GLOBAL LIVESTOCK CRSP

Documenting Causes of Livestock Mortality Among Pastoralists in Ethiopia and Kenya

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A major source of risk facing Ethiopian and Kenyan pastoralists is the death of their livestock. Livestock deaths confront households not just due to the lost value of the animal itself, but also from the lost future potential of the animal to provide a flow of livestock products such as milk, blood, transport, or traction in the future. The well-known 'boom and bust' cycle in arid and semi-arid rangelands is based on widespread, sudden deaths of animals, followed by a long slow process of rebuilding the herd. Researchers from the PARIMA (Pastoral Risk Management) project asked herders over the course of a 'boom and bust' cycle from 2000 to 2002 to report on the reasons for each animal that died in their herd. This brief presents findings on their responses. The main finding is that deaths attributed to drought (58%) are the leading cause of animal death in the period. Animal disease (28%) and predators (6%) are also significant contributors to animal deaths. It is shown that drought deaths are concentrated in specific time periods. These findings indicate that the main interventions that will help reduce the risks associated with pastoral production should focus on reducing the impact of asset loss in droughts. It is also clear that projects focusing on improved livestock health could lead to a significant reduction in livestock losses.

Background

Over the course of the PARIMA (Pastoral Risk Management) project, the research team spent considerable effort on the analysis of household level responses to the risk of livestock loss and long-term herd dynamics (Lybbert et al. 2004; McPeak 2004, 2005, 2006a, and 2006b). The PARIMA project was developed alongside major advances in the study of rangeland ecosystems, such as the evidence collected in *Range Ecology at Disequilibrium* (1993) and other related publications. This 'new range ecology,' as it has been called, is based on the argument that 'boom and bust' cycles are inherent to extensive grazing systems that utilize rain-fed grasslands in arid and semi-arid areas. Researchers with the PARIMA team developed their fieldwork with a goal of understanding how people in these rangelands make decisions in the face of these kinds of risks and herd dynamics and seeking to understand the underlying causes of these dynamics.

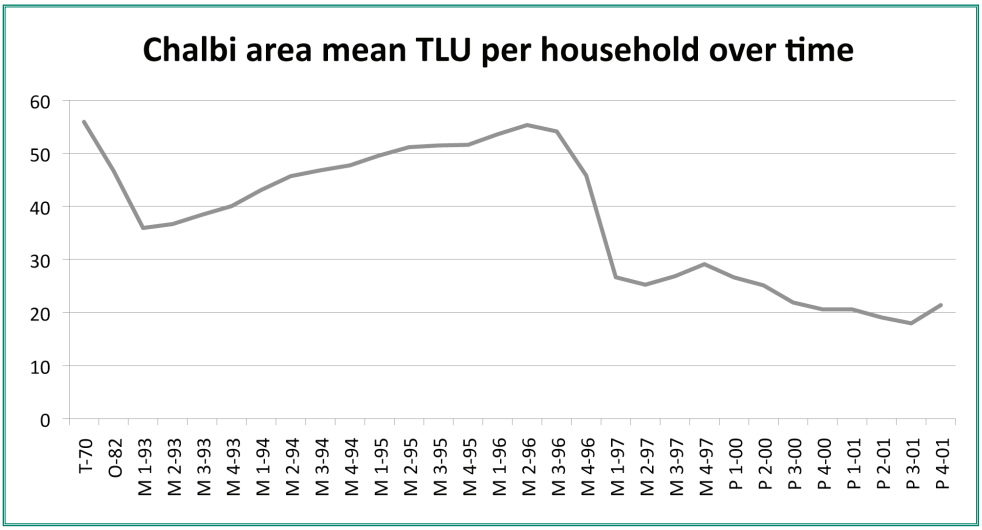
An example of a 'boom and bust' cycle is illustrated in Figure 1 using the PARIMA and other data sets gathered from Gabra herders in the Chalbi basin. On this figure, the y-axis records median herd size measured in Tropical Livestock Units (TLU) for the sampled herders, and the x-axis records time periods and source of the data. Here, studies by Torry (T) in 1970, O'Leary (O) in the early 1980s, McPeak in the 1990s (M), and PARIMA work from 2000-2002 referenced above (P) are put on a single graph. The first two surveys were single round surveys, and the latter two record quarterly data over multiple years, hence the -1, -2, -3, and -4 notation. Thus, the time intervals and sampling methodology differ. It is worth stressing that the x-axis is not equally spaced over time as the sampling frequency varies, and there are gaps of time between surveys. However, this does give some sense of long-term herd dynamics in the area.

Figure 1 illustrates that household herd size volatility over time may be pronounced. While the PARIMA team has made progress answering how the possibility of livestock loss influences pastoral decision making, the uncertainty of the causes of all of these livestock deaths became increasingly evident to members of the research team. Often, the answer was 'drought,' but this was in some ways unsatisfying since it often seemed tautological – it was a drought since many animals died rather than a drought as defined by some metrological or rangeland productivity measure. This brief describes how the write up of the PARIMA findings as conducted by the LiTEK team has moved towards understanding the underlying forces that lead to livestock mortality.

Preliminary Findings

While this brief sets the stage for an analysis of the underlying causes of livestock mortality, it is worth noting that considerable work remains concerning explanations of livestock deaths in the pastoral rangelands. The PARIMA data set is used to provide the context for understanding livestock mortality. Simply put, why do herders think their animals died, and what do the patterns in their responses mean?

Figure 1. Herd size over time for Gabra herders in the Chalbi area. Source: McPeak 2006a.



First, consider spatial and temporal variability in the mortality data. Temporal variability is represented by the reported value of deaths in TLU terms in both the rainy season and the following dry season (a six month period) divided by the TLU herd size reported at the start of the rainy season to get a seasonal mortality rate. This variable describes what percent of the herd died in the six months after the start of the rainy season. The spatial variability is represented by calculating the mean mortality rate for each of the eleven study sites. These figures are reported in Table 1, which covers four seasons (two years) of data.

The values in Table 1 illustrate there is significant spatial variation in the impact of a drought event that is being masked in Figure 1 by pooling data across all sites. Three main patterns are captured by this table. One pattern is that it was a year-long drought, with losses greater than 10% occurring in two consecutive six-month seasons. This would be the pattern in Ng'ambo, Logologo, Sugata Marmar, Kargi, Wachille, and Dirib Gumbo. A second pattern is a sharp drop in one six-month time period, after which the losses were not very large. Dillo, Dida Hara, Finchawa, and North Horr fit this pattern (though it is possible that there were losses in the season before the data gathering began in these sites which were not recorded). Finally, there is one site, Qorati, where it appears there were no significant losses. Whether the fact that this 'bust' exerted an impact over the course of two seasons is a general pattern or due to the nature of this particular event is something currently being researched by members of the LiTEK team and others who are looking at data on multiple bust events generated by the World Bank-funded Arid Lands Resource Management Project.

When gathering data on livestock mortality used to generate the figures presented in Table 1, PARIMA researchers asked the household head to assess the main cause of death for each of the animals they reported as dying. The number of deaths that were reported to be from a particular cause in each site in each time period can be categorized and counted. A death to any animal (camel, cattle, sheep or goat) is given equal weight in the summation in this presentation of the findings. If multiple causes of a single death were identified, each of the causes listed was given equal fractional shares of the one death recorded.

Over half of all mortality (58%) reported in the survey was attributed to drought or a drought related causes. The second leading cause of death is disease. Over one quarter (28%) of all animal deaths were attributed to diseases. Predators are also identified as a problem leading to 6% of deaths, and a variety of other causes account for the remaining 10% of deaths.

Table 1. Six month mortality rates by season and site.

Site	Mar 2000 - Sept 2000	Oct 2000 - Feb 2001	Mar 2001 - Sept 2001	Oct 2001 - Feb 2002
Ng'ambo, Kenya	45%	13%	5%	1%
Dillo, Ethiopia	34%	7%	0%	1%
Dida Hara, Ethiopia	31%	5%	3%	3%
Logologo, Kenya	28%	25%	3%	2%
Sugata Marmar, Kenya	25%	11%	7%	5%
Finchawa, Ethiopia	24%	2%	3%	0%
Kargi, Kenya	23%	17%	7%	4%
Wachille, Ethiopia	23%	12%	3%	5%
Dirib Gumbo, Kenya	20%	43%	6%	1%
North Horr, Kenya	14%	9%	0%	0%
Qorati, Ethiopia	3%	1%	0%	1%

Table 2. Total deaths by survey round and cause of death.

Survey round	Drought/lack of pasture/starvation/ emaciation	Disease	Predator	Accident	Killed to save mother	Old age	Rain/cold	Drank bad water	Other
June 2000	1446	417	32	6	11	7	0	0	12
September 2000	699	177	34	4	13	6	0	0	16
December 2000	440	218	37	6	0	10	75	57	26
March 2001	79	65	29	18	0	2	5	27	10
June 2001	0	63	19	1	0	0	0	1	6
September 2001	7	132	13	1	0	0	0	0	14
December 2001	0	114	58	5	0	2	0	0	5
March 2002	0	58	21	0	0	0	0	1	0
June 2002	0	51	16	1	0	0	0	0	10

The temporal pattern of these deaths is informative. Table 2 presents the causes of death by survey round and the number of deaths recorded in the survey. The deaths from drought, and the magnitude of total loss, are largest in the earlier rounds of the survey. Animal disease does lead to more deaths in the earlier rounds than the later rounds but is more of a constant problem besetting herders.

One final perspective on patterns in livestock loss can be found by considering spatial patterns in the magnitude of livestock deaths. Findings suggest that vulnerability to animal losses in drought is not necessarily associated with lower well-being. In fact, with the exception of Dida Hara in Ethiopia, the five sites with the highest number of animal deaths (Kargi, North Horr, Ng'ambo, and Logologo) are also in the top five for average income per site as reported in an earlier research brief (McPeak 2008). Also, the ordering of the number of deaths is not necessarily indicative of the mortality rates, which makes sense given that average herd size varies across the sites. While it is true that having more animals is associated with losing more animals and that well-being declines when animals die, there is no clear indication that being in a site where many of animals die in a drought means one is in a site with lower average well-being.

Practical Implications

Related briefs have stressed that livestock and livestock products are critical to generating income for residents of pastoral areas (McPeak 2009). Losses of livestock assets can have a direct adverse impact on people's well-being. Understanding what leads to livestock losses is therefore a critical challenge facing development efforts to improve the incomes and reduce the vulnerability of people living in pastoral areas. This brief illustrates that animal deaths are not distributed evenly across time. More animals died in each of the first three survey rounds in 2000 (June, 869 animals; September, 836; and December, 829) than the total deaths in the subsequent six rounds combined (total March 2001-June 2002, 675). Both drought and disease losses are concentrated in these three periods. This has led members of the LiTEK team and others to develop a program for index based livestock insurance in this area (Carter et al. 2008). This project is currently working to understand how remote sensing can be used to estimate when deaths are likely and to design commercial insurance products to help address this risk. Other projects active in this area, such as the Pastoralist Livelihood Initiative, have been exploring emergency feeding operations during droughts as an alternative to restocking after a drought (2007). Both insurance and emergency feeding operations could aid in minimizing the negative impact to household well-being due to droughts.

Furthermore, animal deaths are not distributed evenly across space. Three of the eleven sites, Kargi, Dida Hara, and North Horr account for 50% of recorded losses. This is perhaps not surprising, as these are three of the top four sites when ranked by TLU per capita in this survey; they have bigger herds so they have more to lose. However, it does illustrate that the magnitude of herd losses for a widely experienced drought, such as the one of early 2000, may have very different impacts by site. Any policy to help herders confront the risk of asset loss will have to recognize differences across sites in the impact of droughts.

Findings presented in this brief illustrate that livestock diseases and predators account for over one-third of deaths. Although drought is the major story revealed by this analysis, it is important not to overlook the fact that these two causes present different challenges and account for a significant amount of livestock deaths. Improved disease control in livestock and improved wildlife management could address two other significant sources of risk that lead to livestock losses.

Further Reading

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The Pastoral Risk Management project (PARIMA) was established in 1997 and conducts research, training, and outreach in an effort to improve welfare of pastoral and agro-pastoral peoples with a focus on northern Kenya and southern Ethiopia. The PARIMA project is led by Dr. D. Layne Coppock, Utah State University. Email: Lcoppock@cc.usu.edu. LiTEK is a continuation of the PARIMA project led by Dr. John McPeak, Syracuse University that focused on issues of livestock marketing and the compilation of PARIMA research findings. Email: jomcpeak@maxwell.syr.edu.

The Global Livestock CRSP is comprised of multidisciplinary, collaborative projects focused on human nutrition, economic growth, environment and policy related to animal agriculture and linked by a global theme of risk in a changing environment. The program is active in East and West Africa, Central Asia and Latin America.

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