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Determinants of Pastoralists' Livestock Income in 'Amibara' and 'Gewane' Districts of the Middle Awash, Southern Afar, Ethiopia

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Abstract
Ethiopia is among the first ten nations in the world with respect to the livestock population. However, the benefit obtained from the sector is low compared to other African countries and the world standard. The economic gain for the pastoralists, who predominantly live on rearing livestock for their livelihood, is below the national average. Therefore, identifying the major determinant factors affecting income from livestock is needed to device appropriate development interventions to improve livestock income and thereby living standard of pastoralists. This study was conducted in Amibara and Gewane districts of Afar Region with major objective of analysing determinant factors affecting pastoralists' livestock income. A random sampling procedure is used to select 10 PAs and 100 sample respondents. Primary data are collected from sample respondents through personal interview using structured interview schedule. Multiple Regression Model is used to identify variables capable of affecting the livestock income. The model results reveal that among 15 explanatory variables included in the model, 6 are found to be significant at the conventional levels of significance. Those variables which are important determinants of livestock income are a) total livestock holding, b) access to credit, c) availability of grazing land, d) risk of predators, e) livestock breed type and f) livestock mobility. Improving livestock production and productivity, organizing pastoralists into cooperatives, improving pastoralists' access to and participation in the markets and managing associated risks of mobility are the recommendations forwarded.
Keywords: pastoralists, livestock, livestock income.

1. Introduction and Background

Ethiopia is among the first ten nations in the world with respect to the livestock population and takes the lead in Africa. The lead is both in terms of number and diversity of livestock, with an estimated 41 million cattle, 26 million sheep, 23 million goats, 41 million chicken, 5.7 million equines and 2.3 million camels (CSA, 2010). Though not proportional to the volume, the livestock sub sector contributes considerably to the country's economy. A study indicated that the livestock sector contributes an estimated 16 percent to the national GDP and over 40 percent to the agricultural GDP (Berhanu G. et al., 2007). Its functions take the form of provision of food, cash income, input for crop production and soil fertility management, raw materials for industry, energy/fuel, social values (specially for pastoralists) as well as promotes saving and creates employment opportunities to both highland and lowland inhabitants. More clearly put, the livestock subsector provides wide and year-round employment opportunities for surplus family labour in rural Ethiopia. Cash income from livestock production is especially important for the poor and landless Ethiopian households, particularly women. Income from livestock production is also used for income diversification investment activities. For the average rural farm household with limited investment alternatives, livestock are used as store of wealth and hedge against inflation (CSA, 2010).

The livestock subsector creates livelihood for 65% of the rural population and accounts for about 12–15% of the export earnings of the country in terms of live animals, meat and hides and skins exports (EEA, 2005). Excluding values of draught power and manure for fertilizer, of the total household cash income from crops and livestock, the livestock sector accounts for 37–87% in different parts of the country and the higher the cash income the higher is the share of livestock, indicating that increased cash income come primarily from livestock, particularly in the pastoral areas (Ayele et al., 2003).

As far as the overall contribution of livestock to the economy is concerned, it is concluded that throughout Ethiopia with some regional variations, livestock are valuable (essential in the pastoral areas) in providing food for subsistence, essential in many areas for the cultivation of crops (draught power), essential for the transportation of goods, and in some areas transporting people, the most important source of cash income for the people living in the rural areas, the most significant and widespread form of asset accumulation for the rural residents and used to invest in traditional security systems (Halderman, 2004).

In regard to poverty reduction policies and strategies, the same author states that it is useful to recognize for Ethiopian households, livestock serves as: productive assets that allow households to be self-provisioning; critical safeguards against falling into what is usually unremitting poverty; and springboards that usually enable some households to advance to relative wealth by the standards of contemporary Ethiopia.

However, the benefit obtained from the sector is low compared to other African countries and the world standard. For instance, the 2004 statistical report of FAO (quoted in SOS-Sahel Ethiopia, 2007) revealed

that the average beef yield per animal of 108.4kg for Ethiopia is by far less than 121kg for the Sudan, 130kg for Eastern Africa, 146kg for Africa, 163kg for Kenya, and 200kg for the whole world. Low productivity of the sector coupled with poor performance of livestock marketing system and low prices in the market made it so (Ayele et al., 2003). Moreover, the study conducted in 9 African countries on values and revenues of livestock showed that Ethiopia derives the least income (USD 383 per household; where for Kenya and Republic of South Africa are 6155 and 18593, respectively) from livestock (Niggol S. Seo et al., 2008).

Livestock population in Ethiopia is distributed over the highland and lowland areas. Of the total livestock population of the country, pastoralists own about 27% of cattle, 26% of sheep and nearly two-third of the goats' population; and all the camels (SOS-Sahel Ethiopia, 2007); livestock in pastoral regions accounts for an estimated 40% or so of the country's total livestock population (Sara Pantuliano et al., 2008). In terms of distribution across administrative regions, the predominantly pastoral regions of Afar and Somali have the highest densities per capita. In the lowlands of the country where pastoral management system is practiced, livestock are the principal source of subsistence, providing milk and cash income to cover family expenses for food grains and other essential consumer goods and are the main form of financial and social assets (Yakob A. et al., 2010).

Pastoral areas in Ethiopia, which cover about 0.7 million sq km, support about 12 - 15% (some 15 – 20 million people) of total population of the country (EEA, 2005; Sara Pantuliano and Mike Wekesa, 2008).

The Afar National Regional State is predominantly pastoral where over 90% of the population relies on livestock for their livelihood. Moreover, the region is characterized by extensive range land, huge livestock resources and pastoralists with best traditional knowledge in extensive livestock production systems. Despite the huge livestock population in the region, pastoralists' income from livestock is not proportional to the volume (Afar Atlas, 2006). This mainly is attributed to wide ranging problems of underdevelopment and lack of market-oriented production, lack of adequate information on livestock resources, inadequate permanent animal route and other facilities like water and holding grounds, lack or non-provision of transport, ineffective and inadequate infrastructural and institutional set-ups; together with the prevalence of diseases, illegal trade and inadequate market information. Moreover, the wide ranging and complicated social, cultural and economic factors and absence of proper processing and marketing facilities are mentioned contributing to low income from livestock farming in Afar region in particular (Mohamed, 2009). Therefore, improving livestock productivity and their respective marketing activities may improve the sector's contribution to the GDP in general and increase the pastoralists' income and lead better livelihood, in particular.

2. Statement of the Problem

The current levels of contributions of the livestock sub sector in Ethiopia, at either the national or regional level is below the potential. The level of foreign exchange earnings from livestock and livestock products are also much lower than would be expected, given the size of population and diversification (Niggol S. Seo et al., 2008). The level of contribution of livestock production for the pastoralists, who predominantly live on rearing livestock for their livelihood, is below the national average. Pastoralists could not be benefited as expected from the animals they rear. The most food insecure areas in the country are reported to be pastoral; the condition in Afar pastoralists is the worst regardless of its huge livestock resource (PLI, 2008).

Pastoral households depend primarily on livestock to generate their incomes and food consumption needs. The most important and leading income generating activities for the Afar pastoral communities is animal husbandry. Mainly rearing of cattle, camel as well as sheep and goats for cash income and for the daily subsistence need for milk and milk products, meat, hide and skin (Farm Africa, 2009). However, currently there is a dramatic decline in livestock holdings per household associated with shrinkage and degradation in grazing lands and an increase in frequency of recurrent droughts due to which the income sources of pastoral livelihood are adversely affected and the income level from livestock farming is sharply going down; and pastoralists are found to leading impoverished life. Regardless of the huge livestock resources, the household cash income for the pastoralists from sale of livestock and livestock products is declining and they are becoming more dependants on external assistances (PLI, 2008).

Therefore at this juncture, one may appreciate the paradox (huge livestock resources against absolute poverty and impoverished life) and it is natural and rational thinking to posing questions as "why the contribution of livestock production to the livelihood of pastoralists is not as expected? What has happened to the income from the livestock to move out the pastoralist households from poverty and secure household food needs? Why the pastoralists in Afar are becoming relief dependant and many use imported powdered milk (PLI, 2008)?" These are currently pressing and critical to the region in particular and need to be researched and measures have to be taken to help the innocent pastoralists assume a fair income from the livestock they keep and improve their living standard and ensure that 'pastoralists deserve a fair income from the sale of their animals'. In the severe and widespread drought of 2000, outside observers concluded that, except in extreme pockets of isolation or insecurity, there was no significant problem of food availability, and 'if satisfactory ways

could be found of increasing pastoralists' cash income, there would be no separate food crisis' (Sandford et al., 2000 in Sara Pantuliano et al., 2008). Moreover, it is argued that market participation can be an effective route for pastoralists to reduce poverty and increase income (Mohamed, 2009). It is however, widely seen that thousands of pastoral households in Afar Region seem to fail to deserve fair income from participation in livestock markets which is attributed to controllable and uncontrollable factors. Therefore, it demands that the social, cultural, institutional and other factors that determine the level of income from livestock for the pastoralists have to be identified and analyzed to devise solutions for the aforementioned questions.

3. Objective of the Study

The overall objective of this study is to explore those factors most closely associated with pastoralists' household income from livestock in the Middle Awash area, Afar Region and to draw recommendations that will help to improve pastoralists' livestock income.

4. Methodology

Sampling Design and Sampling Size

The study was conducted in two districts (Gewane and Amibara) of Afar Region. For the study, Middle Awash (Administrative Zone III) is randomly selected. From six districts in Administrative Zone III Gewane and Amibara are selected randomly for the study. For the purpose of data collection from the randomly selected two districts, livestock owners are taken as the main targets. A total of ten Pastoral Associations are selected at random. The number of PAs for each district is proportional to total number they have. Accordingly, from 9 PAs of Gewane 4 and from 18 PAs of Amibara 6 are selected randomly. Then, by taking into account the infrastructural availability, financial capacity, time availability and other logistics requirements, ten households are selected randomly from each sample PAs for the study, totaling 100 households.

Data Collection

As explained above, the survey covered a total of 100 sample households from the targeted PAs to generate quantitative and qualitative data on the issue in concern to achieve the stated objectives. The questionnaire had different parts: household data (family size, education level and occupation), household assets, livestock and land, income (from livestock, land and non- farm), and others. Led by the structured questionnaires, the sampled respondents were interviewed. For the interviewing purpose, rural and pastoral development workers were used as translators.

Econometric Model Selection and Specification for Analysis

The core objective of this study is to identify the major socio-economic factors that have a positive or negative impact on the level of the pastoralists' livestock annual income in the study area and critically analyzing level of impact of the factors on livestock income. It is hypothesized that livestock income of a given household is determined by a wide variety of factors; economic, social or cultural.

To select a proper model of statistical analysis basically follows, among other criteria to consider, the nature of the dependent and independent variables. In this case the dependent variable, the livestock income, obviously is a continuous variable measured in Ethiopian Birr (ETHB). However, it can also be made discrete (classifying as very low, low, medium, high and very high using some references as income quintiles or deciles); or even it can be made dummy variable specifying as high or low income groups for the analysis purpose (European Journal of Comparative Economics, 2007). Following this, either multiple regression model or logit models can be applied. On the other hand, the nature of the regressors (independent/explanatory) variables also dictates the type of statistical model for analysis. In this study some continuous and some dummy variables were included. Models in which the dependent variable, or regressand, *Y* depends on two or more explanatory variables, or regressors are referred to as multiple regression models. Following Gujarati, regressors containing both quantitative and qualitative variables are called analysis of covariance models (Gujarati, 2004).

Thus, the income analysis in this study has been done following the regression technique in linear form; and the following multiple regression model was employed to estimate the determinants of household livestock income.

$$Y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \ldots + \beta_n x_{ni} + u_i \quad \ldots\ldots (1)$$

Where;

Y_i = is the annual household income in monetary term from livestock;

$X_1, X_2, \ldots, X_n$ = are the explanatory (or the regressors) variables containing both quantitative and dummies,

β_0 = is the intercept gives the mean or average effect on *Y* of all the variables excluded from the model;

$\beta_1, \beta_2, \ldots \beta_n$ = are the partial regression coefficients of parameters; and

i = the i^{th} observation

U_i = is the stochastic disturbance or the error term

Or more expressively, the following multiple regression model can be specified for we have both quantitative and qualitative (dummies) explanatory variables, (Gujarati, 2004). This model is more expressive in that it clearly shows the continuous explanatory variables and the dummies.

$$Y_i = \beta_0 + \beta_1 Ax_i + \beta_2(FS)x_i + \beta_3(TLU)x_i + \beta_4(ED)x_i + \beta_5 D_5 x_i + \beta_6 D_6 x_i + \ldots + \beta_n D_n x_{ni} + u_i \ldots\ldots\ldots\ldots (2)$$

Where;
A = is age of the household head;
FS = is family size of the household;
TLU = is the total herd size of the household in TLU;
ED = is the educational status of the household head;
D_5, D_6, …, D_n = are dummies where 1 = existence and 0 = otherwise

5. Determinants of Household Livestock Income (Results from Regression Econometric Model)

The income of a household generally is determined by wide ranges of factors. The ranges of factors may vary between the different sources of household income. When speaking to the determining factors affecting household income from livestock, appreciably different factors can be observed. The study has tried to address the objective and give empirical analysis. The dependent variable considered in the analysis is the total (gross) annual household income derived solely from livestock. 15 explanatory variables are used to estimate the model. Hence, family size, educational status of household head, total livestock holding, age of the household head, livestock mobility, risk of predators, price of livestock in the market, access to credit, market participation, employment, availability of grazing land, livestock breed type, access to livestock market, livestock management practice and access to extension services are the independent variables assumed to explain the dependent variable using the specified model.

Out of these 15 explanatory variables, only 6 variables are found to be significantly affecting pastoralists' household livestock income. Those variables which are considered as important determinants of livestock income as per the analysis result are a) total livestock holding, b) access to credit, c) availability of grazing land, d) risk of predators, e) livestock breed type and f) livestock mobility.

Total Livestock Holding

As hypothesized and expected, total herd size exerts a positive impact on the level of income from livestock for the household and significantly at less than 1% level of significance. This means, a unit increase in the number of herd size in TLU leads to an (73.1%) increase in level of livestock income. The implication is that, livestock are sources of cash income for pastoralist households. They receive cash from the sale of livestock and/or livestock products. Moreover, when all other contributions of livestock such as transportation, stock replacement, reproduction, manure, prestige, social values and etc are valuated, add to the total household income from livestock. Therefore, pastoralists who owned more livestock are able to assume more income for their families.

Access to Farm Credit for the Household

The result of the regression analysis shows that the pastoral household's access to farm credit observed to have a positive relationship with the income that the household derives from the livestock (camels, cattle and small ruminants). The impact of credit access on the level of livestock income to the household is significant at less than 5% level. The positive relation implies that the more the household is likely to get credit access from any source, the higher is the probability that the family's income from livestock improved. This is justifiable from many angles. In rural areas farm families mostly challenged by production failures which leads them to loss of assets (most probably livestock). This results in decline in stock and thereby small income from livestock. The result will be the worst if not supported by credit availability to back store the stock and pass the bad days. Pastoralists will pass the bad times if they have access to credit. They will have bargaining power to wait for good times and receiving good prices for their animals. Moreover, access to credit for the herders helps them to purchase concentrates (alternative feed) for their animals. Herders can improve the livestock production and productivity by adopting different production technologies such as improved livestock breeds. Obviously adoption and wise use of different production inputs helps herders boost production, hence, surplus for the market resulting, in turn in rise in income from livestock resources. Availability of credit for the pastoralist households eases access and adoption of all the production inputs thereby, contributing to increase in income from livestock for the households.

Livestock Mobility

It is common for the pastoralists to move their animals in search of pasture and water. The regression analysis shows that livestock mobility impacts livestock income significantly at less than 10% level of significance. However, the impact is found to be positive as the coefficient is computed as a positive value which is contradictory to the hypothesized proposition. The justifications for the positive relationship between livestock income and herd movement might be when the pastoralists move their animals they get access to pasture and water for the animals. Leaving the risks associated with movement like predators, diseases, theft and others aside, access to pasture and water help the animals be more productive. Obviously, the more productive are the animals the more will be the household income derived from the animals for the family. Otherwise, the positive relation may be interpreted as it happened by chance.

Livestock Breed Type

Breed type here refers to adoption of improved livestock breed types by the households. It is assumed that improved breeds are more productive and bringing additional incomes to the households. The regression model analysis reveals that livestock breed type in the study area found to have a positive relationship with livestock income. The influence was significant at less than 10% level. Therefore, the implication of the result of the analysis is that as the pastoralists adopt improved livestock breed types the more will be their probability to assume high income from the livestock.

Availability of Grazing Land

Availability of grazing land is one of the most figurative constraints of pastoralists in the study area. The study showed that 61 per cent of the sampled respondents responded that they have a problem of grazing land availability and perceive that the problem affects their income from livestock. According to the results of focused group discussions and the researcher's personal observation grazing land in the study area is administered and allotted by the clan leaders and the pastoralists use by communal mode. Moreover, pastoralists used to cross long distances in search of grazing pasture.

The econometric model analysis result reveals that availability of grazing land has a positive relationship with the level of income from livestock. The relationship between livestock income and availability of grazing land is significant at less than 1% level of significance. The implication of the analysis result is that grazing pasture and water are the major inputs for healthy livestock production. Livestock produced with sufficient grazing resources will be more productive and cost well in the market resulting in boost in output (production). In such a case, pastoralists will have surplus for the market which in turn brings additional income to the household.

6. Recommendations

Based on the results and findings of the study, to improve pastoralist households' income from livestock, some recommendations are suggested to be addressed by the pastoral societies themselves, concerned different government sectoral bodies and non-governmental funding agencies. Sticking to the significant factors affecting livestock income, the following has been suggested;

Improving livestock production and productivity: The highest proportion of the household income in the study area comes from livestock. Hence, necessary effort should be made to improve the production and productivity of the sector so as to benefit much from the sector. Higher production and productivity can be achieved through the use of improved breeds (introduction of timely and effective artificial insemination services to up-grade the existing breeds), introduction of alternative feed sources (like concentrates, cut and carry system and etc.) other than the natural grazing pasture, modern livestock production techniques (strategic feeding, feed storage, housing and etc.); and better management of communal grazing resources and risks management. Furthermore, provision of adequate veterinary services, improved water supply points, launching sustainable and effective forage development program, provision of training for the livestock holders on how to improve their production and productivity, improving the marketing conditions, etc. by the local community, NGOs and the local government are needed so as to derive the maximum possible income and thereby secure food consumption needs at household level.

Organizing pastoralists into cooperatives: The livestock owners have over many years suffered to access financial support due to factors such as lack of financial institution and collateral systems fit to their situation. Therefore, organizing the pastoralists in to saving and credit cooperatives solves the problem as these organizations are ideal in serving as one of the funding mechanisms that aim at broadening access by pastoralists to finance through credit. The cooperative promotion offices in the study area should work hard in creating awareness among pastoral families towards objectives, values, principles and importance of cooperatives and help them organize in to cooperatives of their own. Furthermore, livestock marketing cooperatives, milk and milk products marketing cooperatives are needed to be initiated at least at district level so as to help herders bargain in the market.

Improving pastoralists' access to and participation in the markets: The ability of pastoralists to market their livestock and/or livestock products in a timely fashion and at a fair price is essential to improve their income at the household level. It fosters monetization, savings and investment. If prices of livestock in the market are relatively stable, attractive and predictable over space and time, marketing efficiency can be enhanced, in which case pastoralists will be motivated. Therefore, it demands to improve their access to markets through construction of modern markets and access roads, provision of water along stock routes and improved security along market routes. Moreover, strengthening pastoralists' access to markets and livestock trade through better linkages between pastoralists and traders is particularly important.

Managing associated risks of mobility: Mobility is a primary way of managing livestock related risks in pastoral areas. However, there are multiple risks associated with moving along with livestock in search of better grazing rangeland and water. In the study area, ethnic conflicts and predators risks are mentioned foremost challenging

mobility. Therefore, while mobility is a lasting tradition to pass bad times of the year in pastoral areas, managing associated risks is worthwhile. Sustainable conflicts management and peace making schemes led by elders of rivalry ethnicities are needed to be promoted by the regional government.

Table: Linear multiple regression estimates of determinants of livestock income

Explanatory variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(CONSTANT)	-20311.018	15516.677		-1.309	0.194	-51167.631	10545.596
AV_GL	11767.699	2392.062	0.263	4.919	0.000***	7010.821	16524.577
LS_MOB	3735.412	2104.622	0.087	1.775	0.080*	-449.861	7920.685
PR_LS	-52.255	3682.336	-0.001	-0.014	0.989	-7374.983	7270.473
PRD_RISK	-5037.958	2614.554	-0.098	-1.927	0.057*	-10237.286	161.370
ACC_LSM	-2698.350	2402.608	-0.060	-1.123	0.265	-7476.200	2079.499
LS_BRT	4913.851	2707.121	0.090	1.815	0.073*	-469.557	10297.258
MGT_LS	-566.458	498.259	-0.056	-1.137	0.259	-1557.300	424.384
AGE_H	-138.449	94.774	-0.077	-1.461	0.148	-326.917	50.018
EDU_H	-1712.920	1641.956	-0.054	-1.043	0.300	-4978.129	1552.289
FAM_SIZ	-93.733	392.420	-0.012	-0.239	0.812	-874.103	686.636
EMPT_WAGE	-2454.297	2199.594	-0.056	-1.116	0.268	-6828.430	1919.837
TLSH_TLU	880.865	65.625	0.731	13.423	0.000***	750.363	1011.367
PPT_MKT	-4984.663	3318.342	-0.097	-1.502	0.137	-11583.551	1614.224
ACC_EXT	3769.627	3027.798	0.068	1.245	0.217	-2251.481	9790.736
CRDT_AC	9242.286	4292.914	0.110	2.153	0.034**	705.356	17779.217
R2 value	0.824						
Adjusted R2 value	0.793						

Source: Own Field survey, 2010

*, ** & *** significant at less than 1%, 5% & 10% level of significance, respectively

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