From Pasture Land to Farm Plots: Triggers and Motivations for Land Use Changes in Afar, Ethiopia

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Abstract

Communal land use system has existed in pastoral Afar (as in many other pastoral areas) since time of immemorial accommodating the interests of different user groups. This form of land use system, which has adapted to the harsh environment in which herders raise their livestock, enables efficient utilization of scattered pastoral resources since it accommodates constant mobility of livestock. In contrast to the mobile way of life, which characterizes pastoralism, farming as a sedentary activity is only marginally present in the lowlands of the Afar region. However, the traditional land-use system in Afar is changing nowadays if favor farming because of various reasons. This paper explains such changes mainly based the data collected through a household survey of 180 pastoral households inhabiting three districts of Afar region in Ethiopia. While drought is the major natural challenge that induced changes of the traditional land-use system in Afar, statistical analysis shows that there exists significant variation across sites and among pastoral households in regards to changes in the traditional land-use system. The variation is explained by factors such as suitability of the area for farming, wealth of households, external support for farming, and access to wage employment.

Keywords: Land use, pastoralists, farming, drought, Afar, Ethiopia
JEL Codes: Q15, Q24

1. Introduction

The communal land-use system has existed in the Afar region of Ethiopia accommodating the interests of different user groups for many generations. It has adapted to the harsh environment in which herders raise livestock and enables efficient utilization of scattered pastoral resources by allowing constant mobility of livestock. In contrast to the mobile way of life, which characterizes pastoralism, agriculture as a sedentary activity is only marginally present in the lowlands of the Afar region. However, the traditional land-use system is changing nowadays because of various reasons.

This paper explains such changes mainly based on the data collected through a household survey of 180 randomly selected pastoral households. The study was conducted in 2005/06 and it covered six sites namely Qurqura, Doho, Dudub, Harihamo, and Daleti which are administered under three different districts of Afar region namely Amibara, Awash-Fentale and Semu-Robi. While drought is the major natural challenge that induced changes of the traditional land-use system in Afar, results of statistical analysis show that there exists significant variation across sites and among pastoral households in regards to changes in the traditional land-use system. Specifically, factors such as suitability of the area for farming, wealth of households, external support for farming, and access to wage employment were important sources of variation.

The remaining part of the paper is divided into four sections. The next section provides an overview of the Afar region and study areas. Section 3 describes the natural challenge in Afar which induced changes in the traditional land-use system. Section 4 provides the results and Section 5 concludes the paper.

2. Overview of the Afar Region

The Afar region extends from central to northeastern Ethiopia following the East African Rift Valley. The region is characterized by a semi-arid climate, with average annual temperature ranging from 21 to 38 °C. The lowest temperature is recorded between December and February and the highest is recorded between April and June. The region receives a bimodal rainfall (between July and September locally known as the *karma* season and between March and April known as the *gilel* season). The average annual rainfall is about 697 mm.

The dominant source of livelihoods in the study areas is pastoralism, with limited levels of crop cultivation and other activities. Afar pastoralists raise mixed species of primary livestock,

including camels and cattle, and keep supplementary herds of goats and sheep; the latter are usually raised for commercial purposes. Afars manage their livestock under an extensive mobile system whereby the natural pasture is dominantly used as feed source.

3. The Natural Challenge among Afar Pastoralists

It is not hurricane or flooding or earthquake that springs into one's mind when natural disasters are mentioned in Ethiopia. Drought is the major factor affecting the livelihoods of Ethiopians, particularly Afar pastoralists, since time of immemorial (Mesfin 2003; Yemane 2003). Studies indicate that the prevalence of drought in Afar, particularly since the mid-1990s, has adversely affected the pastoral economy in two ways. First, it has significantly reduced the total livestock assets and productive capacities of the area, thereby increasing mortality and morbidity rates (Mesfin 2003, FEWS NET 2002; UN-EUE 2002a; UN-EUE 2002b). Second, the successive droughts have re-calibrated the terms of trade against the pastoralists (Davies and Bennett 2007).

These livestock losses coupled with the deteriorating terms of trade against pastoralists worsened food insecurity in the study areas. The degree of food insecurity reached its climax in 2002/03 because of the intensified drought. A special report produced by the Disaster Prevention and Preparedness Commission of Ethiopia indicates that 448,500 people in Afar region (about 44% of the population of the region) needed emergency aid.

The deterioration of food security in Afar and other pastoral areas necessitated an intensified intervention of external agents (government and NGOs) into pastoral livelihoods. In this regard, the government and NGOs initiated projects in order to help pastoralists engage in farming activities. In three of the study areas (Ambash, Dudub and Qurqura), the external agents sponsored local meetings to create awareness of farming among the pastoralists and to explain its

advantage in regards to the existing nature-induced livelihood instabilities. In the remaining three sites of the study, external supports extended beyond awareness creation and included provision of farm tools, financial supports (e.g. to cover the initial costs of farm operations and development of irrigation infrastructure), provision of oxen, and other logistic and advisory supports.

The pastoralists were required to involve in all activities to prepare the communal land for cultivation, which was thereafter distributed to the participants. While the initial decision to participate in collective activities to start farming rested on individual pastoralists, traditional sanctions were operational on those who might free ride during the fieldwork.

4. Results and Discussion

Overall 39.1 percent of the pastoral households were interested in farming. However, variation exists across locations in terms of the percentage of pastoral households who were interested in farming. The rates of participation were 13.3 % (n=8) in Amibara, 23.3% (n=14) in Awash-Fentale and 81.4 % (n=48) in Semu-Robi.

In order to identify factors contributing to the variation in participation, a regression analysis was done. This is based on the assumption that pastoral households decide to start farming or to stick to their traditional way of life by comparing the expected utilities they derive from these alternative decisions. In this case we expected that community members would be heterogeneous in terms of the level of utilities they may generate from farming (say *Ui1*) and pastoralism (say U_{i0}). If we formulate utility as a function of other variables such that $U_{i1} = \alpha + \beta_i X_{i1} + \varepsilon_{i1}$ and $U_{i0} = \alpha + \beta_i X_{i0} + \varepsilon_{i0}$, (where α and β_i are parameter estimates and X_i is a vector of exogenous variables that cause heterogeneity among individuals), individual i decides

in favor of farming if $U_{i1} - U_{i0} > 0$ and otherwise if $U_{i1} - U_{i0} < 0$ [1]. Thus, one's decision to start farming reveals that $\varepsilon_{i0} - \varepsilon_{i1} < \beta_i X_{i1} - \beta_i X_{i0}$. If we replace $\varepsilon_{i0} - \varepsilon_{i1}$ by ε_i and $\beta_i X_{i1} - \beta_i X_{i0}$ by $\beta_i X_i$ for brevity, and assume a logistic distribution for ε_i, the probability that individual i will decide to start farming can be specified as: $P(C_i = 1) = P(\varepsilon_i < \beta_i X_1)$ which can lead us to the logit model if logistic distribution is assumed[2](Greene 2000).

Table 1 shows the description of the independent variables considered for logistic regression analysis and their hypothesized signs. The dependent variable takes on a value of 1 if a pastoralist participated in collective action to start farming and 0 otherwise. The explanatory variables had been tested for their importance by using descriptive statistics before they were subjected to regression analysis. The descriptive results (not reported) show that participants are significantly different from non-participants with respect to all but one variable[3].

Table 1: Description of Variables and Working Hypothesis

Variable code (X_j)	Description	Mean of X_j (% of X_j = 1)	Hypothesis
AGEHH	Age of household head in years	40.1	-
EDUCATE	A dummy variable which takes on 1 if the household head is literate; and 0 otherwise	(25.7)	+/-
ACTIVLB	The number of household members within the age range between 10 and 60 years[4]	4.9	+

[1] There could be indecision if $U_{i1} - U_{i0} = 0$, but this happens with zero probability if $U_{i1} - U_{i0}$ is a continuous random variable.

[2] Alternatively, the probit model can be used by assuming a normal distribution for ε_i. The results of the probit and logit models are quite similar (Amemiya, 1981).

[3] The exception was EDUCATE.

[4] Classification was made based on local information.

SUITAGR	A dummy variable which takes on 1 if the area is either suitable for rain-fed agriculture or can be irrigated given existing water resources and capacity to irrigate; and 0 otherwise.	(66.5)	+
PERCPLS	Per capita livestock holding of household (TLU)	3.1	-
EMPOPP	A dummy variable which takes on 1 if the household generates income from wage employment; and 0 otherwise.	(10.6)	-
SUPPORT	A dummy variable which takes on 1 if external agents provided direct support[5] before and during collective activities; and 0 otherwise.	(49.7)	+

Source: Own survey data

Table 2 presents the outputs of the regression. Four variables are important to explain cooperation of pastoralists in collective activities geared towards starting farming: suitability of the area for agriculture, household's per capita livestock holding, access to wage employment, and external support. Each of them will be discussed in some detail as follows.

[5] External support includes financial, material and advisory programs. Moreover, the role of external agents in organizing local meetings has been taken into account to define the variable.

Table 2: Determinants of Cooperation among Pastoralists to Start Farming

	Coefficients	**SE**	**Marginal Effects**
Constant	-3.6695**	1.2439	-0.6348
AGE	-0.0143	0.01523	-0.0024
EDUCATE	0.5477	0.5483	0.0947
ACTIVLAB	0.0561	0.0776	0.0097
SUITAGR	3.8085**	1.1561	0.6588
PERCPLS	-0.1681**	0.0623	-0.0291
EMPOPP	-2.0585*	0.8831	-0.3561
SUPPORT	1.5636**	0.6195	0.2705
Chi-square	108.7822**		
Log likelihood function	-65.39940		
Percent of correct prediction	86		
Number of cases	179		

* and ** show significance at 5% and 1% levels, respectively

Source: Own survey data

The proxy variable for suitability for farming (SUITAGR) is positively related to the level of cooperation. This variable was supposed to capture the variability among the study sites with respect to their potential for crop cultivation. In this respect, the study areas were classified into two groups, based on the perceptions of the pastoralists. Ambash, Doho, Harihamo and Daleti were classified as potential sites for agriculture because of the presence of irrigation infrastructure (Ambash and Doho) and because of better rainfall distribution (Harihamo and Daleti). On the other hand, Qurqura and Dudub were classified as non-potential areas. The

heterogeneity of the study sites with respect to their potential for agriculture implies the existence of spatial variation regarding the costs of running a new enterprise (i.e. crop production). In areas where shifting to farming is easier, either because of better rainfall or the possibility of irrigation, mobilizing people for collective action is easier, because people anticipate that they would incur relatively low costs in order to realize benefits that would be reasonably higher than the alternative engagements. The regression result indicates that the probability of cooperation in collectively organized action to start farming increases by about 66 % in areas where people perceive the possible benefits of farming.

The second influential factor is the level of wealth of pastoral households, as implied by per capita livestock ownership (PERCPLS). This variable reduced the probability that one participated in farming activities. More specifically, the probability that a household will cooperate in farm-preparing activities increases by about 2.9 % for each total livestock unit (TLU[6]) reduction in per capita livestock holding, implying that households with lower livestock assets are more likely to cooperate. In this regard, the variation among the pastoral households can be explained from different perspectives.

First, the possible differences in labor demands between those with low livestock assets (≤ 4.5 TLU[7]) − hereafter considered as "poor households" − and those with larger livestock assets (> 4.5 TLU) − hereafter considered as "better-off households" − can be associated with differences in cooperative behavior between the two groups. Actually, better-off households own significantly larger quantities of livestock (67.3 TLU) than poor households (11.2 TLU), whereas, in terms of active labor force potential, the former is in a slightly lower position (4.4 persons) than the latter (5.0 persons). Given the fact that those with larger livestock assets require

[6] TLU refers to Tropical Livestock Unit. One TLU is equivalent to 1 camel = 0.7 cattle = 0.5 donkey = 0.1 sheep/goat = 0.8 mule/horse (ILCA, 1992).

[7] In this region, 4.5 TLU per capita (or about 5 cows) is the minimum threshold level to sustain family members without requiring additional income from other sources (McPeak and Barrett 2001).

more labor to properly manage their animals, the output reveals that labor is scarcer among households with better livestock assets. Thus, it can be deduced from the results that the introduction of crop production into the existing system would lead to greater pressure on better-off households in regards to labor allocation. When competition occurs between crop cultivation and livestock husbandry, it is less likely that better-off pastoralists would prefer to shift their labor to the new enterprise.

Second, the decisions of the pastoralists concerning farming activities reflect their ways of reacting to natural hazards, mainly drought. Pastoralists have exercised several traditional portfolio management techniques to mitigate risk; livestock accumulation is one way to mitigate risk (Herren 1991; McPeak and Barrett 2001). Diversification of livestock ownership is another *ex ante* risk management strategy, in which pastoralists adjust the composition of their livestock in a direction that could minimize asset loss due to disaster. Pastoral households also spread their livestock spatially throughout their personal networks to reduce risk.

While these *ex ante* risk management strategies (although not exhaustive) may exist in many pastoral areas, the poor and better-off households do not have equal capability to exercise them. The poor appear to have lower capability to exercise any of the indicated options, simply because livestock are large investments to them. In this regard, the poor occupy lower positions not only in terms of total amount of livestock assets but also in terms of the diversity of these assets. A comparison made between the two groups vis-à-vis diversification (within pastoralism) shows that better-off households keep more livestock types (3.6 species) than poor households do (3.3 species). Moreover, better-off households own more camels (about 30 head) than poor households (about 3 head), which shows that the former are in a better position to withstand

recurrent droughts[8]. Keeping livestock at different locations across personal networks could be a rational way of mitigating risks, especially those arising from localized. However, the latter strategy appears to be less feasible for poor households because there is not enough livestock to distribute spatially.

Differences in *ex-ante* risk management strategies and capabilities between the poor and the better-off also affect their *ex-post* risk management strategies and capabilities to cope. In this respect, better-off households possess better resources to meet basic needs without resorting to other occupations, whereas poor households need to find opportunities outside of pastoralism to sustain their families. Therefore, the differences in cooperative behavior observed between poor and better-off pastoralists with regard to farming could be attributed to their differences with respect to *ex-post* risk management strategies.

Third, the difference observed between the two groups with regard to collective preparation of farmlands may be seen also from the perspective of property rights. Common property regimes allow multitudes of users to share a resource system in accordance with certain predefined rules (Ostrom 1990; 1992). Nevertheless, this doesn't mean that all rights-holders derive equal benefits from the resource system. Rather, benefits are a function of rights and capabilities of individual actors to utilize a resource system (Rebot and Peluso 2003). A pastoralist who has limited financial ability to purchase additional stock obviously derives less benefit from the communal pasturage than his livestock-rich neighbour, given that the rate of livestock ownership is below the optimum. In other words, the former exploits only a small portion of his rights as compared to the latter although, in principle, he has the right to derive as much benefit as that of his neighbor. Indeed, not only rights but also capabilities determine the actual benefit structure among a group

[8] Camels are best suited to arid areas like Afar. In times of water scarcity, they can endure without water for more than two weeks, while cattle need water at least once in three days. Moreover, camels feed on the foliage of trees and bushes, which are better in resisting drought than the grasses on which cattle are dependent.

of people. This is particularly apparent in common-pool resources, particularly as with this case in rangelands, where there is *de facto* open access for all group members.

Capability differences among right holders to realize benefits from a communal resource system may result in differences in their reactions to new challenges or opportunities that may affect benefit streams. For the near-stockless Afar households, the incentive to cooperate in farming activities would be high, because in this way they can better exercise their rights over the resource system.

Pastoral areas are generally marginal to intensive crop production. Consequently, livestock production appears to be the best and, in some areas the only, option under the existing technologies (Ahmed et al 2002). However, as a result of challenges (mainly drought) which have caused rapid deterioration of pastoral livelihoods, pastoralists usually seek out alternative means of survival, at least on transitory basis. Since opportunities are lacking in most pastoral areas, resorting to agriculture is the main option that pastoralists pursue. Indeed, a growing trend toward crop cultivation is now observable in many pastoral areas of Ethiopia in general and Afar in particular (Yemane 2003). In areas where alternatives are available, it is expected that pastoralists will make choices from the "bundle" of non-pastoral activities to sustain themselves, at least until the conditions for their main occupation improve. In such situations, alternative activities compete for pastoralists' resources and, hence, the decision to cooperate in farming activities is a matter of evaluating the existing opportunities from the perspective of each pastoral household, differentiated as they are in terms of existing assets and capabilities. In this vein, our results indicate that wage employment opportunities (EMPOPP) tend to have a negative influence on the decision to cooperate in pre-farming activities. The probability of opting for cooperation declines by about 36 % if a household earns income from wage employment.

State farms are the major sources of wage employment for pastoralists in the study areas, particularly in some locations of middle Awash valley. Although Afars are recruited only for lower level positions, those who get the chance do not hesitate to join state farms. All in all, about 11 percent of the sample pastoralists were employed in commercial farms. There are reasons why pastoralists prefer employment in state farms to farming by themselves. First, they can generate a more stable (and perhaps higher) income by being wage laborers, whereas farming is a risky business. Second, in most cases, pastoralists are employed as guards to protect crops (mainly cotton) from livestock[9]; it is more likely that pastoralists prefer crop guarding to farming since the former resembles their traditional activity (i.e. tending animals) while farming entirely differs.

Finally, support from external actors (SUPPORT) has been found to be positively and significantly related to participation in collective action to start farming. The probability that a household will participate in collective action increases at the mean level by 27.1 percent in the presence of external support. There are two possible explanations for this result. First, participation of external actors in organizing meetings facilitates discussions and information exchange among pastoralists. Some pastoralists may not participate because they are completely unaware of the intervention. Some others may be ambivalent because of incomplete information with regard to the intended activities. Thus, the existence of external support increases the likelihood of participation of those households that either unwittingly or due to ambivalence fail to cooperate, thereby improving their awareness regarding what has been intended for their

[9] Information obtained from MAADE indicates that there is great pressure coming from the surrounding areas to feed livestock on cotton stocks. While cotton harvesting normally comprises three rounds, pastoralists have been rushing their animals into the cotton fields immediately after first-round picking. In order to reduce this pressure from the local herders, guards are now hired by each clan. This is just to use social capital as a means of mitigating the problem. Quite large amounts of money are allocated by MAADE to mitigate the problem. For instance, a total of 294,335 Birr (~USD 34,000) was allocated in 2004/5 for this purpose (personal communication with MAADE administrative officer).

locality, the costs and benefits of cooperation and non-cooperation, the commitment of external supporters, the reactions of other members of the community, and the "rules of the game"[10].

Second, financial and material support provided by external actors could increase the likelihood of participation. Such support, which augments the capacity of households to invest in the new venture, can particularly increase the participation of the poor, who may otherwise refrain from participation due to financial and material limitations. The positive effect of this variable is not, however, exclusively associated with poor households. Even the participation of better-off ones can be enhanced in the presence of financial and material support as a result of possible reductions in costs of participation compared to the anticipated benefits. Moreover, better-off households may become persuaded to have their "share" from the resources externally injected into the system.

5. Summary and Policy Implications

Traditional communal landholding has been prevalent in Afar accommodating the interests of different user groups for many generations. Needless to say, this is attributable to the ecological conditions of Afar which entail the use of pastoral resources scattered over a wide area of land to produce livestock. However, the results of this study show that the traditional communal land-use system in Afar is changing because of natural challenges threatening pastoral way of life. The transformation of property rights due to natural challenges has had important implications for the livelihoods of pastoralists. In this regard, this paper has shown that poor households are more interested in farming as compared to better-off ones. The decisions of pastoralists towards the commencement of farming activities could reflect their reactions towards recurring natural

[10] There is also a possibility that external agents may romanticize the outcomes of forthcoming cooperative efforts to persuade those who have not yet decided to join them.

hazards: farming is considered as being a post-shock source of livelihood by those households that cannot call upon their pastoral assets in seasons following a drought period.

While nature has been the major driver of the change, the state has also played a facilitating role. In this regard, the support of the government in favor agriculture is not limited to Afar. There is a nationwide movement to convert pastoralists into sedentary agriculturalists although it has been declared that the "conversion" would be done on voluntary basis (FDRE 2002). These attempts from the side of the government is being done because of the presumption that farming serves better than pastoralism in using land and embedded resources in an efficient manner thereby improving the well-being of people therein.

Nevertheless, two reflection points can be made about the potential of farming in the study areas. First, efforts to produce food crops under rain-fed conditions may not provide any substantial remedy to the decline of food security when drought occurs; during a prolonged spell it presumably will not. This is because crops are also biological products (like livestock) and, hence, can be adversely affected by drought. Livestock appear to be even somewhat more tolerant to drought conditions than crops since they are mobile. The existence of mobile pastoralism in dry regions of the world also implies the relative viability of livestock production as compared to rain-fed agriculture in these regions. Second, although crops can be produced using irrigation in some ecological niches, an irrigation-based production system is less appealing in many parts of Afar, given the scarcity of water. Consequently, livestock production appears to be the best, and in some areas the only, option under the existing technologies. The relatively low participation level of better-off pastoralists in collective action to start farming also implies that crop production is not a substitute for, but rather is a subsidiary to, livestock production in such dry areas. Therefore, instead of overrating the sustainability and impact of farming on poverty reduction, it would be worthwhile to re-examine the comparative advantage of livestock

production in pastoral areas. In this regard, improving key services, such as the livestock-market information system, veterinary services, and financial services; investing in infrastructure (roads and other facilities); and enhancing feed management are key to turning the silent transformation of the commons into a viable development path for the Afar. Moreover, farming and other alternative income sources should be promoted as a means of improving the capacity of (poor) pastoralists to overcome potential livelihood challenges.

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