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Knowledge of Livestock Grading and Market Participation among Small Ruminant Producers in Northern Somalia

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ABSTRACT

This study focused on market participation and producers' knowledge of the indigenous livestock grading and pricing system applied to small ruminant marketing in Somaliland. Data were collected from a random sample of 144 men and women producers in three livelihood zones: Hawd pastoral, West Golis pastoral and Togdheer agro-pastoral zones. Results confirmed the importance of small ruminants as sources of income in producer households. Knowledge about the grading system was generally widespread, and this was important for market participation. Factors that significantly influenced market participation were number of animals kept, gender of sales/decision maker, age of household head and livelihood zone.

KEYWORDS

Livestock; farmers; grading system; market participation

Introduction

Livestock is the leading economic sector in Somalia where animal production and marketing (both domestic and export selling) have persisted, despite over two decades of civil war and instability. According to FAO (2012), the livestock sector in Somali accounts for 40% of the gross domestic product (GDP) and 80% of foreign exchange earnings. At the household level, over 65% of the population is engaged in various ways in the livestock industry. Income earned from animal sales and other livestock related activities is used to buy food and other necessities, thus impacting directly on food security and poverty.

Sheep and goats are among the most important livestock species reared and marketed in Somalia. In 2011, over three million sheep and goats worth over USD 200 million were exported to the Middle Eastern countries (mainly Saudi Arabia) at the port of Barbera (SLCCIA, 2013). Besides export, a significant number of small ruminants are marketed domestically, generating employment to the local population – especially women, who are popularly involved in domestic meat selling and production of useful by-products such as soap and ornamentals.

To understand how market access for Somali livestock can be enhanced, Terra Nuova and ILRI conducted value chain studies on livestock export in Somalia (Negassa *et al.*,

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ATTRIBUTES AND THEIR LEVELS				GRADES			
Age	Conformation	Nutritional status	Sex	GRADE I	GRADE II	GRADE III	LOCAL
• Adults	• Excellent	• Fat	• Male				
• Young	• Good	• Normal	• Female				
	• Fair	• Thin					

Figure 1. A schematic representation of the Somali livestock grading system.

2008; Mugunieri *et al.*, 2012). The studies documented the use of an indigenous animal grading system in markets. Based on levels of important traits including age, conformation, body condition and sex (only male animals are exported), animals are grouped into grades I, II, III and local quality. Grade I marks the highest quality animals and these fetch the best prices. Lower grades are discounted. The studies noted that the grading system offered an opportunity for producers and other intermediaries to make higher profits through quality improvement of animals sold (see Figure 1).

Although the studies by Negassa *et al.* (2008) and Mugunieri *et al.* (2012) generated useful information for enhancing market access by actors in export marketing of livestock in Somalia, farmers were not included in the studies, despite the importance of livestock producers in the value chain both in terms of numbers and also the role that they perform. The current study focuses on market participation and awareness of the livestock grading and pricing system among Somali sheep and goat producers. The study is motivated by the realization that producers cannot make deliberate efforts to exploit the grading system to realize higher incomes if they are not aware of it.

Materials and methods

Sampling

Data for this study were collected from a random sample of 144 pastoral and agro-pastoral households who reared sheep and goats in Somaliland. The study area covered three livelihood zones including (i) West Golis pastoral zone, where goats, camels and sheep were the main species of livestock kept; (ii) Togdheer agro-pastoral zone, where rearing of sheep, goats and also vegetable production were the main agricultural activities; and (iii) Hawd pastoral zone, where rearing of sheep and goats was the main activity.

Human settlements in each livelihood zone were categorized into those located close to the market (within a 20-km radius) and those located far from the market. From each settlement category, two settlements were randomly picked. A list of households that kept sheep and goats in each selected settlement was prepared with the help of local leaders. Subsequently, 12 households were randomly selected. A semi-structured questionnaire was administered on the most senior male and/or female in the sample households. If a sample household was not willing to be interviewed, it was dropped from the study and replaced with a spare household.

Data analysis

Descriptive statistics (means and frequencies) were used to evaluate the level of awareness about the grading system and also to investigate whether the producers made any deliberate efforts to exploit the grading system for higher returns. A Heckman (1979) two stage model was used to evaluate the effect of producers' knowledge of the indigenous livestock grading system and other factors on market participation.

For the purpose of this analysis, market participation was only represented as the number of sheep and goats sold, while purchases were ignored as buying was rather scarce in the dataset. Market participation has a censored distribution and involves two decisions: (i) whether or not to participate in the market; and (ii) how much to sell conditional on having decided to be a market participant. Under these conditions, use of a Heckman two stage selection model rather than ordinary Tobit regression to evaluate determinants of market participation was favoured, as the latter often yields parameter estimates that are biased (Bellemare and Barrett, 2005).

To model producers' decisions on whether or not to participate in markets, a Probit model was used. Denoting market participation as a dummy variable, Z_i which takes a value of 1 if the i th producer decides to participate and 0 otherwise, the Probit model was formulated as follows:

$$\begin{aligned} Z_i = 1 & \quad \text{if} \quad Z_i^* = W_i\gamma + u_i > 0 \\ Z_i = 0 & \quad \text{if} \quad Z_i^* = W_i\gamma + u_i \leq 0 \end{aligned} \quad (1)$$

$$\text{Prob}(Z_i = 1|W_i) = \Phi(W_i\gamma)$$

Where Z_i^* is an unobservable random variable representing utility derived from market participation, W_i is a set of explanatory variables influencing market participation, γ is a vector of parameters to be estimated, u_i is a vector of stochastic error terms and $\Phi(\bullet)$ is the standard normal cumulative distribution function. It is assumed that $u_i \sim N(0,1)$.

In the second stage of modelling (modelling the intensity of market participation), the number of animals sold was expressed as a function of a set of explanatory variables with the inverse of mills ratio (IMR) also included as a regressor in equation (2). In the model,

IMR is represented as $\frac{\varphi(-W_i\gamma)}{1 - \Phi(-W_i\gamma)}$ and serves to correct for the bias attributable to non-

use of observations where no sales had taken place; φ denotes the normal probability density function; X_i is a vector of explanatory variables influencing intensity of market participation; β is a vector of parameters to be estimated; ε_i is a vector of stochastic error terms and is $N(0, \sigma_\varepsilon^2)$; τ is an unknown parameter computed as $\rho_{\varepsilon u} \sigma_\varepsilon$ where $\rho_{\varepsilon u}$ is the correlation coefficient between the error terms ε_i and u_i .

$$Y_i = X_i\beta + \tau \frac{\varphi(-W_i\gamma)}{1 - \Phi(-W_i\gamma)} + \varepsilon_i \quad \text{if} \quad Z_i = 1 \quad (2)$$

The two sets of explanatory variables (W_i and X_i) comprise the same variables except for "number of sheep and goats kept", which only appear as a determinant of market participation. Essentially, the selection equation should contain at least one explanatory variable more than the intensity of market participation equation in order to avoid the problem of weak identification of parameters. Explanatory variables in the two equations

included producers' knowledge about grading; gender, age and level of education of household head; gender of sales decision maker; and type of livelihood zone. Knowledge about the grading system was inferred from two issues ("respondents ability to correctly describe the grading system" and "knowledge of export quality grades") and was expressed on a scale of 0, 1 and 2, depending on whether a producer had no knowledge of both issues (0), was correct on only one (1), or was right on both (2).

Results

Demographic features of surveyed households

Table 1 presents a summary of the demographic features of the surveyed households. Although the majority of households were male-headed, women accounted for the majority (56%) of respondents.

In households where men were unavailable, a common explanation was that they were away in "the bush" with their livestock or they were "just hanging out" in market centres. Literacy levels were low, with 77% of the household heads having had no formal education at all. The high incidence of illiteracy is attributable to the many years of fighting that has disrupted provision of formal education in Somalia. On average, a household kept 53 shoats. Commonly, shoats either solely belonged to a male head of household or to both the head and his wife/wives (48% of households in each case). Besides small ruminants, numerous farmers also kept other species of livestock including camels, donkeys, cattle and chicken. Camel was the most popular alternative livestock both in terms of number of farmers involved (19% to 31%) and stocks of animals kept (on average 5.2 to 8.5 animals).

Table 1. Demographic characteristics of the surveyed households.

Number of households interviewed	144	
Gender of respondents (% of households)	Male	44
	Female	56
Gender of household head in surveyed households (% of households)	Male	85
	Female	15
Age of household head	Mean	46
	Standard deviation	13
Frequency of household heads with different levels of formal education	None	77
	Elementary	12
	Intermediate	8
	Secondary graduate	3
Number of sheep and goats kept	Mean	53
	Standard deviation	44
Number of sheep and goats sold during the last 12 months	Mean	9
	Standard deviation	20
Owners of sheep and goats in households (% of households)	Household head only	48
	Spouse only	4
	Jointly by household head and spouse	48
	Others (male child/relatives/ Business partners)	8
	Jointly in the household	53
Providers of labour for sheep and goat activities in households (% of households)	Male child	23
	A woman in the household	12
	Others (man/female child/business partner)	13
	Jointly in the household	45
Decision makers on sales and purchases of sheep and goats in households (% of households)	A woman in the household	10
	Man in the household	39
	Others (male child/relatives/business partners)	9
	Jointly in the household	45

Awareness about grades

Awareness about the grading system was high with only 6% of male and 18% of women respondents being unaware. Three different answers emerged when respondents who claimed to be aware about the system were asked to describe the categorization of animals under the grading system. The majority of farmers (94% of men and 97% of women) correctly mentioned all the four grades of animals. A few farmers, however, erroneously left out the local grade in their description (2% of men and 1% of women) while others (4% of men and 4% of women) said that the system comprised of only two grades.

Many farmers were aware of the factors/attributes determining grade. Over 90% of both men and women knew that age, body conformation and nutritional status were important determinants of grade. Conversely, small numbers of men (8%) and also women (5%) were unaware that breed plays no role in influencing grade in sheep and goats. Interestingly, many farmers (about 90% of men and 91–96% of women) viewed sex as an important determinant of grade, perhaps because grading was commonly performed on male animals for export.

Participation in markets

Most households (81–83%) had sold some sheep and/or goats during the previous 12 months. On average, a household had sold nine animals (significant difference = 20). This high number of farmers reporting sales of sheep and goats and also the high number of animals sold authenticate the importance of small ruminants as sources of household income. Sales tended to be higher where decisions to sell were made by men (mean=14.2 animals) and lowest in cases when the women made these decisions (mean=4.4 animals). Grades I and II accounted for the largest proportions of the animals sold (35% and 38%, respectively) with grade III and the local grade accounting for only 14% and 13%, respectively. On average, a grade I animal fetched USD 67.4–76.1 compared to USD 58.6–66.7 for grade II, USD 42.8–54.7 for grade III and USD 29.4–52.4 for the local quality grade.

Table 2 shows the Heckman two stage model results. As the dependent variable, that is, “number of sheep and goats sold during the preceding 12 months” was positively skewed, it was included in the model in logarithmic form. The model size was 138 observations (out of which eight were censored) and the goodness-of-fit was statistically significant at the 1% level. The parameter “rho”, which represents the correlation between the error terms in “market participation” and the “intensity of market participation” model equations was also statistically significant ($P=0.03$), justifying the use of Heckman’s selection model over ordinary Tobit regression.

Determinants of probability of market participation

Factors that were significant in influencing market participation included “numbers of sheep and goats kept” and “age of household head”. As expected, the size of flocks of sheep and goats kept had a positive effect on the probability of market participation. In this export orientated small ruminant production and marketing system, animals sold are often males while females are retained for breeding. Where flocks are small, the production of male animals for sale is likely to be low, thus minimizing the chance of producers participating in markets as sellers. Also, producers with fewer animals may give priority to building up their stocks before engaging in any selling.

Table 2. Heckman's two stage model estimates of factors influencing market participation and also participation intensity.

	Market participation intensity		Market participation (0,1)		
	coefficient	Standard error	Coefficient	Standard error	
Constant	1.15***	0.38	0.87	1.18	
Gender of household head (1=man; 0=woman)	-0.33	0.22	0.15	0.84	
Knowledge of the grading system	0.06	0.10	0.14	0.30	
Age of household head (years)	0.00	0.01	-0.04**	0.02	
Level of education of household head	-0.04	0.08	0.42	0.48	
Sales decision maker (base of comparison=a female in the household)					
	Male household head	0.73***	0.21	0.04	0.69
	Jointly by spouses	0.37*	0.20	0.15	0.65
Survey region (base of comparison=Togdheere agro-pastoral)	Hawd pastoral	0.35**	0.18	0.42	0.67
	West Golis pastoral	0.54***	0.19	0.24	0.63
Number of sheep and goats kept			0.04**	0.02	
/athrho	-0.74	0.31		0.02	
/lnsigma	-0.26	0.07		0.00	
Rho	-0.63	0.19			
Sigma	0.77	0.05			
Lambda	-0.49	0.16			
Number of observations = 138	Probability >				
	chi2=0.0001				
Censored observations = 8	Log likelihood = -168.4				
Uncensored observations = 130	LR test of independence of equations (rho = 0): chi2(1) = 4.46			Probability >	
	chi2 = 0.03				
Wald chi2(8)=31.71					

**** and * indicate 1%, 5% and 10% statistical significance, respectively.

Probability of market participation was significantly higher in cases where household heads were relatively younger ($P=0.05$). This finding perhaps reflects the higher demand for income often faced by relatively younger parents at a stage when many of their children are highly dependent on them. Also, such young adults may not have accumulated much wealth in other forms, making them more dependent on the sale of sheep and goats whose production is relatively easier to get into.

Awareness about the livestock grading system had no significant effect on the probability of market participation. This lack of significance may be attributable to the fact that knowledge of the fundamental issues about the grading system is already widespread and that fine issues such as ability to correctly describe the grading system and also knowledge of which grades of animals are exported does not make any difference with respect to market participation.

Determinants of intensity of market participation

Consistent with the results of the descriptive statistics, gender of household head had no significant effect on intensity of market participation. On the other hand, households where sales decisions were made by either a male household head or collectively by both spouses tended to have more intensive participation ($P=0.01$ and 0.1 , respectively) compared to cases where these decisions were solely made by women. The strong effect of sales decision making by male household heads on intensity of market participation perhaps relates to a trend that has been reported in past studies of men assuming greater control of activities in cases where these tend to be important sources of household cash income.

It was also observed that producers in West Golis and Hawd participated in the market more intensively compared to their counterparts in Togdheere. This finding perhaps relates to differences in livelihoods in the three study sites. Unlike Togdheere, which is agro-pastoral, West Golis and Hawd are strictly pastoral with only livestock as the main source of livelihood. In the absence of crop production, livestock producers in West Golis and Hawd may need to sell more animals to raise the amount of money they need to finance their food purchases. Again, knowledge of the livestock grading system had no significant effect on the intensity of market participation.

Conclusions and recommendations

This study focused on market participation and awareness about the indigenous livestock grading and pricing system among small ruminant producers in Somaliland. Results confirmed the importance of these animals as a source of income to households. Consistent with findings in previous studies, participation by women in the rearing and marketing of small ruminants was found to be strong, implying that these activities provide a good entry point in promoting gender parity in economic welfare in producer households in Northern Somalia.

Producers were well versed about the grading system. Both market participation and participation intensity were higher among pastoralists compared to agro-pastoralists, which underscore the huge importance of sheep and goats among the pastoralists. The number of animals kept significantly influenced market participation, justifying interventions designed to safeguard stocks of small ruminants held by producers. Market participation intensity was significantly lower where sales decisions were made by women, pointing to a need to search for ways to correct this situation.

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