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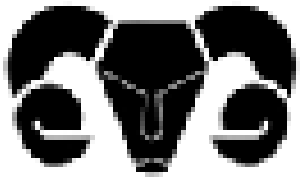

Cattle Population Dynamics in the Southern Ethiopian Rangelands

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The Borana Plateau of southern Ethiopia is a pastoral region known for producing high-quality cattle. The sustainability of this pastoral system has been recently questioned, however, as livestock losses, poverty, and food insecurity are increasing. We used rainfall records and herd-history data from 56 pastoral households to characterize cattle population trends on the Borana Plateau during 1980-97. We supplemented these data with other findings to update the record through 1999. We wanted to learn to what extent drought and high stocking rates contribute to the high rates of cattle mortality in recent years. We also wanted to estimate economic losses from cattle deaths. Cattle population dynamics resembled a "boom and bust" pattern where longer periods of gradual herd growth were punctuated by sharp crashes in 1983-5, 1991-2, and 1998-9 when 37 to 62% of the cattle population perished. Cattle losses due to periodic starvation regulated the population—net sales or numbers slaughtered were relatively small. When extrapolated to the entire Borana Plateau, the monetary losses of cattle deaths may have exceeded USD 300 million from 1980 to 1997. Separating out the inter-twined effects of high stocking rates and drought on cattle mortality is difficult. We believe, however, that high stocking rates predispose the system to crash when a dry or drought year happens to occur. The higher the stocking rate and larger the annual rainfall deficit, the larger the crash. In some cases a high stocking rate only needs a slightly dry year to cause a crash. System stability appears to be decreasing because drought grazing reserves are reportedly being lost to cultivation, bush encroachment, insecurity, and over-population. We believe that a cattle crash occurs once every 5 to 6 years because this is the time required for the regional herd to grow to over 20 head per square kilometer, and this increases vulnerability. We thus expect the next cattle crash to occur no earlier than 2005. Capturing some of the wealth lost from cattle mortality is important, but the process is difficult. Development solutions could involve aspects of economic diversification for pastoral households if it is sustainable. Improved risk management could involve more timely livestock sales before crisis occurs and investment of some of the revenue into entrepreneurial ventures or community projects. Such system change requires improvements in education, marketing, and rural financial systems.

Background

The semiarid Borana Plateau of southern Ethiopia is an important cattle-producing area in the Greater Horn of Africa. The dominant cattle breed, the Boran, is valued as a hardy, dual-purpose producer of milk and meat. High-quality Borans are sought in domestic Ethiopian markets and are exported to the Middle East and Kenya. The Borana pastoralists are the dominant ethnic group on the Borana Plateau. They number about 325,000 and herd over 1 million head of cattle along with fewer number of sheep, goats, and camels. Although the Borana pastoral system has long been viewed as productive and "successful," there has recently been concern about sustainability of the system due to human population growth, loss of key grazing and water resources, and inadequate development investment. Food insecurity and

poverty are now important problems on the Borana Plateau as they are in other East African rangelands.

We wanted to study the pattern of population dynamics for Boran cattle to determine the scope of wastage mortality and to what extent death losses could be attributed to drought or negative effects of high stocking rates. We also wanted to estimate the economic value of cattle losses using price data for various sex and age classes of animals. Our view was that both drought and high stocking rates were contributing to increasingly regular and catastrophic losses of cattle in the system. Our expectation was that the regional cattle population trend would consist of a "boom and bust" cycle where relatively long periods of gradual herd growth would be punctuated by large, drought-induced losses. It was expected that cattle losses would be most likely to occur when rainfall was low and stocking rates were high. The main data set was based on herd histories covering the period 1980-97 as obtained from detailed interviews of 56 households.

Major Findings

Annual rainfall averaged over the four sites for the 17-year study period is shown in Figure 1. The overall annual mean was 706 mm. The harsh drought of 1983-5 is clearly evident from the data pattern, but it is notable that annual fluctuations in precipitation seem relatively modest after 1986.

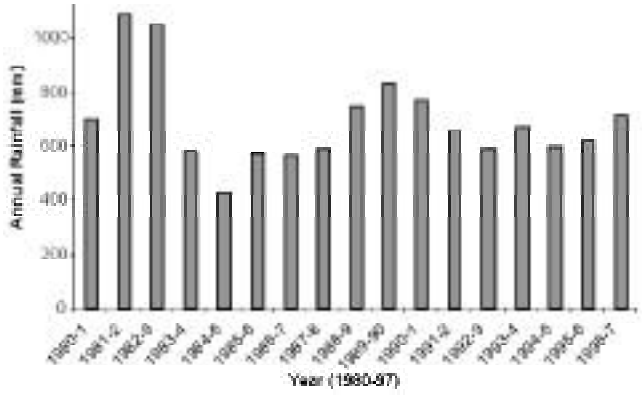
The cattle population trend, as aggregated across the 56 households, is depicted in Figure 2. We observed a "boom and bust" pattern as anticipated. Cattle numbers dropped by 37% after the drought of 1983-5. The herd then quickly grew to about 85% of the previous peak size by 1990. Another crash occurred in the early 1990s with a 42% reduction in cattle numbers, but interestingly the corresponding change in annual rainfall was less apparent in the early 1990s compared to that observed in 1983-5.

It is also notable from Figure 2 that cattle holdings per household declined overall by 37%, implying that people are getting poorer in terms of livestock assets. In 1980 our sample households had 92 head of cattle, and this dropped to 58 head per household by 1997. Net use of cattle for sale or slaughter was only about 2 head per household per year, illustrating that wastage loss from drought-related starvation was the key factor regulating cattle numbers.

The monetary value of the death losses during 17 years was estimated at USD 6,523 per household and USD 893 per person. When extrapolated to 7,000 households in the study areas the total grew to USD 46 million. When extrapolated to the entire Borana Plateau the total losses may have exceeded USD 300 million.

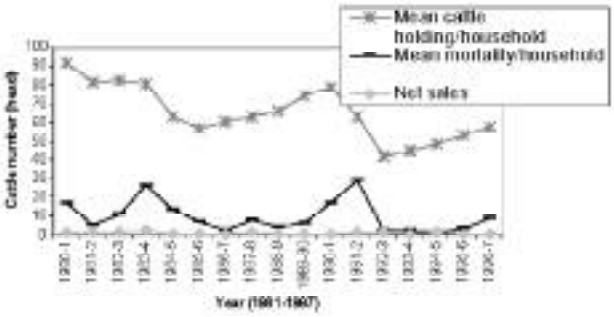
Separating out effects of drought from negative effects of high stocking rates on cattle mortality is difficult using herd history information. We feel the best evidence that both factors

Figure 1: Annual rainfall averaged over four sites in the southern Ethiopian rangelands for the period 1980-97. Source: Desta (1999).



contribute to cattle losses is simply the general pattern of herd dynamics (Figure 2). In looking at, annual rainfall change, estimated stocking rate, and the lagged change in cattle numbers when averaged across the 56 households over 17 years, the important point is how response of the cattle herd appears to have changed with regards to annual rainfall deficits between 1983 and the early 1990s. For example, in response to the 1983-5 drought it took about two years following the initial drop in precipitation until cattle began to die in large numbers—we suspect this lag was due to better availability of drought grazing reserves at that time. By 1991, however, only a small decline in annual rainfall occurred compared to that for 1983-5, and yet a similar number of cattle died. Stranger still, the cattle appeared to die more quickly in response to a dip in rainfall during the early 1990s than they did in response to the drought in 1983-5. We suspect that compared to the drought of 1983-4, the situation in the early 1990s was driven more by a high stocking rate in conjunction with an intervening loss of key grazing reserves in the system. The Boran have reported loss of key grazing areas to us in interviews. The people say that grazing reserves have been lost due to encroachment of cultivation, proliferation of bush, tick infestation that has made some areas unusable, insecurity with respect to conflicts with neighboring ethnic groups, and even occupation of some reserves by surplus Boran households with no other place to live. In sum, compared to the mid-1980s, the entire system appears less able to protect the pastoral population from drought by the early 1990s.

Figure 2: Cattle population dynamics (average number of head per household) aggregated across 56 Borana households for the period 1980-97 and broken-out according to total, total mortality, and net sales. Source: Desta (1999).



After we left the field in 1997 another research project was undertaken in the same general area by Shibru (2001). He surveyed 137 pastoral households during 1999-2000. Shibru found that 62% of the cattle population suddenly died once again during a drought in 1998-9 when annual rainfall was about half of the long-term average.

When we combine our data with those from Shibru we see a pattern—a vicious cycle, actually—where the cattle population now seems to crash on a regular basis every 5 to 6 years. We believe that the period between crashes is primarily determined by the time needed for the cattle population to grow and exceed a critical threshold of about 20 head per square kilometer. Once the herd exceeds this stocking rate, even a modest drop in annual rainfall can suddenly create a "forage crisis" that leads to cattle starvation. If this situation is compounded by a continued loss of key grazing areas, it is conceivable that the time between crashes could shorten. We also believe that the size of any given cattle crash is determined by stocking rate in conjunction with annual rainfall deficits, although this is very hard to detect with our data. We suspect that the higher the stocking rate and greater the annual rainfall deficit, the larger the crash. Each cattle crash may have a different degree of stocking rate effect versus rainfall effect, and relationships may change over time. This makes analysis tricky.

Why do we think that drought alone is not the major factor causing cattle mortality? We agree

that drought or dry years are important "triggering" events, but we suspect that stocking rate predisposes the system for calamity. We believe that drought alone is not the main factor simply because we have seen several years that have been as dry (or drier) than the big cattle crash years of 1983-4. These other dry years were 1986-8, 1992, and 1994. We believe that the reason cattle mortality was low in these years was because the cattle population was recovering from a previous crash. Stocking rates were low at these times.

Practical Implications

Based on the pattern observed for the past 20 years, we expect that the next cattle crash on the Borana Plateau is unlikely to occur before 2005. This information essentially provides a framework for a long-range early warning system.

With a loss of grazing reserves and slow growth in the human population, it seems as though the situation may get worse on the Borana Plateau. Losses of livestock capital are indeed large and may regularly occur for many households. If lost or degraded production resources cannot be restored, the main alternative seems to be finding a sustainable and suitable means to capture some of the livestock wealth otherwise lost to pastoralists. This is a big challenge that would require changes in pastoral livestock marketing behavior and investment in marketing and rural financial systems. It also would require new opportunities for some pastoral households to diversify their economy and improve livelihoods by allocating a portion of their investments outside of livestock. Our prediction for the timeframe of the next crash gives development agents and interested pastoralists a few years to implement creative interventions.

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Further Reading

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The GL-CRSP 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 project is led by Dr. D. Layne Coppock, Utah State Univeristy, Email contact: lcoppock@cc.usu.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 Africa, Central Asia and Latin America.

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