British and Indian armies as mercenary soldiers, out-migrant work to India, Republic of Korea, Malaysia and a number of countries in the Middle East (WB, 2006). Mountainous land is much less fertile than *Terai* land and therefore the result that the consumption as well as income of households living in mountain is higher than *Terai* households is surprising. The reason may be that many of the mountain people involve in internal trade, tourism, hotel-lodge etc and also that they use their less productive land for fruit farming and livestock farming. Consequently, they might be better than the *Terai* households who only use their land on crop farming and they have less other sources of income. This result supports the conclusion that a mere increase in land holding without other complementary sources does not guarantee poverty alleviation.

9.4 Relationship between Poverty and land

The coefficient for land gives an idea of the change in income and consumption using the OLS that would result from a 50% increase in land: 4.7% and 3.6% respectively. These figures are low and suggest that land has a small part in altering the poverty of these houses. Table 4 considers the marginal values from the GAM.

This suggests that whilst income may go up as land is increased, consumption tends to go up more slowly. This would fit with the idea that the poor need every extra bit and need to keep what they need whereas the richer can afford to spend more.

Finan et al. (2005) found that a small plot of land can increase welfare significantly in Mexican rural communities. They also found that households that face lower transaction costs as measured by access to roads provide a return to land that is two to three times as high as those without access to road. For a country such as Nepal which has high transport costs, this might explain the weaker strength of the relationship revealed in our dataset.

Indeed, one should remember that a household's ability to generate sufficient economic livelihood depends also the existing environment available around. The general expectation is that due to credit constraint and other unfavourable conditions households with small size of land have a lesser marginal value of land with respect to consumption. For larger farms have better access to credit and so an increase in landholding will increase the use of variable inputs and reduce the distortion in the input markets as well (Eswaran and Kotwal, 1986). So, as land endowments increase, access to credit improves and the household can allocate its labor more effectively. Hence, the marginal value of land begins to increase.

The resulting estimate of the consumption value of land, g(X), is plotted in graph 1a, where consumption appears as an increasing function of land. This shows that the relationship between consumption against land is not linear. This result suggests that a linear specification would be a poor approximation. The thin red line shows the GAM which is not constrained to be linear and the blue is the OLS. The thick blue line is linear and gives the same percentage increase independent of land size – 4.7%. The resulting estimate of the consumption value of land, g(X) is also plotted in graph 1b which gives a similar shape.

The shape of graph 1a as well as 1b reflects our theoretical prediction of the impact of a credit market constraint on return to land. This captures the fact that for small farmers, additional land produces return that is lower than the simple production value of the extra plot of land.

Graph 2 displays the marginal value of land for the consumption with approximate 95% confidence intervals for the mean marginal increase of income and land based on the Bayesian posterior covariance matrix (see Wood, 2006 for details). It highlights the nonlinear relationship between land and the poverty measures. It suggests that those with already existing land will receive more consumption and income from an extra bit of land than the landless. This underlines the importance of not considering land reform as an exclusive measure to alleviate poverty.

The percentage increase is positive but not as large as we initially expected. Instead, whilst our findings still suggest that land can be an important element of poverty reduction strategy, we also observe that household characteristics, complementary assets, and contextual circumstances influence the consumption/income generating potential of land. For instance, households that face high transaction costs (e.g. to nearest hospital) have a lower return to land. So the effectiveness of the process depends on many contextual factors. This includes, most particularly, the role of household characteristics, the availability of complementary assets, and the context where the land is used. So, besides better access to land, it is important to improve access to complementary assets such as education, and to improve the provision of public goods such as infrastructures (provision of road, hospital, market, bank) needed for them to make an effective use of land. These all suggest that programmes of access to land must be packaged as elements of more comprehensive programmes in order to secure the poverty reduction potential of land.

However, there is limited amount of land that can be redistributed if a scientific ceiling on land is imposed (CBS, 2004a). So if the poverty reduction agenda is to work, it is imperative that some people who cannot use their land efficiently and productively leave their land voluntarily for those people who can use more efficiently. For instance, educated households members may find greater rewards in off-farm non-agricultural employment and in migration. Further, households with capital endowments and easy access to markets may be better off investing in commerce rather in farming. Similarly, households possessing with insufficient complementary assets may be at an advantage renting out their land to others, who can use it more productively rather than farming themselves. It has been observed that the income and consumption of very small farmers tends to be inferior to that of landless households (Cornia 1985; Lopez and Valdes, 1997). This seems that farmers with very small size of land would be better off abandoning farming for other occupation. The higher the technological change, the higher the agricultural production and the lower the subsistence size of the holding (Conway, 1997). In the context of pluralism households access to even small amount of land can prove to be valuable (Agrawal, 1994) because access to land serves as a component in an income strategy in such households. Farm earnings help insure non-farm revenues, when liquidity earnings obtained in one activity are used in another. Similarly remittance incomes relax liquidity constraints in farming, giving a high shadow value to off-farm earnings (Carter and Barham, 1996). These all suggest that access to land may not always be sufficient to alleviate poverty (cf de Janvry et al., 2001).

There are some studies which show that access to land by land reform program has little impact in income. McCulloch and Baulch (2000) documented that the impact of a policy giving 2 hectares of land to households in rural Pakistan with less than this amount had no effect on income. Lopez and Valdes (2000) found similarly in eight Latin Americans countries. They suggested that landholdings in rural areas of Columbia would have to quadruple in order for the poorest 40% of farm households to reach the poverty line. However, as stated by Finan et al. (2005) the methodology that has been used in these studies has several limitations, not least in assuming a linear model.

However, just because they struggled to establish it does not mean the link does not exist and is not strong. That there are a number of clearly defined subgroups in our

data for example, is established by graph 3. This uses cluster analysis to consider how many subgroups there are within our dataset using explanatory variables in our models. We can see that there are 3 groups that explain most of the variation in our dataset (for $R^2 \leq 0.56$ – note the clustering of groups towards the left indicating most variability is explained by just a few groups). The 3 groups represent one younger, well educated group with the smallest amount of land that live more on Terai near local amenities, one older group with the most amount of land and a number of adult workers and one group that is poorly educated and lives in the mountains, therefore being far removed from local amenities (bank, health post etc). It seems wisest to target the first group who are well educated who have the knowledge to make use of extra land and to leave the third group who have other factors inhibiting their growth like education and location.

Our results show the importance of careful consideration of the link between land access and poverty. Specifically, it seems clear however that land reform must come as part of a larger overhaul that includes targeting the appropriate subgroups within the community and applying strategies to each one. Only if access to land is unaccompanied by complimentary reforms is it likely to be unhelpful.

10. CONCLUSION

Land is the main source of income and consumption for Nepalese people. This study analyses the economic relationship between access to land and poverty in Nepal by establishing the link between land and consumption as well as land and income. A generalised additive model and OLS demonstrate that greater access to land for the poor increases income and consumption and thereby reduces poverty. The significant marginal value of land of both consumption and income implies that an effective land reform policy could well be the most effective approach to alleviate rural poverty. However, land reform must come as part of a larger overhaul. The effectiveness of the process of consumption/income generating potential of land depends largely on many contextual factors, most particularly, the role of household characteristics, the availability of complementary assets, and the context where the land is used.

The results show that both consumption and income appear as an increasing function of land. This implies that the relationship between consumption against land is not linear suggesting that a linear specification would be a poor approximation. Income may go up as land is increased while consumption tends to go up more slowly. This would fit with the idea that the poor need every extra bit and need to keep what they need whereas the richer can afford to spend more. This indicates that a household's ability to generate sufficient economic livelihood depends also the existing environment available around. This supports the theoretical prediction of the impact of a credit market constraint on return to land which capture the fact that for small farmers, additional land produces return that is lower than the simple production value of the extra plot of land. Due to credit constraint and other unfavourable conditions households with small size of land have a lesser marginal value of land with respect to consumption and income. For larger farms have better access to credit and so an increase in landholding will increase the use of variable inputs and reduce the distortion in the input markets as well. So, as land endowments increase, access to credit improves and the household can allocate its labor more effectively. Hence, the marginal value of land begins to increase. It suggests that those with already existing

land will receive more consumption and income from an extra bit of land than the landless. This underlines the importance of not considering land reform as an exclusive measure to alleviate poverty. This result supports the conclusion that a mere increase in land holding without other complementary sources does not guarantee poverty alleviation.

The study also investigates the effect of other complementary factors along with land on consumption and income. The results reveal that consumption and income significantly increases with higher education. The more adults and the more educated the adults, the less likely that a household will be poor. Further, as the distance of infrastructures (e. g., road, hospital, market, and bank) increase, the costs of household raises and hence consumption and income level decreases. Reducing the time that rural households take to reach these locations should lead to increase in income and improvement in consumption. The results show the importance of careful consideration of the link between land access and poverty. Specifically, it seems clear however that land reform must come as part of a larger overhaul. Only if access to land is unaccompanied by complimentary reforms is it likely to be unhelpful. So, besides better access to land, it is important to improve access to complementary assets such as education, and to improve the provision of public goods such as infrastructures (provision of road, hospital, market, bank) needed for them to make an effective use of land. These all suggest that programmes of access to land must be packaged as elements of more comprehensive programmes in order to secure the poverty reduction potential of land.

Cluster analysis shows that land reform should target appropriate subgroups within the community in order to differentiate those who would make use of the extra land from those who would not and so applying strategies to each one. It reveals the importance of subgroups in determining an appropriate strategy for tackling poverty. Three distinct groups are found within our dataset that explain most of the variation. The first group represent younger, more educated with the smallest amount of land that live more on Terai near local amenities followed by second group of older household head with the more amount of land and a number of adult workers and finally, the third group represents as poorly educated households that lives in the mountains, therefore being far removed from local amenities. It seems wisest to target the first group who are more educated who have the knowledge to make use of extra land followed by second group with the provision of education and other infrastructures. Similarly, as the third group seems inhibiting their growth by education, location and other factors it is sensible to move this group to other sectors of the economy such as to industry.

Land reform is an effective approach to tackle poverty, but needs to do so as part of a larger, carefully constructed reform procedure. Whilst the data used to form these recommendations are restricted to Nepal, such patterns may apply more widely to other developing countries in the world with similar issues and conditions. This study considered not a subsection of a country as previous studies (see section 1), but more broadly, the whole country. It therefore reaches into an unknown void, the gap of which will be duly plugged by further studies in other nations which will verify just how widely applicable such findings are.

Table 1: Significant explanatory factors from previous studies

Authors and Dates	Land Size	HH Size	Education	Age	Gender	Infra-structure
Finan et al. (2005)	√	√	√	√	√	√
Lopez & Valdes (2000)	√	√	√	√		√
Gunning et al. (2000)	√	√	√			
Scott (2000)	√	√	√	√		
Szekely (1998)		√	√	√	√	√
Grootaert et al. (1997)	√	√	√	√	√	√
Coulombe & McKay (1996)	√	√	√	√	√	√
Rodriguez & Smith (1994)		√	√	√	√	√
Kyereme & Thorbecke (1991)		√		√	√	√

Table 2: OLS and GAM Estimation of the Consumption Equation

Coefficients:	OLS Estimation				GAM Estimation			
	Est.	St.Err	t-	p	Est.	St.Err	t-	P
Intercept	10.453	0.054	194.014	<0.001	10.400	0.052	201.550	<0.001
Age	0.001	0.001	1.097	0.273	0.001	0.001	0.958	0.338
HH Size	0.104	0.010	10.060	<0.001	0.104	0.010	10.095	<0.001
HHH Edu	0.037	0.003	11.177	<0.001	0.036	0.003	11.097	<0.001
Edu.<10	0.042	0.012	3.483	0.001	0.044	0.012	3.640	0.001
SLC	0.139	0.028	4.971	0.000	0.134	0.028	4.800	<0.001
Inter	0.331	0.048	6.876	0.000	0.320	0.048	6.660	<0.001
>B.A	0.314	0.067	4.719	0.000	0.312	0.067	4.696	<0.001
Age <10	-0.109	0.013	-8.546	<0.001	-0.109	0.013	-8.541	<0.001
Age10 to18	0.001	0.014	0.102	0.919	-0.002	0.014	-0.113	0.910
Age18 to 60	0.036	0.011	3.127	0.002	0.033	0.011	2.893	0.004
Age.60	0.013	0.020	0.633	0.527	0.011	0.020	0.548	0.584
Road	-0.001	0.001	-0.862	0.389	-0.001	0.001	-0.983	0.326
Pri. School	-0.058	0.020	-2.948	0.003	-0.060	0.019	-3.085	0.002
Hospital	-0.093	0.011	-8.546	<0.001	-0.091	0.011	-8.376	<0.001
Mountain	-0.054	0.032	-1.674	0.094	-0.053	0.032	-1.651	0.099
Terai	-0.094	0.023	-4.094	0.001	-0.101	0.023	-4.418	<0.001
Log Land	0.089	0.009	9.665	<0.001				
R²	0.437				0.440			

Table 3: OLS and GAM Estimation of the Income Equation

| Coefficients:	OLS Estimation				GAM Estimation			
	Est.	*St.Err*	*t-*	*p*	*Est.*	*St.Err*	*t-*	*P*
Intercept	10.290	0.070	146.500	<0.001	10.220	0.067	152.300	<0.001
Age	0.002	0.001	1.902	0.057	0.002	0.001	1.760	0.079
HH Size	0.086	0.013	6.399	<0.001	0.085	0.013	6.375	<0.001
HHH Edu	0.045	0.004	10.430	<0.001	0.044	0.004	10.286	<0.001
Edu.<10	0.049	0.016	3.067	0.002	0.049	0.016	3.120	0.002
SLC	0.144	0.036	3.947	<0.001	0.137	0.036	3.757	0.000
Inter	0.375	0.063	5.983	<0.001	0.364	0.063	5.823	<0.001
≥B.A.	0.437	0.087	5.038	<0.001	0.434	0.087	5.017	<0.001
Age <10	-0.101	0.017	-6.034	<0.001	-0.100	0.017	-6.035	<0.001
Age10 to18	0.015	0.018	0.862	0.389	0.012	0.018	0.654	0.513
Age18 to 60	0.067	0.015	4.469	<0.001	0.064	0.015	4.294	<0.001
Age ≤ 60	0.036	0.027	1.364	0.173	0.033	0.027	1.234	0.217
Road	-0.001	0.001	-1.127	0.260	-0.001	0.001	-1.195	0.232
Pri. School	-0.071	0.025	-2.809	0.005	-0.074	0.025	-2.926	0.004
Hospital	-0.092	0.014	-6.439	<0.001	-0.089	0.014	-6.266	<0.001
Mountain	0.001	0.042	0.033	0.974	-0.002	0.042	-0.043	0.966
Terai	-0.089	0.030	-2.990	0.003	-0.097	0.030	-3.254	0.001
Log Land	0.115	0.012	9.516	<0.001				
R^2	**0.370**				**0.373**			

Table 4: GAM Estimation of Marginal Value of Land for Income & Consumption

Land Owned (in Hectare)	Household Category	Income	Consumption
Less than 1	Small	5.25	4.17
between 1 and 2	Medium	8.76	4.16
Over 2	Large	9.75	11.92

Graph 1a: OLS and GAM fitted to Nepal Data for Consumption
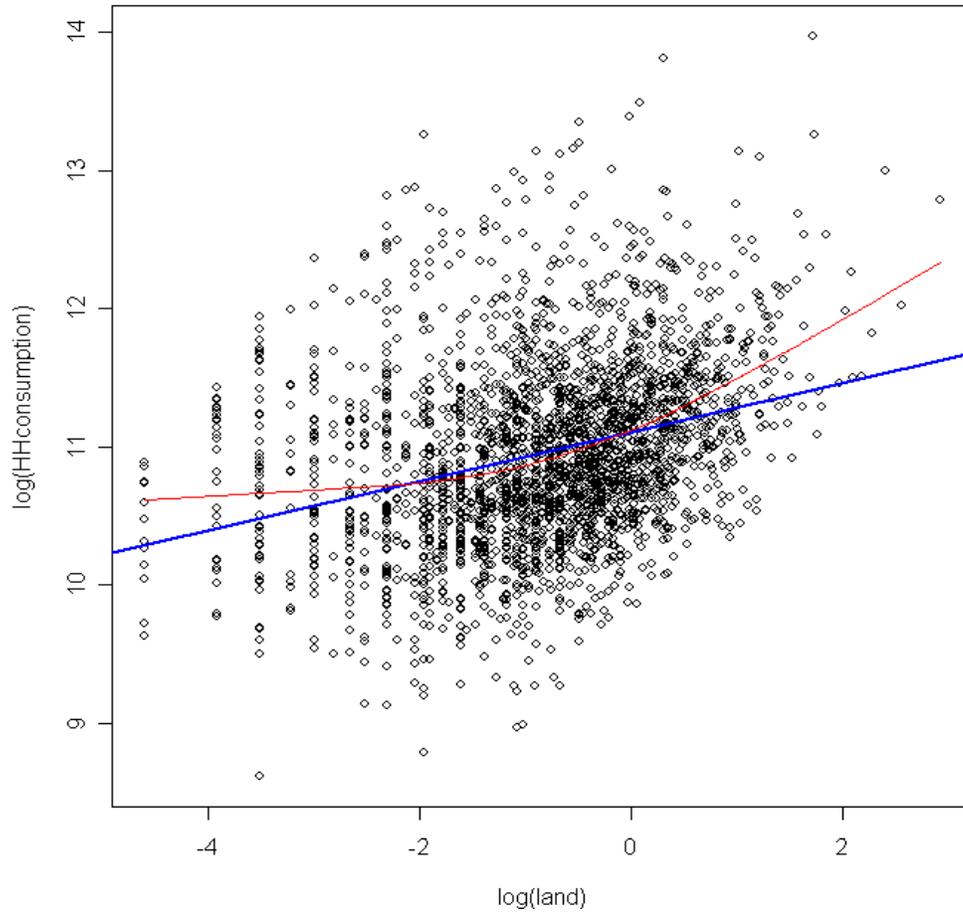
Graph 1b: OLS and GAM fitted to Nepal Data for Income
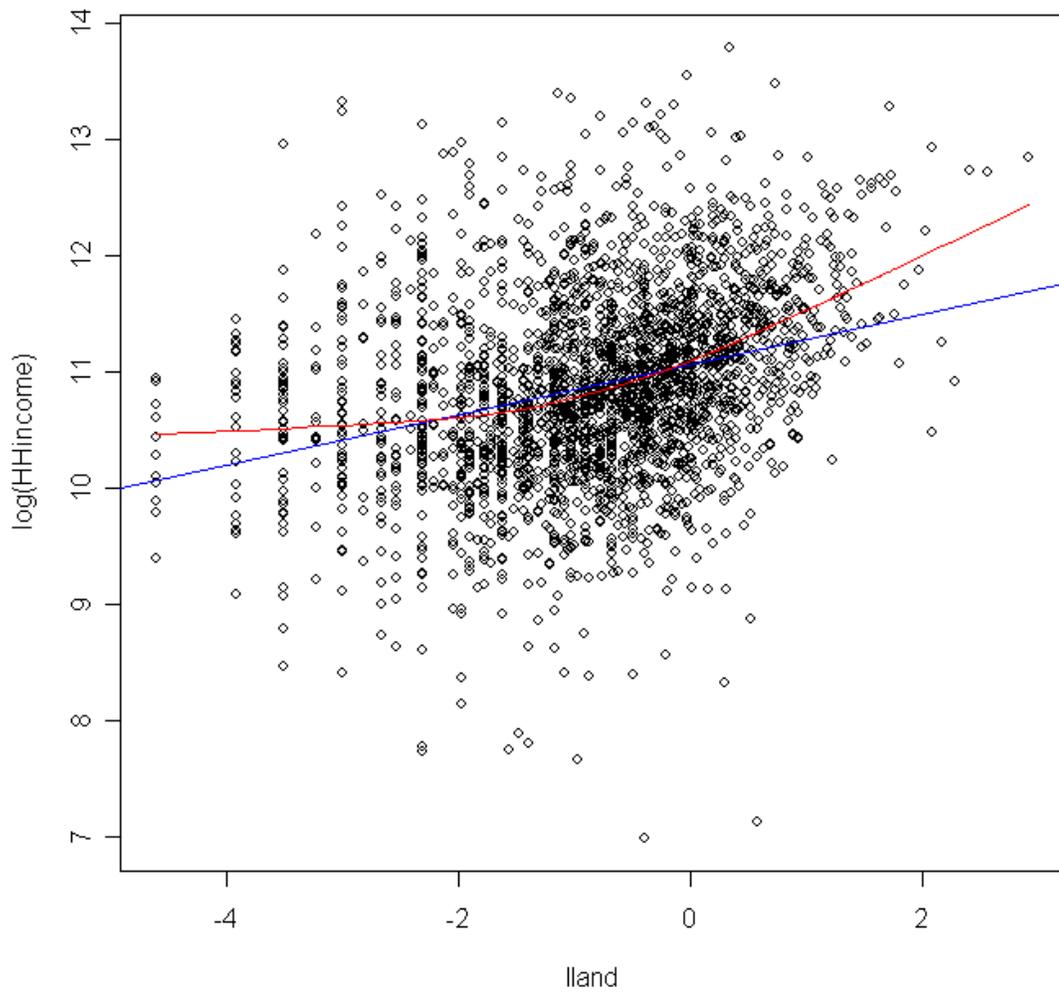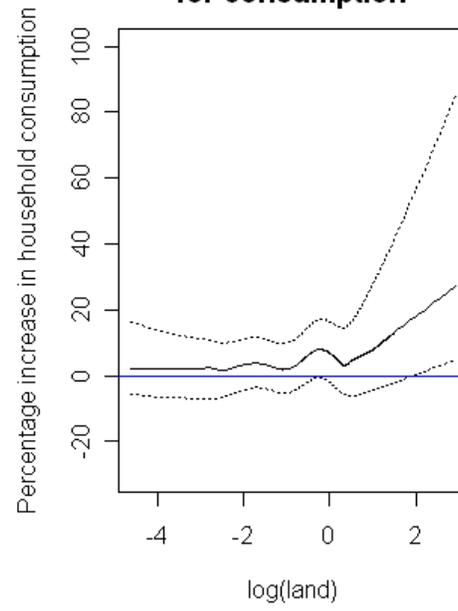

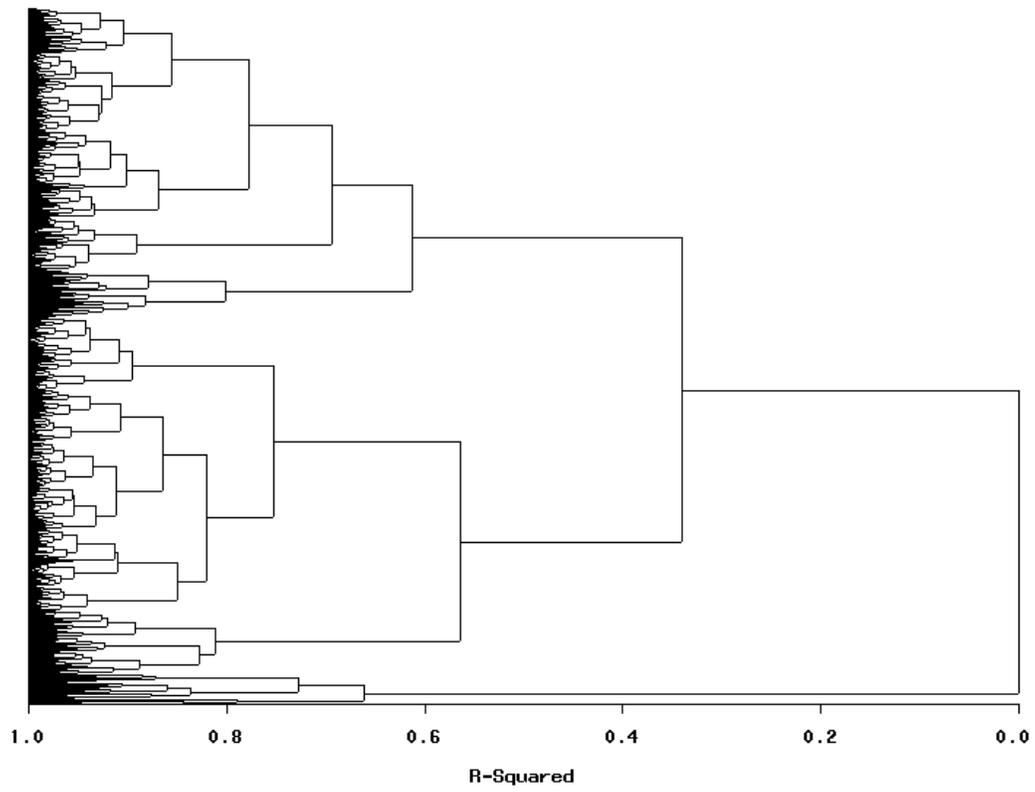**Graph 2: Marginal values of land for 50% increase in land.**

a) Marginal value of land for income
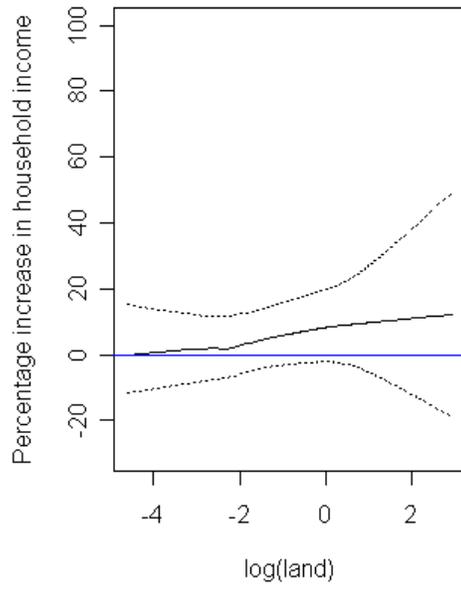
b) Marginal value of land for consumption

Graph 3: Dendogram for explanatory factors within our model

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[1] The government was able to recognise only 50, 580 hectares of land with 9136 landowners above the ceiling, though the expectation was for nearly 600,000 hectares. Out of which only 34,705 hectares were acquired and only 21,050 hectares were redistributed to 10522 households. The estimated compensation payable was Rs 22.40million (Zaman, 1973).

[2] The land ceiling per family was 7 hectors in *Terai*, 1.1 in Kathmandu valley, and 2.75 hectares in hills.

[3] The LSMS is a household survey approach developed by World Bank and applied in more than 50 developing countries in the world. Out of 3912 total sample households a total of 2585 households were taken for the analysis excluding the rest due to incomplete data.

[4] Mountain lies in the North with 3,000-8,848m above mean sea level whereas Hill lies in the middle and Terai in the South with 300-3,000m and 60-300m respectively. Physiographically, 35% of its land lies in the mountains followed by 42 % in the hills and 23% in the *Terai* (CBS, 2004c)