Common Property Resource:
Victim of ambiguities in and failure of property right institutions during transition
and restructuring of the Ethiopia economy

Ayalneh Bogale (PhD)
Alemaya University
P.O. Box 170
Alemaya University
Ethiopia
e-mail: ayalnehb@yahoo.com

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Abstract

Survey data from 149 randomly selected rural households in Hirna watershed in eastern Ethiopia were used to identify determinants of household choice among alternative land property right regimes to help mitigate negative consequences of scarcity induced land degradation and land related conflicts. Socio-economic, demographic, agro-ecological, and institutional information were collected with the help of interview using structured questionnaire. It has been observed that absence of clearly defined property right and management plan have led to overexploitation of the hillsides leading to perpetuation of poverty and food insecurity.

The study used an adaptation of the multinomial model to environmental entitlement framework and theory of collective action for empirical analysis. Multinomial discrete choice models were specified for explaining decision of household heads for most preferred property right regimes. Overall, variables including dependency ratio and level of education of the household head provide the most predictive power whether or not the household prefers common property resource regime, where as number of household members, livestock holding of the household and area of cultivated land lost due to enclosure of part of the watershed were found to be more relevant in determining household's preference for resettlement to other potential areas. On the other hand, age of household head, number of household members and level of education of the household head were found to be statistically significant in determining the likelihood that a household prefers intensifying agriculture.

The paper finally concludes that most institutional solutions proposed by the primary resource users as an optimal way to deal with resource degradation problem originating from failure in property right regimes to community forestry depend up on different properties of the actors and their resource endowment. Hence, authorities need to have better knowledge of how they should orient their effort to intentionally design institutional innovation that might enhance rural livelihoods but also responsive to the natural resource.

1.   Introduction

Land is considered the most fundamental resource to the poor and is essential to generate income, accumulate wealth and transfer it between generations, and enabling them to prevaricate from human insecurity. More than 85 percent of the population in Ethiopia is dependent on land for livelihood. Of these, the poorest ones are those who lack material resource including productive land and education. The near-landless and landless poor in Ethiopia lack means of production and remain food insecure. They lack access to education because school fees and associated costs become prohibitive. Subsequently, this means lack of better-paid and regular employment.

In this context, providing security of tenure is often seen as a precondition for intensifying agricultural production; and it is now being increasingly stressed as a prerequisite for better natural resource management, sustainable development and reduce household vulnerability. Rural people generally need both secure individual rights to farm plots and secure collective rights to common pool resources upon which the whole village depends. Farmers will be more likely to make medium- to long-term land improvements if their tenure is secure because they will be more likely to benefit from the investments made by them. There would be fewer disputes and they would be able to use resources that might otherwise have been used for litigation (Roth and Haase, 1998). Assuming the existence of viable technologies, access to inputs and extension advice, and the availability of household labour and financial resources, enhanced tenure security will lead to higher investment and higher agricultural production. Therefore, the way in which property rights to land are defined and the efficacy in administering it and resolving conflicts among economic agents is crucial for the country's overall development (EEA/EEPRI, 2002).

It is not surprising, therefore, that the challenge of reducing household vulnerability in rural areas of Ethiopia is so formidable within the existing framework of the incomplete property rights to land and scarcity of natural resources that have been leading to resource degradation and impoverishment of the resource users. Many researchers have raised a number of issues on the prevailing property right to land, its detrimental effect and potential disastrous consequences to the country's agrarian population (Dessalegn, 1994). Dejene and Teferi (1995) argued that existing tenure system has no mechanism to make land relatively accessible to more efficient vis-à-vis the less efficient ones.

The use of natural resources is often a source of conflict for a number of reasons. First, natural resources are embedded in an environment that is so interconnected in space that actions by one individual or group may generate effects at far off-sites. Furthermore, the nature of the problem may not be apparent because ecological relationships are often poorly understood, and/or go

unnoticed, at least in the short-run. Understanding conflict is a prerequisite to developing approaches to resolving it through cooperative means, whether via community-based natural resource management or otherwise. This requires both a material analysis of the basis for resource use and a social analysis of the stakeholders involved. The implication here is that conflict and its resolution need to be examined in its ecological, socio-cultural, economic, political, and policy contexts.

The issue of resolving conflict in resource utilization has been given due attention by the Ethiopian Government, its development partners and NGOs. Indeed, various interventions have been crafted at both national and local levels to address what is believed by many to be Ethiopia's critical development challenge. Yet, it appears that such interventions should consider the added dimensions of resource entitlement and collective action to harmonize the environment-society relationship.

Against the background provided above, this study aims at sensitizing policy makers, contribute to policy dialogues and to the development of actions, which would enhance the capability of rural households to resolve resource scarcity induced conflicts and to help rural households to cope with resource degradation. In order to achieve these goals, the present study attempts to identify significant variables in the households choice for the most preferred property right regime which may reduce human insecurity by increasing the efficiency of land use and management based on proper understanding of alternatives.

2.   Theoretical Framework: Resource degradation, scarcity and property rights

One of the major challenges facing humankind is the suffering of vast populations in the developing world from shortage of good lands, water, forests due to degradation and depletion of resources. A number of studies have documented the linkage between resource degradation and conflict (Dabelko, 1996). Even though the description of such linkages differs in terms of methods, definitions and goals, a number of shared elements allow for some generalizations. Reduction in quality and quantity of a resource shrinks the resource pie, while population growth divides the pie in to smaller slices for each individual, and if the resource distribution is unequal, some groups get disproportionately large slices (Homer-Dixon, 1994)

Conflicts over natural resources may have class dimensions, pitting those who own the resource against those who own nothing but whose work makes the resource productive (Chenier et al., 1999). Political dimensions may dominate where the state has a keen interest in a public good such as conservation (Fisher et al., 1999) or in maintaining the political alliances it needs to remain in power (Suliman, 1999). Differences in gender, age, and ethnicity may inform the use of natural resources, bringing to the fore cultural and social dimensions of conflict (Hirsch et al.,

1999). Even the identification of natural resource problems may be contested in light of different information sources, world views, and values (Arrarte and Scarlato, 1999). Although this paper does not intend to explore all of these dimensions, the dialogue between them is multifaceted.

There is a general tendency among scholars to interpret the linkage between environment and conflicts as a question of struggle for scarce natural resources. In fact, environmental conflicts can manifest themselves as conflicts over resources and that they often do so. The understanding of these conflicts requires a thorough understanding of institutions, which determine, or rather, shape human agency in regard to conflict as well as to natural resources. In this paper, we will carefully distinguish between institutions and governance structures, or between rules and organizations.

One of the main reasons underlying the increased incidence of land related conflict in most sub-Saharan African countries is the failure of the prevailing property right to land to respond to the challenges posed by population growth and other exogenous factors including technological change (Deininger and Castagnini, 2004). Land tenure system in Ethiopia is also described as failing to provide the basis for higher levels of investment and productivity enhancing land transfer rather than the dissipation of land degradation.

Property rights refer to the sanctioned behavioral relations among actors that arise from the existence of physical entities and focus on the cost and benefit streams from using them. Effectively, property rights assignments specify the norms of behavior with respect to these costs and benefit streams that each person must comply with, or bear the cost for non-compliance. Property rights can be defined as *"the capacity to call upon the collective stand behind one's claim to a benefit stream* (Bromley 1991)." Thus, property rights involve a relationship between the right holder, others, and an institution to back up the claim. Property rights over land and other natural resources are often broadly classified as public, common, and private or "legal individuals" such as companies. Property rights consist of bundle of rights. Following Schlager and Ostrom (1992), this bundle consists of access, withdrawal, management, exclusion, alienation. Complete title is generally interpreted as holding all four sets of rights (Pejovich 1990; Cooter and Ulen, 1997).

Property rights theory is often misunderstood as an approach explaining the definition and distribution of disposition rights focusing on physical entities (Hagedorn et al., 2002). Strictly speaking, actors only attribute (positive or negative) values to a physical good because the right holder is favored by *benefit streams* or in case of a duty is burdened by *cost components* which are connected with the physical good.

3.   Agro-ecology and evolution of the enclosure of Hirna watershed

The study has been conducted at the Hirna watershed of Tulo District in West Hararghe Zone of the Oromiya National Regional State, Ethiopia. It has an altitude ranging from 1750-1990 meters above sea level (masl). The watershed is bounded by a series of hills and mountain chain in the west, east, southeast and north with a narrow common natural drainage channel following the Hirna River in the south west of Hirna town, thereby forming a topo-sequence. The watershed is characterized by rugged topography and steeply sloping mountainous landscapes with severe erosion hazard.

Based on the recent agricultural zonation of the country, the climate of most of the Hirna district falls under the semi arid zone. Rainfall is bimodal with average annual rainfall of 1002 mm. The small rainy season (*Belg*) occurs between March and May with a mean seasonal rainfall of 366 mm whilst the main rainy season (*Kiremt*) covers July to September with a mean seasonal rainfall of 636 mm and a peak mean rainfall of 226 mm being received in August. The annual mean minimum, average and maximum air temperatures at the Hirna station are 18.2, 23.6 and 25.7 ^{0}C, respectively.

The area is one of the highly populated regions in the country. Similar to other rural areas of the country, agriculture is the predominant source of food and income of the people in the district. Crop and livestock production in the region is largely determined by climatic factors. Agricultural productivity in the region is generally very low. Major soil and water related agricultural problems in the region include *inter alia*, low and poor distribution of rainfall, soil moisture stress, poor drainage and flooding in the valley bottoms, soil erosion and/or land degradation, low soil fertility, mainly low organic matter and nitrogen contents, shallow soil depth and coarse textured (droughty) soils.

The establishment of the Hirna watershed enclosure, especially the delimitation of its boundaries which started in 2000, provoked the first major conflict of interest with the local population, essentially over the move from a system of free access to one of restricted access, without any effort to provide information, or negotiate with key users of the resources. The process of change began in early 2000, partly as a result of the prevailing resource degradation that demanded local groups and officials to undertake a great many initiatives. In the year 2000, when the Agriculture and Rural Development Office (ARDO) of Tulo District decided to protect the watershed by declaring the Hirna watershed enclosure, little attention was paid to the needs and interests of the local population and other groups. Moreover, because there was no legal or administrative framework to back up the provisions for establishing the enclosure both at regional and national level, the district council delegated the initial task of delimiting the boundaries in parts of the enclosure to the ARDO of the District. This decision was protested on the part of the community who had already encroached the hillslopes of the watershed. They created a climate of mistrust

and anticonservation sentiment among the local populace, a feeling that persists strongly even today. The measures were challenged and defied in various ways and to varying degrees by the affected households.

The local populace, poorly informed and excluded from the decision process, adopted a generally reactive position. People refused to recognize the continued dispossession of the land by the state. Very loosely organized resistance has been reported in various villages. These required a lot of work for development agents, peasant association leaders and district administration to defuse the tension. Some farmers attempted to disrupt the activities by uprooting seedlings and launching armed attack on guards, principally to reclaim the alienated land and to defend the remaining land from further expropriation. Others let their livestock graze on the hillslope during the night. Many households reported paying fine (*afelama*) for the damage they inflicted by grazing on the protected land. This opposition against land enclosure practices on the hillslope of Hirna watershed was waged primarily against the development agents who are responsible to implement the activities.

The unclear property right regime on the hillside resource coupled with complete absence of management plan hindered efforts to strike cooperative agreements and resolve common issues. The constant tug of conflict of interest between the resource users and the government seems to have obstructed objective appreciation of the long-term and/or indirect benefits of the conservation activity in people's lives.

Although local people lost access to the hillside resources and use of its resources, there are marked differences in attitude among community members. Some community members see their interest as extracting the maximum possible present benefit from the resource. Others, on the other hand, tend to be more sensitive to initiatives aimed at sustainable use of the resource and to be ready to make a long-term commitment to this end.

Cognizant of the above problems, a forum was created for regular discussion between involved local parties. It adapted some participatory research methods to allow participants to visualize complex issues through the use of simple techniques and pass resource governance to local institutions such as youth groups, women associations, *idir* (*afosha*), and group of villagers. The process began with interactive problem-solving discussions that sensitize groups involved. These groups are engaged in managing the area allotted to them in the hillside and engaged in various conservation activities such as constructing and maintenance of physical soil conservation practices including terraces and checkdams, and tree planting.

4. The study setup and methodology
4.1. Survey design and data acquisition

In order to have a clear understanding of the problems associated with environmental scarcity and conflict in which natural resource management fall into the responsibility of a group of users, it is necessary to be able to trace the interdependence through effective methodologies of acquiring reliable information. The first task in data collection phase was to identify major issues in the management of land and other resources in the region through literature review, examination of secondary data, and informal exploratory surveys. Informal surveys are particularly useful because reliable prior studies on resource degradation and conflict are often unavailable or, if available, are mostly incomplete. Since it was necessary to obtain a variety of information through questionnaire survey, the pre-tasting of the survey questionnaire was also done during the informal survey.

During the extensive survey, all the Peasant Associations (PA) in the Hirna watershed were covered and semi-structured group interviews with community representatives were conducted. These were supplemented by information acquired from key informants with the help of moderation toolkit. At this stage data was collected on land use pattern and farming systems, the evolution of enclosure of the hillside and its progress, land rights and land tenure systems, rules of resource uses, development of formal and informal land market, history of and change in use of natural resources and their acquisition.

The selection of appropriate communities for intensive household survey was based on the intermediate results of the extensive survey. One of the selection criteria was to ensure representation of communities with contrasting characteristics in terms of prevailing land tenure institutions, farming systems, and degradation and protection of the natural resources. The sample size considered the complexity of the issue and accuracy and coverage of data necessary for the statistical analysis to be used.

Three Peasant Associations were selected purposively for the study, namely Kira Kufis, Reketa Fura and Oda Belina. Then we followed the probability proportionate to size random sampling procedure to select 43, 34 and 62 households from Kira Kufis, Reketa Fura and Oda Belina peasant associations, respectively. Even though, random sampling procedure has been generally applied, the households that became near-landless due to the enclosure and were forced to migrate to the town as laborer and those who decided for resettlement in other parts of the country through government support but returned back for different reasons were included in the sample, purposively.

A structured questionnaire was designed and pre-tested before executing the intensive household survey. The survey elicited information on household characteristics such as demographic

characteristics, education, inventory of assets, history of acquisition of assets, current production and non-labor input use, property rights, investment in conservation of natural resources, among others. The plot level information was supplemented with subjective assessment of soil fertility and slope, details of land related conflict, participation in land market and decision-making and agricultural output.

4.2. *Framework for econometric analysis*

The study attempts to investigate factors associated with choice of various property right institutional arrangements for sustainable use of the land resource. We assume that farmers in the study area choose an alternative arrangement if the private benefits from the specified choice exceed the cost they incur, i.e. the net benefit (NB) is positive. Among the various private benefits are gains from crop cultivation, grazing livestock, extracting firewood and construction poles. In addition, some land use may provide additional utility obtained from non-market benefits resulting from reducing erosion on croplands. On the other hand, costs include not only part or all of the economic and social costs of mobility in case a household is displaced, but reduced productivity, additional cost to enhance or maintain productivity such as the use of fertilizer, high yielding varieties and pesticides.

The net benefits (NB_j) derived from the *j*-th alternative arrangement can be modeled as a latent variable, which is a linear function of a vector of attributes which characterize the *i*-th household, X_i: i.e.,

(1) $NB_j = X_i\beta_j + \varepsilon_j$ Where $\varepsilon_j \sim N(0, \sigma^2)$, $j = 1, 2,.....J.$

where β_j represents parameters to be estimated and ε_j the disturbance term. The disturbance terms are assumed to be independently and identically distributed. If the farmer's choice is arrangement *j*, this implies that:

(2) $Pr(NB_{ij} > NB_{ik},)$ $\forall\ k \neq j.$

where NB_{ij} is the net benefit to the *i*-th household of alterative *j*, and NB_{ik} is the net benefit of alternative *k* to *i*-th household. If each arrangement is considered as a possible decision choice by the farmer, the decision maker is expected to choose that alternative which will maximize the present value of net benefit. Therefore, given finite set of alternatives to select from, the decision of the *i*-th household can be modeled as maximizing the present value of streams of net benefits by picking the *j*-th alternative from among the *J* discrete choices available such that:

$Max_J\ \{E(NB_{ij}) = f_j(X_i) + \varepsilon_j\},$

Where f_j is a function of $X_i = (X_{i1},\ldots, X_{in})$, which is a (1 x n) vector of attributes of the i-th household that are expected to potentially affect the desirability of an alternative.

In the study area, we can distinguish among four arrangements namely, private property right, i.e., distribute the hill slopes to individual households for use and control (j = 1), common property resource (j = 2), resettlement of households encroaching the hill slopes to other potential areas (j = 3), and move the households from the hill slopes and intensify agriculture with the use of external inputs in the less sloppy segment of the watershed (j = 4). Given the multinominal nature of such institutional arrangements, and assuming that a household can identify the most preferred arrangement, a multinomial logit econometric technique Greene (2003) can be used in the empirical investigation of the factors associated with the decision of the households.

Since NB_{ij} is latent, it is not observable. Therefore, let Y_{ij} be the indicator variable, so that:

$$(3) \qquad \Pr(Y_{ij} = j) = \frac{\exp(\beta_j X_i)}{\sum_{k=1}^{J} \exp(\beta_j X_i)},$$

where Pr(.) is the probability that the i-th household most prefers the j-th arrangement. X_i represents a vector of demographic, economic and spatial characteristics for the observed individual households. β_js are a vector of estimated parameters. Normalization of the alternatives by one of the categories ($\beta_k = 0$) yields the multinomial logit model as:

$$(4) \qquad \Pr(Y_{ij} = j) = \frac{\exp(\beta_j X_i)}{1 + \sum_{k=1}^{J} \exp(\beta_k X_i)},$$

The probability of omitted (j-th) alternative was derived from the formula:

$$(5) \qquad \Pr(Y_{ij} = j) = \frac{1}{1 + \sum_{k=1}^{J} \exp(\beta_k X_i)},$$

where $\Pr(Y_{ij} = j)$ is the probability that individual i chooses alternative j. The X_i is a vector of characteristics of individual i, J is the number of unordered alternatives, β_j measures the contribution of personal characteristic i to the probability of choosing alternative j, and β_k measures the contribution of personal characteristic i to the probability of selecting alternative k.

The log- likelihood function for the multinomial logit model is given by:

$$(6) \qquad \ln L = \sum_{i=1}^{n} \sum_{j=0}^{J} d_{ij} \ln \frac{\exp(\beta_j X_i)}{\sum_{k=1}^{J} \exp(\beta_k X_i)} ,$$

where $d_{ij} = 1$ if individual i chooses alternative j and $d_{ij}=0$ otherwise (Greene, 2003; Han and Harrison, 2004). Since the coefficients of such models are not directly interpreted in contrast to OLS results, marginal effects (δ_j) were estimated to express the probability of change in alternative arrangement with respect to each independent variable, measured from the mean of the variable.

$$(7) \qquad \delta_j = \frac{\partial P_j}{\partial x_i} = P_j \left[\beta_j - \sum_{k=0}^{J} P_k \beta_k \right] = P_j \left[\beta_j - \bar{\beta} \right],$$

The marginal effect on the redundant category is obvious as the sum of the marginal effects of all alternatives equals to zero. The data were analyzed employing LIMDEP version 7.0 econometric software. More over, descriptive statistics has been used to analyze the demographic characteristics, asset endowment, and institutions that govern resource entitlement, use and system performance.

5.   Results and discussion
5.1.   Descriptive characteristics of the sample households

Factors that have contributed to natural resources scarcity are manifold and varied ranging from socio-economic to environmental, the spectrum is indeed very broad. Among the socio-economic factors are demographic characteristics of rural households, inadequate resource endowment, and inadequately developed infrastructure. Table 1 provides with information on general characteristics of the households included in the sample.

The mean family size is 6.7 persons per household of which 2.93 are adults, with a head who is 40.63 years of age. The age structure of rural households reflects the level of dependency of elder and younger members of the household and can influence its production decision as well as livelihood strategies. A typical household in the study area consists of 3.74 dependent members and more than 34 percent of the sample households have at least 4 dependent members. The implied dependency ratio, the ratio of the number of household members younger than 14 years and older than 64 years old to the number of household members between 15 and 64 years old, is 1.51.

There are adequate findings suggesting that education can improve productivity of rural households and promotes the efficiency of resource use at the farm level in response to resource scarcity. It affects the smallholders' state of knowledge of available technologies and management practices and helps them generate ideas at the right times and places to keep resource scarcity from negatively affecting their well-being.

(Table 1: about here)

Although this is the general fact, the ill-funded educational sector of Ethiopia until recently could not fulfill the development needs of the economy. Not surprisingly, the gross enrollment ratio is among the worst in the world, the estimate for the 2001 being 57.4%. The results obtained from the survey data also confirm the same fact. Over all, almost 24.5% of the household heads are illiterate and further 36% of them never attended school but can read and write. This calls for concrete action by policy makers towards creating human capital, which can serve as an engine to escape from poverty and persistent food insecurity. There remains a lot to be done at least to bring these figures to a level, which may be acceptable at the world standard.

A key indicator of welfare of rural household in Ethiopia is the possession of land and livestock. Land is essential natural resource both for survival and prosperity as well as an important source of violent conflict. Land is becoming more and more scarcer as a resource. Competition among different uses is becoming acute, more frequent and complex. Population pressure in rural areas has resulted in the expansion of cropping to more marginal lands where physical factors limit potential productivity and the risk of failure is higher.

Data from the 139 sample households show that the average cultivated land has declined from 0.85 ha in 1990 to 0.80 ha in 2003. However, it has shown increment between these years because of encroachment to the previously protected hill slope. From this farm size, an average household supports 6.7 persons, which imply that every person should live on 0.13 ha of land in 2003, which is too little to make a livelihood sustainable. The problem has manifested itself in terms of eroding the capacity of rural households to attain food security.

Land fragmentation, caused principally by institutional, agro-climatic, and socioeconomic factors, is a common phenomenon in the study area. Sample households hold a total of 112 ha of cultivated land distributed over 352 plots with average plot size of 0.32 hectares. Fragmentation of land is considered by some as a strategy adapted to overcome agro-climatic and natural problems and to respond to subsistence needs of the peasant households. Due to continuous fragmentation, however, farm plots are turned into smaller and sub-optimal sizes that are not convenient for efficient use of the available resources, technology adoption, and natural resources conservation.

The importance of livestock as a production factor, store of wealth and hedging against risk deserves an important place in the discussion of resource endowment of subsistence farmers in Ethiopia. The livestock system provides a multitude of products, which may find themselves in conflict. The number of oxen in a herd that are needed for draught purposes are indirectly kept at the expense of female breeds, thus reducing the herd's reproductive potential and milk production but promoting crop production.

A pair of oxen is required to draw the *maresha* (traditional plow) for land preparation. It will take five to six days to plow a hectare of farmland with a pair of oxen depending on the soil type, slope and stage of land preparation, the first plow requiring the longest time. However, nearly 31% of sample households do not posses any oxen, a further 45% have only one ox. That implies almost 76% of the sample households do not posses the required minimum number of oxen (i.e. two) to perform land preparation. The livestock system also contributes to crop production by provision of manure. In the study area, farmers are observed frequently applying manure on plots on which high value crops are grown.

5.2. *Socioeconomic effects of resource scarcity*
5.2.1. Perpetuation of poverty and food insecurity

There is no disagreement about the current dreadful state of resource scarcity, expressed in terms of cultivated land per household in rural Ethiopia. It has reached an alarmingly lower level exposing millions of rural households to vulnerability to food insecurity. As households fail to meet the requirement of their household members and get more impoverished, they are forced to strip the land of its resources. They strip trees for firewood, charcoal making and construction poles, leaving the hill slope bare, exposing it to erosion. As a consequence, agricultural productivity has decreased. In the survey year, farmers harvested only 962 kg of cereals per hectare as compared to 1132 kg in 1995. Almost 58% the sample households stated that the harvests they obtained from the cultivated land is not adequate to support their family members through out the year. The survey revealed that 30.6% of the sample households can feed their family members from January until June, i.e., for only six months in a year.

As agricultural resources are degraded, poor households switch to low-paying jobs in the near-by towns, but their plots are quickly taken by others desperate for cultivated land. Resource scarcity also causes individual households to focus on narrow survival strategy, which reduces the interaction of civil society and weakens local institutions. This segmentation reduces social capital- trust, norm and networks, which gives an opportunity for powerful groups grab control over resources inviting conflict.

This is manifested by the decline in frequency and duration of participation of households in community affairs. As compared to a decade ago, only 43.7% of the household heads maintained their membership of local organizations. More over the drive for collective action to successfully maintain the natural resource are failing. Almost all sample households feel that it is the responsibility of the government to look after the sustainability of the natural resource. These responsibilities include planting trees and maintenance, constructing various conservation structures and enforcing rules for use and non-use of the resource on the enclosed hill slope.

5.2.2. Incidence of conflict

Increased scarcity of cultivated land, which can support a family of rural households provokes for action by households towards protecting their interest. The culture of self-interest rules over the culture of cooperation, goodwill, civic mindedness, and mutual trust. These narrow interests often impede building institutions that reflect the broader interest of the society. They hinder efforts to reform social institutions that can serve larger public interest at the slightest expense of individual's self-interest.

At the time of critical resource scarcity, local institutions were vital part of the complex conflict setting and as such they were incapable of addressing the regulative needs of common property use. While most families seem to entertain friendly relationships with their neighbors, some reported lack of unity and occurrence of frequent quarrels in their villages.

As many rural households lost part of their cultivated land at the hill slope and had thus become economically vulnerable, they often did have no choice other than taking the risk and try to come to terms leading to conflict with the neighborhoods particularly by blurring the boundaries between plots. Out of the total of 352 plots owned and operated by the sample households, it is reported that 63 plots (nearly 18%) were subject of conflict of varying degree, ranging from minor dispute between individual owners to conflict among communities and peasant associations.

5.3. Correlates of the most preferred land use arrangement

As mentioned above, the multinomial logit analysis was performed using the LimDep 7.0 Discrete choice logit procedure. The model was determined as systems of equations in which equations for various best preferred land property right regime were jointly determined using iterated seemingly unrelated regression. Table 2 reports the results for estimated coefficients, marginal effects and standard error of marginal effects of each of the variables in each of the jointly determined models. The model chi-squared statistic is significant at the 1% level of probability.

The parameter coefficients of such models are difficult to interpret directly. Instead the marginal effects are the only means to effectively interpret the effect of explanatory variables on the distribution of proportion of dependent variables. Marginal effects are the probability of change in favor of a specific arrangement with respect to each independent variable, measured from the mean of that variable. A positive or negative sign of marginal effects, the only reliable indicator in such models, indicates an increase or decrease in the probability of preferring a given property right under consideration.

It was observed that there are some statistically significant variables that provide predictive information on the household's best preferred property right system. Overall, variables including dependency ratio and level of education of the household head provide the most predictive power whether or not the household prefers common property resource regime, whereas the number of household members, the livestock holding of the household and area of cultivated land lost due to the enclosure were found to be more relevant in determining household's preference for resettlement of those households who encroached the hillside and other landless households in some other potential areas. On the other hand, the age of household head, the number of household members and the level of education of the household head were found to be statistically significant in determining the likelihood that a household prefers intensifying agriculture.

Although the marginal effect of age of household in common property and resettlement were negative but not statistically significant. How ever, it was found to be positive and statistically significant for enclosure and intensifying agriculture. More specifically, if the age of the household increases by one year, it is 1.1 percent more likely that it will prefer property right regime which calls for enclosing the hill slope and at the same time intensifying agriculture on cultivated land. Theoretical expectation was that as age of the household head increases, it would be less likely that the household prefers resettlement. Because such arrangement would involve cost of displacement as well as uncertainties to which aged household heads may attach more important in decision making. But it is unclear why the marginal effects of age of household head are not statistically significant such arrangements.

(Table 2: about here)

If a household increases household size by one person, it is 4.7 percent more likely to fall in preferring resentment, and 5.8 percent less likely to prefer enclosure and intensifying agriculture, while the remaining coefficient on the household size is not statistically significant. The marginal effect for dependency ratio, however, indicates that if dependency ratio increases by one unit, a household is 8.6 percent more likely to prefer common property rights regime. The expectation was that an increase in dependency ratio implies addition of more children and old persons as household members which makes cost of displacement very high and therefore the household is

very unlikely to prefer resettlement to other places. Even though the sign of the marginal effect is still negative as expected, it was not found to be statistically significant. Hence, other things being equal, an increase in dependency ratio would have a positive and significant effect on household's preference for common property right regime.

The level of education of household head was found to be among the variables which have strong predictive power for preference of household for common property resource as well as enclosure and intensifying agriculture. Specifically, as household head is promoted from one education category to the next, it is 8.2 percent less likely to prefer common property but 14.1 percent more likely to prefer enclosure and intensify farming on cropped lands. An explanation for this may be sought in terms of the adoption and utilization of technologies which help intensify agriculture and increase productivity by households who have more information through exposure to education.

In communities characterized by mixed crop-livestock farming system, ownership of livestock is seemingly important in determining household's preference for a given property right regime. The ownership of livestock was found to be statistically important variable for resettlement. More over, the positive and statistically significant estimated marginal effect for area lost due to the enclosure of part of Hirna watershed imply that there is sufficient evidence to believe that as the cultivated area lost increases by one hectare, households are 30.8 percent more likely to prefer resettlement to other agriculturally potential areas.

6.   Summary and Conclusions

This study tried to argue that land scarcity in the context of absence of precise definition of property rights and failure to respond with appropriate technological innovation is bound to induce human insecurity leading to conflict. Some of the major indicators include land degradation, stagnant or declining productivity, perpetuation of poverty and food insecurity that may lead to strife and tension.

The case study of Hirna watershed offers a good illustration of such interlinkages between property right and degradation of the local ecosystem. Getting access to the rich agricultural land of the valley bottom was made difficult because of population growth in the study area. This forced the landless and poor community members to move to the hillside, which was supposed to be common land. Some migrated to the nearby towns and others moved to least productive and sometimes most ecologically vulnerable regions. They bring with them little knowledge or money to protect the fragile ecosystem and their small scale farming often caused horrendous environmental damage, particularly soil erosion. This has set in motion a cycle of falling food production, the clearing of more plots on the hillside for cultivation and causing further land

degradation. As a result, farm productivity has declined and also forced individual households to focus on narrow survival strategies that reduce the interaction of civil society and weaken the local institutions. This segmentation has reduced social capital and gave an opportunity for powerful groups to grab control over resources inviting conflict.

Even though not yet conclusive, the findings suggest that insecure property right to land resulted in resource degradation, and decline in productivity by 14 percent at plot level in terms of cereal production during the last ten years. More over, scarcity of cultivated land has also enhanced the likelihood of conflict that relates to use and control of natural resources. This calls for technological options that enhance productivity and at the same time capitalizing on indigenous institution to resolve conflicts.

This study also revealed a set of important factors that determine household choice of property right regime. The study shows that the age of household head, household size, dependency ratio, level of education of household head, number of livestock that a household owns and cultivated land lost due to the watershed enclosure are all significant factors in determining the probability of preferring a certain property right regime. Finally, we need to remind that if our vision is to ensure human security, the issue of property right should deserve its proper place in the development policy dialogue of Ethiopia.

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Table 1: Important Characteristics of Sample Households

Attributes	Best preferred property right regime									
	Over all		Private property		Common property		Resettlement		Enclose & intensify	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	mean	Std. Dev.
Age of HH head in years (HAGE)	40.63	9.58	41.88	9.47	39.91	8.56	40.21	7.75	40.40	11.70
Residence- town distance in minutes (DistTWN)	37.72	17.12	37.12	16.81	38.96	17.89	36.87	15.35	38.30	18.92
Size of the household (HHS)	6.70	2.05	6.74	2.33	6.74	1.65	7.33	2.08	6.07	1.84
HHS in Adult Equivalent (AEU)	5.57	1.66	5.67	1.93	5.51	1.27	6.05	1.69	5.07	1.50
No. of working and active members (ADLT)	2.93	1.24	3.18	1.47	2.65	1.11	3.05	1.123	2.77	1.19
Dependency ratio (DEP)	1.51	0.87	1.35	0.89	1.88	1.18	1.55	0.635	1.39	0.81
Education level of household head (EDUCHH)	1.37	1.11	1.06	0.98	1.04	0.928	1.44	1.095	1.74	1.22
total oxen (bulls) owned (Ox)	1.00	0.90	1.06	0.98	0.87	0.815	1.28	1.025	0.77	0.684
Tropical livestock unit (TLU)	3.13	1.68	3.44	1.48	2.83	1.67	3.59	2.16	2.619	1.147
Land holding in hectare (TLH)	0.80	0.41	0.82	0.43	0.84	0.487	0.87	0.43	0.704	0.309
Land holding per adult equivalent (LHPAE)	0.15	0.067	0.15	0.066	0.153	0.085	0.148	0.066	0.145	0.057
Cultivated land lost due to the enclosure (CLLOST)	0.25	0.46	0.42	0.777	0.277	0.324	0.149	0.28	0.20	0.259
Number of days the HH members participated in SWC	21.38	22.14	18.21	25.14	23.15	20.09	23.40	23.01	20.95	20.54

Table 2: Results of Multinomial Logit Model

| | Most preferred land property right regimes | | | | | |
| | Common Property | | Resettlement | | Enclose & intensify | |
Variable	Coeff.	Marginal effect	Coeff.	Marginal effect	Coeff.	Marginal effect
Constant	-0.860	-0.072	-0.720	-0.088	-0.226	0.054
		(0.238)		(0.319)		(0.335)
HAGE	-0.003	-0.002	-0.010	-0.006	0.044	0.011**
		(0.004)		(0.006)		(0.005)
DistTWN	0.006	0.000	0.009	0.001	0.012	0.001
		(0.002)		(0.002)		(0.002)
HHS	0.006	0.007	0.102	0.047*	-0.230	-0.058**
		(0.023)		(0.026)		(0.028)
DEP	0.636	0.086**	0.017	-0.022	-0.032	-0.038
		(0.040)		(0.056)		(0.059)
EDUCHH	-0.194	-0.082**	0.408	0.024	0.796	0.141***
		(0.035)		(0.044)		(0.046)
TLU	-0.175	-0.023	0.149	0.051*	-0.158	-0.037
		(0.026)		(0.031)		(0.036)
LHPAE	1.051	0.449	-2.297	-0.147	-4.342	-0.765
		(0.516)		(0.712)		(0.758)
CLLOST	-0.038	0.098	0.251	0.308**	-0.128	-0.030
		(0.089)		(0.150)		(0.131)

*, **, and *** represent 0.10, 0.05, and 0.01 levels of statistical significance, respectively.

Note: - Redundant category is "distribute the hill slope as private property"

- Figures in parenthesis are standard errors of marginal effects