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Driving forces in the expansion of enclosure among pastoral and agropastoral herders in Ethiopia

Fekadu Beyene

Haramaya University, Haramaya, Ethiopia

Abstract

The paper analyses factors influencing rangeland enclosure practices among groups of herders in eastern Ethiopia. The study employed logistic and linear regressions to identify the determinants. Linear regression results show that the labor endowment of a household has a positive influence on households' decision to enclose. Greater network density and membership in different social organizations produce disincentives. Livestock ownership and membership as a resident in a village have a positive effect on the area fenced. The logit model shows that wealth and ownership of private water points positively determine range enclosure. However, there is no positive linear relationship between labor endowment and area fenced. In addition, land allocated to crop farming has a negative influence, rejecting the hypothesis that herders' intention is primarily to cultivate the enclosed land.

Keywords: enclosure, property rights, rangeland, herders

JEL: P48, Q15

1. Introduction

The empirical literature on property rights in pastoral and agropastoral systems has increasingly revealed a controversy over the emergence of claims for private use of the rangeland. In explaining the reasons for the expansion of land enclosure and private use of land in pastoral areas of Africa, SWALLOW and KAMARA (1999) underline the role of both endogenous and state-supported individualization. For example, some investment activities associated with rangeland enclosure that could increase the value of land can motivate enclosure practice. This represents an internal driving force. Nevertheless, many argue that rangeland enclosure can arise from the state's influence inherent in its policy and intervention towards sedentarization of herders. State's action is often cited as the single great transformation to pastoralists' way of life and their communal tenure, as African states perceive them as 'potential threats to security

and evaders of fiscal dues' (LANE and MOOREHEAD, 1995: 123-127). Others associate such transformation of land use with the introduction of a new formal administrative system that can potentially preclude long distance mobility (KAMARA et al., 2004). Whether the driving forces are internal or external, an important observation is that wealthy pastoral and agropastoral herders may pose an influence on the existing *de facto* institutions to enclose larger area of land (ENSMINGER and RUTTEN, 1991; WOODHOUSE, 2003; SWALLOW and KAMARA, 1999).

The emergence of enclosure reflects dynamism in property rights. Although specialization into livestock increases labor productivity, diversification into opportunistic crop farming would enable herders to prevent sales of livestock to buy grains or use crop residues as feeds (BAYER and WATERS-BAYER, 1995; LANE, 1998). As some have deeply reviewed, there has been a debate between: (1) those arguing that pastoralism is bound to disappear and will be replaced by mixed crop-livestock systems and (2) others who rely on empirical results and indicate that mixed crop-livestock is less suitable than pastoralism owing to erratic rainfall condition. This debate does not seem to end at all (BARBIER and HAZELL, 1999).

In Ethiopia, where land use policy remains ambiguous, the use of marginal lands such as the rangelands for private uses, within the context of the possibility to generate reliable income in whatever form, has been subject to policy debates over the years (KAMARA et al., 2004; HOGG, 1997). An extensive study in the Somali region highlights the evolution of pastoral system into agropastoral land use in which an increasing competition from farmers for quality grazing land, enclosure of land at the valley bottoms and at the riverbanks characterize private seizure of quality land (DEVEREUX, 2006). Nonetheless, a thorough and systematic analysis of drivers of such change in land use, with a far-reaching implication on property rights to rangeland resources, is required to contribute to the development of effective land use policies. The objective of this paper is to identify and examine the incentives to claim for private enclosure.

Drawing on the evidence from the Somali and Oromo herders in eastern Ethiopia, the paper contributes to the emerging debates on land privatization in semi-arid environments where the driving forces for enclosure remain either unclear or are not firmly established. The next section provides a theoretical explanation for the emergence and expansion of enclosure through reviewing the property rights literature. Section 3 provides the analytical tools used. The fourth section presents the results and discussion. The last section concludes the paper and states some implications.

2. Some theoretical concepts

Property rights change has been the major subject of debate in the rural development policy circle. The New Institutional Economics literature emphasizes how and why they change. Analysis of drivers for enclosure, which involves a claim for private use rights to rangeland resources, requires in-depth understanding of the reasons for shift in property rights. Two theoretical arguments remain central. The first argument emerged consequent to the path-breaking article by DEMSETZ (1967) 'Toward Property Rights Theory'. Inspired by this classic idea, advocates of the new institutionalism firmly hold the view that an increase in resource value leads to a claim for more exclusive property rights. Property rights emerge when the benefits obtained from controlling access to resources exceed the transaction costs of defending the resource from others. Emphasis has since then been given to the social 'cost-benefit' comparison and the 'internalization of externalities' in introducing new property rights. That is, the gains from internalization of externalities must exceed the costs. Economic forces causing new opportunities (emergence of markets and newly introduced technology) should ensure cost-effective way of internalizing external effects (DEMSETZ, 1967).

Proponents of this view argue that economic actors gain (or fail to maintain) interest in the definition and enforcements of rights along with shift in marginal benefits and marginal costs of defining these rights (ANDERSON and HILL, 1977). It means that an interest for exclusive property rights arise when benefits from claiming rights exceed costs of negotiating and enforcing those rights. However, the recent literature criticizes the benefit-cost consideration since it does not give an explicit account of factors determining costs of a property regime and fails to explain a precise mechanism how benefits and costs are evaluated (MERRILL, 2002; BANNER, 2002; DE MEZA and GOULD, 1992).

The *second* argument is that the forces of change in property rights emerge between achieving economic efficiency and attaining equity (distribution). Since we need to make choices, we can attain one at the expense of the other. Many have argued that efficiency gains could not be realized when questions of distributional inequality are not answered (LIBECAP, 1989; WANG, 2001). The distribution view recognizes that the forces of change in property rights are the inherent dissatisfactions by certain groups or individuals from the existing property rights structure. The existing distribution of property rights may benefit some but harms others (LIBECAP, 1989).

As this continues to prevail, we will find a struggle over rights between "winners and losers" from the existing property rights system in which those losers in the prevailing rights structure become part of the process of struggle to speed up the process of change. On the contrary, those with a fear of distributional losses may take measures

to block property rights change if such actions cost little. This may even constrain achieving change that can potentially improve efficiency (LIBECAP, 1989). The strength of the distributional view lies upon its appreciation of the role of economic actors, their interaction, and their response to the action of one another (KNIGHT, 1992; WANG, 2001). An important variable in the distribution view is the economic actors' ability to bargain. To indicate this, KNIGHT argues that new rules of property rights will be in place to serve the interest of those actors with greater bargaining power. This power may emanate from action resources that economic actors possess, an example of which can be wealth and social relationships.

However, the economic efficiency view considers that property rights change results from opening of new markets, change in relative prices of factors of production, demographic shift and technological innovation (such as adoption of new technologies). The change in these factors in an economy creates a pressure for change in property rights. Efficiency of land use increases when property rights change from a purely open access (no property rights) to common and then to private property rights due to population growth and resource scarcity leading to more commercialization (DEMSETZ, 1967; BOSERUP, 1965; NORTH, 1981; BROMLEY, 1991; ENSMINGER, 1997).

Irrespective of the reasons for change (equity, efficiency and scarcity), two situations challenge the survival of common property. First, motivation arising from widespread privatization in other parts of an economy can influence "co-owners" not to comply with common property rules. It initiates them to overuse those resources that they would have otherwise used for managing seasonal fluctuations under common property. The second situation arises from a state's lower recognition to common property and disregarding the interests of those relying upon it (BROMLEY, 1991).

3. Research design

3.1 Description of the study areas

Most pastoral and agropastoral groups inhabit eastern Ethiopia. The region is located between 3° to 11° North and 39° to 48° East, with an area of 279,252 square kilometers and a population density of 15.3 persons per square kilometer (CSA, 2005). The region experiences bi-modal rainfall (the *gu* rains from March to June and the *deyr* rains from October to November); a mean annual precipitation ranging from less than 200 mm in the southeast to 650 mm in the northwest. It covers 50% of the total drylands of the country, with a total area of 772,000 hectare (ha) of irrigable land at different basins, of which only 36,689 ha has been irrigated (MEKONNEN, 1999; SOMALI REGIONAL STATE, 1999). Nearly 53% of Ethiopian pastoralists and

agropastoralists inhabit the Somali region followed by Afar (29%) and Oromia (10%) (SANDFORD and HABTU, 2000).

For the purpose of this study, three districts in eastern Ethiopia were selected: Harshin, Kebribeyah and Mieso. These districts have unique as well as overlapping features. The overlapping features are that these areas have been until the 1950s used mainly for grazing where livestock production and involvement in contraband trade have predominated the livelihoods of the pastoralists. As time elapses, recurring droughts, increased population and a relative resource scarcity have increased the value of the grazing land. The casual involvement of people in crop production has contributed to the emergence of claims for private use of land.

Harshin district is inhabited mainly by Isaaq clan. It is located in the southeast of Jijiga Zone, 30 km away from the international border. The political instability in the southern Somalia and the resulting influx of a large number of refugees since the early 1990s has increased competition for potential land. This has been rather reinforced by the impact of resettlement of the refugees who also claimed land for settlement. As the Isaaq clan members inhabit areas across the international border, the clan members in Harshin are obliged by the embedded customary law to provide land for settlement of their kin members. Establishment of water points which require land enclosure as a prerequisite to protect the water points is another reason. The interaction between political forces and customary institutions has indirectly increased land value giving a space for raising claims to private use of land. It has also been a tradition among the Somalis that clan members can secure rights to private use of land through the permission of their clan head and village chief.

Looking at the economy, nearly 90% of the inhabitants are pastoralists with a population of 82,884 (CSA, 2006). A greater degree of livestock production and growing of a few crops (maize and sorghum) contribute to their livelihoods. Close to 8.1% of the district land is allocated to crop and 57.18% is suitable for grazing (BOA, 1996). Pastoral economy in the district also relies upon camel renting where urban merchants rent in camel for transporting contraband goods. This serves as a strategy to defy the surveillance from the state customs authority. Households depending on this income source do not support the expansion of enclosure because the practice of fencing causes the destruction of trees to protect the fenced land, which could otherwise be preserved as a feed source for the browsing animals. Pastoral households with a greater proportion of grazers tend to claim for enclosure much more than others.

Kebribeyah is the second study site. It is an agropastoralist district located 55 km southeast of Jijiga where there is a diverse land use practice. The largest refugee camp in the country is located in this district. Competition for land with the refugees,

exposure to the influence of agricultural extension services and the uncertainties arising from the expansion of farming from the surrounding settled farming communities have jointly increased the value of land. This has led to increased claims for private use of land either for grazing or for crop cultivation. The granting of rights to private use of land through fencing is performed jointly by the customary elders and the state authorities at *kebele* (representing the lowest administrative unit) level. Households differ in terms of landholding for crop farming and private grazing. Most of the plots on agropastoral farms are occupied with *t'chat* (cash crop), maize and sorghum (LAUTZE et al., 2003). Feed sources for the livestock vary every year; the major sources being communal and private pastures (63.65%), crop residue (30.59%), hay (2.96%) and others (CACC, 2003). In this district, household economy is based on crop and livestock production almost equally in normal years and more on livestock in prolonged dry season and drought years. In drought years, agropastoralists practice extended mobility from their permanent settlement in search for better pasture and water whereas, in prolonged dry seasons and partial rainfall failure, they use crop-fields as a feed source. The crop biomass, even in instances of crop failure, could still serve as a livestock feed, which motivates a given agropastoral household to secure private use of land via fencing the commons.

The third district is Mieso with an area of 2,573 square kilometres. The amount of rainfall varies from 332 to 1,385 mm with an average of 795 mm per annum. The altitude ranges from 1,107 to 3,106 m above sea level with a population density of 20.85 p/sq. km (ILRI/MOARD, 2005). It is 225 km away from Addis and remains to be a strategic livestock market to traders. The Oromo and Somali ethnic groups inhabit the district. The former group is mainly agropastoral, whereas the latter is pastoral, which entirely relies on livestock. Households from the former ethnic group have private grazing land, ranging from 0.26 to 1.93 ha, whereas the cultivated land varies from 0.83 to 1.75 ha (BEYENE, 2008a). An important reason for the increased claim for private use rights of land among the agropastoral groups is the increasing incidence of violent conflict between the two ethnic groups (BEYENE, 2009). As a result, agropastoralists could not have access to wider grazing commons and were forced to rely more and more on crop production rather than livestock. A gradual increase in population and a shift of livelihood sources were some of the drivers for enclosure. Moreover, strong extension service in training agropastoral households in livestock fattening and the reliable access to livestock market have pushed them to shift their emphasis from herding large size to producing quality animals whose feed can be produced on the enclosed land nearby their cultivated plots. Lastly, the institutional arrangement related to land enclosure in this district also differs from others. Instead of clan head, the local state authority grants the right to private use of land.

Table 1. Comparison of the case study districts using certain features

Districts	Attributes			
	Population density ^a	Major crops grown	Mean rainfall (mm)	Mean livestock holding (TLU)
Mieso	High	maize, sorghum, beans, <i>chat</i> and vegetables	795.93	3.11
Kebribeyah	Medium	maize, sorghum and <i>chat</i>	629.57	7.23
Harshin	Low	maize and sorghum to some extent	253.00	6.55

^a based on the detail discussions with regional experts and observations

Source: compiled from CACC (2003) and other sources

3.2 Sampling and data collection

A simple random sampling was used to select sample households, roughly proportional to the population size while the districts and *kebeles* were purposely selected, i.e. 4 *kebeles* from Mieso and 4 from the other two districts. The selection of the *kebeles* considered settlement patterns, land use practices and, in the case of agropastoralists, the proximity to communal grazing land. Malkahora, Annanno, Gulufa and Bililo are the selected *kebeles* from Mieso; Gerbi and Guyow are from Kebribeyah while Lankayrta 1 and 2 are from Harshin. Each *kebele* has a number of villages. To overcome the distortion of resident registration caused due to food aid, a new registration list has been prepared for sampling. The selection of the *kebeles* came after the transect walks and discussions with community elders.

Results reported in this paper relied upon data collected from 160 sample households from the three districts described above between 2004 and 2006. To collect data, two methods were used: a household survey using standardized questions for household heads and a focus group discussion that involved key informants (elders, village leaders, clan-heads and regional agricultural extension agents).

3.3 Analytical model

In this case, quantitative methods mainly econometric models were used. A multiple linear regression was essential to identify those variables that influence the area of land enclosed. In situation where the dependent variable is continuous in nature, such as area of the rangeland enclosed by a household, MADDALA (1993) recommends the use of multiple linear regressions, which can be expressed mathematically as:

$$(1) \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \varepsilon$$

where Y is the dependent variable, β_0 is a constant value, $\beta_i X_i$ are the coefficients of the independent variables (continuous or dummy in nature) where X ranges from 1 to n and ε is the vector of the error terms that are distributed normally with mean 0 and variance σ^2 (i.e. $\varepsilon \sim N(0, \sigma^2)$). A stepwise regression method was followed to establish the empirical model.

A number of independent variables were included in the model. These are classified into two categories. The first was household characteristics (age, dependency ratio, livestock holding, total labor unit of a household, years lived in the village since married). And the second was the socio-economic variables (household income, the use of relative grazing land, group size in mobility, frequency of mobility, number of villages where relatives live, membership in varied social activities in the community, distance at which furthest relative live, the number of close relative households residing in other villages). There was multicollinearity diagnostics to overcome estimation bias.

However, a multiple linear regression cannot help in capturing those variables that determine the likelihood that a household enclose land or not given a set of explanatory variables. In such cases, one can use a binary logistic regression model to identify some of the factors that could determine whether a household encloses the rangeland for private use or not. Thus, a binary logistic regression is appropriate when the dependent variable has two outcomes (MADDALA, 1993), mathematically expressed as:

$$(2) \quad Y_i^* = \beta' X_i + u_i$$

where $Y_i = 1$ if $Y_i^* > 0$, 0 otherwise, in which u_i is the error term and shows logistic distribution. Y_i^* is unobservable (predicted value), X_i is a vector of explanatory variables and β' is a vector of corresponding coefficients.

$$(3) \quad \left. \begin{aligned} \text{Prob}(Y_i = 1) &= \text{Prob}(u_i > -\beta' X_i) \\ &= 1 - F(-\beta' X_i) \end{aligned} \right\}$$

where F is the cumulative distribution function for the error term u , assuming that the distribution is logistic in nature, which is similar to cumulative normal distribution except differing at the tails (MADDALA, 1993). Thus,

$$(4) \quad P(Y_i = 1) = \frac{\exp(X_i' \beta)}{1 + \exp(X_i' \beta)}$$

To capture the effect of an increase or a decrease in the value of explanatory variables (measured from their mean values) on the dependent variables, the coefficients for the marginal effect are given by (MADDALA, 1993): Hence,

$$(5) \quad \frac{\partial p(Y=1)}{\partial X_{ik}} = \frac{\exp(X_i' \beta)}{[1 + \exp(X_i' \beta)]^2} \beta_k$$

whereby the derivatives show the predicted effects of changes in the value of an independent variable on the probability of belonging to a group ($Y=1$); X_{ik} is the k^{th} element of the vector of explanatory variables X_i and β_k is the k^{th} element of β .

3.4 Hypotheses

The last part of this section, from (a) through (j), provides the hypotheses on how some variables influence herders' behavior in the rangeland enclosures, where the dependent variable is whether a household claims for rangeland enclosure or not.

a) *Availability of labor* (\pm):

This is a continuous variable and might have a positive or negative influence, depending on how a household uses the available labor. Allocation of labor to fencing might make enclosing easier. It encourages one to fence, while allocation of labor for herding can have a negative influence since a household still mobilizes the available labor to move far away from the settlement.

b) *Group Size in Mobility* (-):

This refers to the number of households who move far away from settlement together. A household moving with large group is expected not to enclose, as it tends to secure livestock feed from grazing commons rather than from enclosed land. Being a member of a large herding group produces an incentive to take herds far from settlement. It is, thus, hypothesized to have a negative effect.

c) *Participation in community meetings* (-):

Participation in meetings serves as source of information on the location of better pasture. It was measured as proportion of participation in community level meetings held in a year, which is a continuous variable. It is hypothesized to discourage investment in enclosure.

d) *Wealth category* (+):

This is a dummy variable and refers to whether a household is categorized as member of a poor or rich, using average livestock ownership as cut of point. It is hypothesized that rich households are more likely inclined to enclose land than the poor do since

herders in the former do not find sufficient feed for the entire herd in times of grazing scarcity.

e) *Land allocated to crop farming* (\pm):

This captures the area of land a household allocates to crop farming. Herders have a private land use rights, which can partly be allocated to crop farming when deemed necessary or entirely for privately used grazing area. They may expand land in private holding either for grazing or for cultivation. Thus, it is hypothesized that allocating larger area to crop farming might motivate herders to engage in enclosure.

f) *Tree ownership in private plot* (+):

This is a dummy variable and denotes whether a household has a tree in his privately used land or not, which is used as a shade for the animals or as a source of fodder for the livestock. Therefore, protection of perennial trees makes investment in enclosure a necessity, which is expected to have a positive effect.

g) *Ownership of private water points* (+):

As a dummy variable, this indicates whether a household has established private water points (assuming the value 1), and 0 otherwise. In many cases, prevention of other herders from intruding into one's water points requires fencing the land around the water point. Thus, it is hypothesized that investment in water points will encourage herders to enclose the land.

h) *Dependency ratio* (-):

This is a continuous variable showing the proportion of active labor in a household. Households with high dependency ration might not be able to construct fence and protect it. It is hypothesized to have a negative effect on household to invest in enclosure.

i) *Livestock species* (-):

It is a continuous variable taking the value 0 if a household does not have any livestock. As herders with large number of species cannot satisfy the feed needs of the different species they herd from specific area, they tend not to enclose land for grazing. It is, thus, anticipated to have a negative influence on enclosing land.

j) *Herd died during the last drought* (+):

A large body of literature underline that loss of herd in specific time might temporarily force households to shift to enclosing land either until they rebuild their herd or to contract out the enclosed land for grazing by others or to sell the fodder as source of income to urban dairy producers. Therefore, greater herd loss during the recent drought motivates households to enclose land.

4. Results and discussion

4.1 Comparing the case study districts

This sub-section provides narratives on the peculiar feature of each district with respect to the practice of enclosure. There are certain particularities with respect to the institutional and socio-economic factors that are drivers for the expansion of enclosure in each district. In the case of Harshin, the history of enclosure is largely connected with competition for the scarce pasture and influx of refugees. Studies in the district indicate that customary institutional change in favor of private land use was not an easy step. Rather, it involved tremendous disputes among various groups within a clan (HOGG, 1997; HAGMANN, 2003). Also, the re-establishment of communal areas by abandoning enclosure to overcome disputes did not succeed due to relative increase in the value of enclosed land. As a result, those pastoral households who claimed potential land for private use have used it permanently with a few exceptions.

In the case of Kebribeyah district, the production of cash crops such as *t'chat* and introduction of better performing varieties of maize and sorghum crops have increased the claim for private use of the rangeland. At present, the claim for private enclosure is driven by the rangeland rehabilitation activities introduced through the stated supported food security projects. This involves the fencing of land which is temporarily protected from livestock grazing until it rehabilitates. Agropastoral households were provided with some species of trees to plant and manage in which some of the tree seedlings are multipurpose ones.

In Mieso district, land enclosure is practiced among those agropastoral households which inhabit hinterland whereas others operating on their farms in the middle of a village do not get a permission to fence. Such an institutional arrangement is introduced to safeguard newly emerging couples who might claim land for private use. This inhibits a simple and excessive expansion of land enclosure in the district. In addition, the retaliatory action from the Somali pastoral groups for increased expansion of enclosure undermines the motivation to practice it on a continual basis. In the past, massive expansion of land enclosure and grievances from the pastoral groups manifested in terms of destruction of crop fields and livestock raids destabilized the district. As a result, protecting the enclosed land from intruders remains a costly activity. Nevertheless, the commercialization of livestock production and self-imposed restriction of the agropastoral households from grazing their animals on the contested commons had somehow reduced the frequency of crop-field destruction and livestock raids on the part of pastoral groups.

There is some communality across the studied districts. First, rainfall and its unpredictability has become an important factor determining land use practice. The available rainfall data for three districts shows that there is some level of variability causing a variance in land productivity. This condition undermines investment in land for private uses. A comparison shows that the variability in rainfall for Mieso is not high with the coefficient of variation (CV) over the 43 years period being 25.4%. However, it is high for Kebribeyah (34.2%) and Harshin (42.3%). According to the standard rainfall CV set for a disequilibrium system¹, the condition in Mieso does not discourage investment in private use of land unless other factors inhibit such a practice.

Second, the governance of private enclosure has increasingly become complicated as a result of herd mobility causing inevitable intrusion, increased relative scarcity in times of drought that increases the costs of protecting it (exceeding the benefits) and the grievance emanating from elite capture on the part of the customary practice in allocating good quality land to wealth herders. This is against the cost-benefit argument of DEMSETZ (1967) where scarcity values would motivate one to privatize but the internalized costs of privatization should be much lower than the benefits. On the other hand, this result conforms to the recent assessments of the policy environment in governing African rangelands underlining that local institutions may not provide a sufficient basis upon which policies should rely. And there is a need to gather adequate data to address different interest and social groups to attain equity and environmental sustainability (HOMEWOOD, 2004; MWANGI, 2009).

Lastly, the puzzle remains whether cutting of mature tree branches to fence a specific part of the range to permit rehabilitation is economically viable and environmentally sustainable. Fencing as a technology to protect the enclosed land might have unforeseen repercussion in managing communal land and in conserving feed for browsers and biodiversity. Meanwhile, when assessed from the perspective of the small herders or herd-less households, the expansion of enclosure enables them to benefit from contractual grazing indicating new forms of income generation which is impossible if the entire rangeland is held communally.

4.2 Econometric results

This sub-section presents the econometric results based on the analysis of household surveys. The empirical model indicates a number of socio-economic variables affecting the practice of rangeland enclosure. It presents a much more detail analysis

¹ A rangeland condition with rainfall cv greater than 33% is classified as a disequilibrium environment where erratic rainfall determines forage productivity than livestock densities (ELLIS, 1995: 43).

of factors that are drivers of the expansion of enclosure. In this section, there were two econometric models (multiple linear regression and binary logistic regression) employed to identify those variables that are hypothesized to influence the decision of a particular household to fence part of the communal range for private use.

The multiple linear regression result (table 2) shows that of the thirteen variables used for the analysis, seven have a significant effect on the area of land fenced by a herding household. From table 2, age of a household head, the total labor units of a household², number of villages in which relatives of a household live and the number of membership in various social organizations negatively affect the land area enclosed. To explain how some of these variables determine fencing, old people may not have the capacity to build fences. Greater labor endowment will also create a means to move long distance in search for pasture for the herd, giving less preference to enclosure. The larger the number of villages where relatives of a household reside the higher the network density will be, which provides better chance of access to common pasture, which, in turn, influences a household to give little priority to land enclosure.

On the other hand, number of households which are relative to a household but who are living outside a village, number of years a household lived in a village since married and the livestock ownership (TLU) have a positive influence. The sign for the variable 'number of households which are relative to a household' was contrary to the expectation because it was hypothesized to have a negative influence. Further examination of the survey data indicates that households with 'larger number of households as relatives' have reported that their relatives are located in another clans' territory. This discourages long distance mobility while encouraging them to enclose more land.

An example from the cases studied is that many respondents in Mieso District indicated that most of the villagers whose relatives live far from their settlement did not move for years. The effect of other variables is as anticipated. For example, the longer a household head lives in a village since his marriage, the greater will be the chance to enclose larger area. Having a larger number of livestock provides an incentive to enclose larger area since enclosure serves as a dry season feed reserve for lactating animals, which is consistent with others' observation.

² The total labour units of a household are calculated based on the standard set by the MURPHY and SPREY (1982): 194.

Table 2. Regression results for variables affecting the area fenced (ha)

Variables	Coef.	Std. Error	t	Sig.	95% Confidence Interval for B		Mean of Xs
(Constant)	2.685	0.721	3.724	0.000	1.260	4.111	-
Age	-0.025	0.015	-1.666	0.098	-.054	0.005	41.98
Dependency ratio	-0.008	0.083	-0.100	0.921	-0.172	0.155	1.79
Total labor units	-0.161	0.076	-2.125	0.035	-0.311	-0.011	3.70
No. of relative HHs in other villages	0.035	0.021	1.658	0.100	-0.007	0.076	6.46
No. of villages relatives live in	-0.073	0.031	-2.351	0.020	-0.134	-0.012	3.69
Furthest relative living (Km)	0.001	0.004	0.215	0.830	-0.007	0.009	20.11
Using relative grazing land	0.066	0.211	0.314	0.754	-0.351	0.483	0.66
Years lived in the village since married	0.039	0.018	2.237	0.027	0.005	0.074	19.77
Livestock owned (TLU)	0.043	0.026	1.674	0.096	-0.008	0.094	4.99
Membership in social org.	-0.313	0.138	-2.264	0.025	-0.587	-0.040	3.10
Frequency of mobility	-0.027	0.055	-0.491	0.624	-0.136	0.082	1.49
Group size in mobility	-0.002	0.011	-0.161	0.872	-0.024	0.021	10.1698
Income (Birr)	-0.076	0.211	-0.362	0.718	-0.493	0.340	1779.1194

Notes: dependent variable: area fenced (ha), number of obs. = 159. $R^2 = 0.64$

Source: survey data

In addition, the logistic regression model (table 3) indicates that of the ten independent variables hypothesized to determine the decision of a household to fence, four are found to have a significant effect. For example, a household with larger labor unit is more likely to fence the rangeland, seemingly contradictory to the result reported in table 2, but actually, it does not, as can be deduced from the marginal effect. Because an increase in labor endowment by one unit is likely to reduce the probability with which a household decides to invest in enclosure by 6.1%. The variable wealthy category, as poor and better-off³, has shown consistency with the hypothesis and the

³ 5.01 TLU was used as cut-off point to categorize as poor and better-off, which relies on the judgement of respondents.

model result presented in table 2. It is found to be significant at $p < 1\%$. This indicates that a household moving out of the poor category and falling into better-off group is likely to increase its chance of enclosing the rangeland by 29.7%. As wealthy members of a herding community gain respect and will have an influence on clan rules favoring private use of the rangeland, they can extend their *de facto* influence to be protected from intruders.

Table 3. Logistic regression results for variables determining fencing (Y= 1, yes)

Variables	Coeff.	St. Error	P[Z >z]	Mean of X	Marginal effect
Constant	0.762	0.921	0.401	-	-
Total labour units	0.284	0.128	0.027	3.705	-0.061
Group size in mobility	-0.015	0.020	0.467	10.16	-0.003
Participation in meetings (%)	0.009	0.007	0.238	68.48	0.002
Wealth category (dummy)	1.380	0.494	0.005	0.35	0.297
Land allocated crop farming (ha)	-0.612	0.269	0.022	1.39	-0.132
Tree Ownership in private plot (dummy)	0.513	0.567	0.365	0.88	0.110
Private water points (dummy)	0.710	0.387	0.066	0.57	0.153
Dependency ratio	-0.130	0.149	0.384	1.79	-0.028
Livestock species (number)	-0.016	0.234	0.943	2.28	-0.003
Herd died in recent drought (TLU)	0.012	0.017	0.494	9.14	0.002

Note: dependent variable: whether a household has fenced land or not (yes/no); reference value is 1 (yes); number of obs. = 159; Log likelihood = -95.19, Restricted log likelihood = -106.76, $\text{Chi}^2(10) = 23.14$, $\text{Prob}>\text{Chi}^2 = 0.01$

Source: survey data

One of the controversies in the literature on pastoralism is whether crop farming is expanding and private use of land for grazing is associated with crop farming. Tempted by such an argument, the area of land allocated to crop farming was considered as a variable. The result shows that there is a significant negative relationship between land allocated to crop farming and “ownership” of enclosure, indicating that the purpose of enclosure is not primarily for crop farming. Rather, it is to control a potential area for private grazing, adhering to the view that state’s non-recognition of common property as one of the drivers for the dismantling of the commons via range enclosure. A time series data is required to check whether a piece of land enclosed a decade ago is currently under cultivation. Insights from the focus group discussion show that herders

converting their enclosures into crop farming do not have the permission to enclose another piece of land in the subsequent years.

An interesting development associated with the evolution of enclosure is that it is used to protect private water points. A significant increase in the number of water points was evident over the last three decades in the region. Moreover, the model predicts that having private water point has a significant positive effect on range enclosure at $p < 10\%$. Analysis of collective action in communal water point management in the same region indicates a dramatic increase in private water points in the study area (BEYENE, 2008b).

To discuss on some of the implications of the findings, the available but scant literature underlines a continued deterioration in the terms of trade (livestock against crops) among herders in eastern Ethiopia since the mid-1990s. This might have shifted attention to private land use for crop farming (TEKA and AZEZE, 2002). It is believed to be attributed to the fact that livestock produced in the commons are of poor quality to improve the terms of trade in favor of animal husbandry, which is currently viewed as a major obstacle to integrate herders into the market economy. A more preferred livestock production system is to reduce herd mobility while decreasing herd size to produce marketable livestock. This circumstance generates an incentive to use land temporarily (or permanently) as determined by variance in land productivity (BEYENE, 2008a).

The logistic regression result does not support the perception that land allocation to crop farming is a driving force for rangeland enclosure. Information from the focus group discussions and field observation shows that there are differences among the studied districts in terms of purposes of land enclosure. In the case of Mieso, enclosed land will partly fall under cultivation in areas where population density is high (in Malkahora and Bililo Kebeles). In Harshin, even large tracts of land enclosed remain uncultivated for long time and it serves as private grazing areas. Contractual grazing where households allow outsiders to graze on their land in return for some fees has become very common.

The situation in Kebribeyah is somehow moderate. A new practice in this district is that the resettlement of refugees from the destabilized Somalia has been causing pressure on the land, which has in turn increased the demand for the enclosed land as a place of settlement where owners of an enclosure rent out the land for the refugees to place their tents. Though this may not be permanent, it has temporarily increased land value. However, the formal system that involves the transfer of land use rights to other households from different clans has become a source of disputes. This may in the future induce an offensive act by the indigenous people with customary rights to the

land as such action is often interpreted as violation of cultural norms. Taking this into consideration, some have agreed that formal titling in such systems can be expensive and futile (MIGOT-ADHOLLA et al., 1991).

In general, when herders enclose the rangeland mainly for grazing purposes, it supports its regeneration. This will be the case if herders keep less number of key livestock categories, such as lactating herd. The results presented here reaffirm the observation of others (LANE and MOOREHEAD, 1995; SWALLOW and KAMARA, 1999; WOODHOUSE, 2003). They all argue that the increased value of land due to some investments by herders themselves and the uncertainties surrounding the survival of communal areas given the existing land use policy of the country are the major drivers of range enclosure.

5. Conclusions

Results indicate that the ‘cost-benefit’ argument is not sufficient in explaining shift in property rights in the semi-arid pastoral areas because households with enclosure do not internalize the social costs but rather transfer them to other members of the community who rear browsers. The distribution and efficiency views also explain herders’ motivation to enclose the rangelands. The distribution theory underlines the bargaining power of the herders, which was captured in the regression analysis using livestock wealth as a proxy variable. Water harvesting through construction of cisterns as a new technology creates an incentive to enclose the range to protect the water points, which is consistent with the efficiency view. The variable wealth category and livestock ownership from both estimated models indicates that the ability of the small herders in restraining the action of large herders seems to be limited. This calls for the state action to redress distributional imbalance as far as *de facto* rules seem to marginalize small herders. The empirical model yields the implication that the practice of enclosure does not seem to favor national policies of poverty reduction since it favors elite capture (inequity) where large herders tend to enclose larger area than that of small herders, while the latter are incapable of bargaining for change in allocation rules.

Nevertheless, the feasibility of range enclosure as a means to reinforce private land use in the pastoral and agropastoral systems has remained controversial on the grounds of achieving social efficiency and ensuring sustainable land use. Expansion of enclosure restricts herd mobility. It could also cause rangeland degradation which could produce a spillover negative effect in achieving livelihood security in the long-term. This means that if customary authorities (*de facto* rules) are required to address this threat, they need to introduce disincentives for individual households to allocate enclosed land to crop-farming.

Adoption of such a land use practice among herders will have two advantages. First, it lowers the transaction costs of enforcing customary rules if internal disputes escalate because households can easily put private enclosures back to the grazing commons. Second, encouraging private right holders to allocate their enclosed land to private grazing, rather than cultivation, will make it easier for them to abandon the enclosed land when required. This implies that a wider adoption of a land use practice that allows flexibility will increase household and community welfare. The underlying weakness of the ‘cost-benefit’ as well as ‘efficiency versus distribution view’ is that they do not underline the influence of resource attributes (in this case predictability) in influencing the change in property rights.

References

- ANDERSON, T.L. and P.J. HILL (1975): The Evolution of Property Rights: A Study of American West. In: *Journal of Law and Economics* 18 (1):163-79.
- BANNER, S. (2002): Transitions between Property Regimes. In: *Journal of Legal Studies* 31 (June 2002): 359-371.
- BAYER, W. and A. WATERS-BAYER (1995): Forage Alternatives from Range and Field: Pastoral Forage Management and Improvement in the African Drylands. In: Scoones, I. (ed.): *Living with Uncertainty: New Directions in Pastoral Development in Africa*. Intermediate Technology Publications, London: 58-78.
- BARBIER, B. and P.HAZELL (1999): Implications of Population Growth and Declining Access to Transhumants Grazing Areas for the Sustainability of Agropastoral Systems in the Semi-arid Areas of Niger. In: McCarthy, N., B. Swallow, M. Kirk and P. Hazell (eds.): *Property Rights, Risk and Livestock Development in Africa*. International Food Policy Research Institute (IFPRI), Washington, D.C.: 371-395.
- BEYENE, F. (2008a): Challenges and Options in Governing Common Property. Aachen, Shaker.
- (2008b): Institutions, determinants and effects of collective action among (agro) pastoralists of eastern Ethiopia. In: *Quarterly Journal of International Agriculture* 47 (2): 97-119.
- (2009): Property Rights Conflict, Customary Institutions and the State: The Case of Agropastoralists in Mieso District, Eastern Ethiopia. In: *Journal of Modern African Studies* 47 (2): 213-239.
- BOA (Bureau of Agriculture) (1996): Bureau of Agriculture. Jijiga Zone, Office Archive.
- BOSERUP, E. (1965): *The Conditions of Agricultural Growth*, London: The Economics of Agrarian Change under Population Pressure. George, Allen and Unwin, London.
- BROMLEY, D. W. (1991): *Environment and Economy: Property Rights and Public Policy*. Basil Blackwell, Cambridge, MA.
- CACC (Central Agricultural Census Commission) (2003): *Ethiopian Agricultural Sample Enumeration for 2001/02 Production Year*. Addis Ababa.
- CSA (Central Statistical Authority) (2005): *Central Statistical Authority. Statistical Abstract*. Addis Ababa, Ethiopia.
- (2006): *Central Statistical Authority. Statistical Abstract*. Addis Ababa, Ethiopia.

- DE MEZA, D. and J.R. GOULD (1992): The Social Efficiency of Private Decisions to Enforce Property Rights. In: *Journal of Political Economy* 100 (3): 561-580.
- DEMSETZ, H. (1967): Toward a Theory of Property Rights. In: *American Economic Review* 57 (2): 347-59.
- DEVEREUX, S. (2006): Vulnerable Livelihoods in Somali Region, Ethiopia. Research Report 57. Institute of Development Studies, London.
- ELLIS, J. (1995): Climate Variability and Complex Ecosystem Dynamics: Implications for Pastoral Development. In: Scoones, I. (ed.): *Living with Uncertainty: New Directions in Pastoral Development in Africa*. Intermediate Technology Publications, London: 37-46.
- ENSMINGER, J. and A. RUTTEN (1991): The Political Economy of Changing Property Rights: Dismantling a Pastoral Commons. In: *American Ethnologist* 18 (4): 683-699.
- ENSMINGER, J. (1997): Changing Property Rights: Reconciling Formal and Informal Rights to Land in Africa. In: Drobak, J.N. and J.V.C. Nye (eds.): *The Frontiers of the New Institutional Economics*. Academic Press, New York: 165-196.
- HAGMANN, T. (2003): Mitigating violent conflicts in the Somali region of Ethiopia. Unpublished research report.
- HOGG, R. (1997): Changing land use and resource conflict among Somali pastoralists in the Haud of southeast Ethiopia. In: Hogg, R. (ed.): *Pastoralists, Ethnicity and the State in Ethiopia*. HAAN Publishing, London: 105-122.
- HOMEWOOD, K.M. (2004): Policy, environment and development in African rangelands. In: *Environmental Science and Policy* 7: 125-143.
- ILRI/MOARD (International Livestock Research Institute/Ministry of Agriculture and Rural Development) (2005): Mieso Pilot Learning and Site Diagnosis and Program Design. Project report, July 2005. Downloaded at <http://www.imps-ethiopia.org/contents/files/documents/PLS-DPO/Mieso.pdf>, on October 22, 2007.
- KAMARA, A.B., B. SWALLOW and M. KIRK (2004): Policies, Interventions and Institutional Change in Pastoral Resource Management in Borana, Southern Ethiopia. In: *Development Policy Review* 22 (4): 381-403.
- KNIGHT, J. (1992): *Institutions and Social Conflict*. Cambridge University Press, Cambridge.
- Lane, C. (1998): *Custodians of the Commons: Pastoral land tenure in East and West Africa*. Earthscan, London.
- LANE, C. and R. MOOREHEAD (1995): New Directions in Rangeland Resource Tenure and Policy. In: Scoones, I. (ed.): *Living with Uncertainty: New Directions in Pastoral Development in Africa*. Intermediate Technology Publications, London: 116-133.
- LAUTZE, S., Y. AKLILU, A. RAVEN-ROBERTS, H. YOUNG, G. KEBEDE and J. Leaning (2003): *Risk and Vulnerability in Ethiopia: Learning from the past, responding to the present and preparing for the future*. Feinstein International Famine Center, Boston.
- LIBECAP, G.D. (1989): *Contracting for Property Rights*. Cambridge University Press, New York.
- MADDALA, G.S. (1993): *Limited Dependent and Qualitative Variables in Econometrics*. Cambridge University Press, Cambridge.
- MEKONNEN, A. (1999): Water Resources of the Somali Region. Paper presented at Workshop held in Jijiga, July 1999. Jijiga, Ethiopia.

- MERRILL, T.W. (2002): Introduction: The Demsetz Thesis and the Evolution of Property rights. In: *Journal of Legal Studies* XXXI (June): 331-338.
- MIGOT-ADHOLLA, S. E. SHEM, P. HAZELL, B. BLAREL and F. PLACE (1991): Indigenous Land Rights System in Sub-Saharan Africa: A Constraint on Productivity? In: *World Bank Economic Review* 5 (1): 155-75.
- MURPHY, J. and L.H. SPREY (1982): Monitoring and evaluation of agricultural change. ILRI (International Institute for Land Reclamation) Publication 32. Wageningen, The Netherlands.
- MWANGI, E. (2009): Property rights and governance of Africa's rangelands: a policy overview. In: *Natural Resources Forum* 33: 160-170.
- NORTH, D.C. (1981): *Structure and Change in Economic History*. Norton, New York.
- SANDFORD, S. and Y. HABTU (2000): Emergency Response Interventions in Pastoral Areas of Ethiopia. UK Department for International Development (DfID), Addis Ababa, Ethiopia.
- SOMALI REGIONAL STATE (1999): Regional Conservation Strategy Document. Volume 1. Jigjiga, Ethiopia.
- SWALLOW, B. and A. KAMARA (1999): The Dynamics of Land Use and Property Rights in Semi-Arid East Africa. In: McCarthy, N., B. Swallow, M. Kirk and P. Hazell (eds.): *Property Rights, Risk and Livestock Development in Africa*. IFPRI, Washington, D.C.: 243-275.
- TEKA, T. and A. AZEZE (2002): Cross-Border Trade and Food Security in the Ethiopian – Djibouti and Ethiopian–Somalia Borderlands. OSSREA Development Research Report Series No 4. Addis Ababa.
- WANG, N. (2001): The Co-evolution of Institutions, Organizations, and Ideology: The Longlake Experience of Property Rights Transformation. In: *Politics and Society* 29 (3): 415-445.
- WOODHOUSE, P. (2003): African Enclosures: A Default Mode of Development. In: *World Development* 31 (10): 1705-1720.

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Fekadu Beyene

Haramaya University, P.O. Box 161, Haramaya, Ethiopia

phone: +(251)-25-55 30 314

fax: +(251)-25-55 30 325

e-mail: keneefbk@yahoo.com