# Are Drought-Related Crashes in Pastoral Cattle Herds Predictable? — More Evidence of Equilibrium Dynamics from the Douthern Ethiopian Rangelands

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# Are drought-related crashes in pastoral cattle herds predictable ? —More evidence of equilibrium dynamics from the douthern Ethiopian rangelands

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**Introduction** Drought routinely ravages the Greater Horn of Africa , especially rangelands . Drought leads to massive reductions in livestock productivity and increased risk of famine and poverty for people . Traditional pastoral systems were better able to cope with drought , but restoring traditional pastoralism is nearly impossible in many cases . Other strategies focus on helping people deal with drought using market development and opportunities for livelihood diversification . Livestock remain the core economic engine for pastoralism and understanding how risks and returns to livestock vary over time is important to devise tactics to improve the situation . Ellis and Swift (1988) proposed that some East African pastoral systems are non-equilibrial , meaning that vegetation and herbivore dynamics are controlled by precipitation ; carrying capacity and livestock-induced ecological degradation lose relevance . Livestock death losses would be unpredictable and vary with rainfall . For the semi-arid Borana Plateau we posit a different theory based on dynamic equilibrium concepts (Desta and Coppock 2002) . In this situation , drought impacts on livestock production are predictable due to interactions between stocking rates and precipitation . When stocking rates are high the regional herd is more likely to crash if annual precipitation is low . Cattle crashes in 1983-5 , 1991-3 , and in 1998-9 lead to the hypothesis that periodicity of crashes is related to time needed for the regional herd to grow to a vulnerable size . Desta and Coppock (2002 ; p . 450) predicted that the next cattle crash would occur by 2005 . The purpose of this paper is to verify the cattle prediction and illustrate whether ecological change has occurred as a result of pastoral activity (Mesele , 2006) .

**Materials and methods** Herd dynamics during 1999 to 2007 were assessed using reviews of secondary information , results from focus group discussions with pastoralists , and analysis of rainfall records . Ecological trends in one 400-km$^2$ district were assessed using standard soil surveys and analysis of three satellite images collected at 15-year intervals between 1973 and 2003 .

**Results** A major cattle crash indeed occurred during 2005-2006 . Herd losses were 40-70% , consistent with losses in previous crashes . Losses were associated with a regional drought . For Yabelo District , soil surveys indicated losses of topsoil fertility and increased compaction in heavily grazed sites compared to lightly grazed sites . Analysis of land-cover change indicated that large portions of the original grasslands were lost to bush encroachment and maize cultivation over 30 years .

**Conclusions** We accurately predicted the most recent cattle crash several years in advance . Ecological analyses confirmed that pastoralism has directly and indirectly changed the environment in several detrimental ways . These results indicate that this ecosystem is dynamic yet equilibrial and that interaction among vegetation and livestock components is important in understanding ecological change . Such findings can better inform pastoral development and relief strategies for this region .

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