ERAMAT! A Culturally-anchored Board Game Simulator for Maasai Pastoralists in Southern Kenya

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Abstract

A culturally-anchored board game simulator named ERAMAT was created in cooperation with Maasai pastoralists and then piloted with members of Maasai communities in southern Kenya during the summer of 2012. The game provides an alternative to a computer-based simulator, and hence provides a culturally credible simulation of the system dynamics associated with an accelerating boom-bust cycle of drought and hunger in the region. Factors driving the phenomena include greatly increased population densities, pastoralist cultural values, evolving pastoral practices, the ebb and flow of the semi-arid environment in which Maasai pastoralists live, and political and ecological pressures. The game encourages deeper understanding of these dynamics for pastoralists and non-pastoralists alike, and can generate conversations leading to insights on effective strategies for reducing the impact of the inevitable periods of low rainfall. This paper reports on the underlying dynamics, the game design, and the results of the pilot. ERAMAT's rules, symbols and language attuned to Maasai core values and pastoral praxis allowed players to engage in conversations about past experiences and outcomes, as well as explore alternative strategies for livestock and livelihood survival.

KEY WORDS: pastoralism, Africa, Maasai, board game, boom-bust cycle

Introduction

In the summer of 2012, a new board game simulator called ERAMAT was piloted with Maasai pastoralists in six different communities in Kajiado County of southern Kenya. The name ERAMAT derives from the Maa word meaning "mind your cattle," and indeed the purpose of the simulator is to provide a system-based learning environment to explore in "fast-forward time" the dynamics contributing to the recurrent boom-bust cycle of drought and hunger in that region. Factors driving the phenomena modeled in the game include greatly increased population densities, cultural values and evolving pastoral practices, the

ebb and flow of the semi-arid environment in which Maasai pastoralists live, and still more political and ecological pressures. The game encourages deeper understanding of these dynamics for pastoralists and non-pastoralists alike, and can generate conversations that include insights on effective strategies for reducing the impact that inevitable periods of low rainfall have on the livelihoods of pastoralists in the region.

This culturally-appropriate game simulator and attendant study were inspired by the effects of the 2008-2009 drought on livestock holdings in southern Kenya. During that drought, most herders, including members of the home community of one of this paper's authors (Mayiani), lost up to 95% of their herds. The specific objectives of the study were to:

1. Develop a simple, yet culturally-targeted board game that mimics the boom-bust dynamics associated with recurrent cycles of drought, livestock loss, and hunger in southern Kenya.
2. Use the game with decision makers in pastoral communities to evaluate
    - the cultural validity of the game
    - the validity of the game for modeling the dynamics associated with the recurrent boom-bust cycle in the region
3. Pilot the game with American students to evaluate the potential of this game as a teaching tool about pastoralism and semi-arid livelihoods.

Pastoralism in Kenya

The League for Pastoral Peoples, a non-profit research and resource organization for holistic and people-centered livestock development, defines pastoralists as:

> …people who depend for their living primarily on livestock and…access to "common property resources" for grazing. They inhabit those parts of the world where the potential for crop cultivation is limited due to lack of rainfall, steep terrain or extreme temperatures (2011).

Pastoralism has proven to be one of the most efficient means by which to utilize arid and semi-arid lands (ASALs) (Huho et al. 2009, Western et al. 2009, Western 1982, Ellis and Swift 1988). Pastoralists own and manage over 60 percent of Kenyan livestock, and that produces approximately 10 and 50 percent of the domestic and agricultural GDP, respectively (Huho et al. 2009, USAID 2010). Pastoral production accounts for 90 percent of employment opportunities and 95 percent of family incomes and livelihood security in the ASALs of Kenya (Huho et al. 2009; USAID 2010), and also contributes to the national economy through the export of byproducts such as hides and skins, dairy products and processed meat products.

The problem of accelerating boom-bust cycles among pastoralist communities

Despite the critical role played by pastoralism in the ASALs of Kenya, pastoralists live with the threat of inadequate rainfall and therefore drought, during which they can suffer catastrophic losses of livestock, poverty, and food insecurity. Recent trends of increasing drought severity have raised concerns about the viability of the pastoralist lifestyle in the region. Pastoral landholdings are shrinking as populations continue to rise. Pressures on southern Kenya's land use due to increasing population density, agriculture, charcoaling, mining, sand harvesting, timbering and more have significantly impacted the quality and quantity of land cover, which influence the increasingly arid climate. These factors contribute to a context that decreases opportunities for pastoral people to make a viable living (Hesse and MacGregor 2006).

Recent studies in eastern Africa have found that cattle population dynamics resemble a boom and bust pattern where periods of gradual herd growth are punctuated by sharp crashes (Anderson and Broch-Due 2000; Rutten 1992), often linked to drought and famine. Desta (2001) concluded that high stocking rates predispose the system to crash when a dry or drought year happens to occur, in some cases even during only a slightly dry year (see Table 1). Maasai pastoralists typically strive to restock their herds rapidly following a drought, as livestock play such a prominent role in subsistence and status.

Desta (2006) calculated that cattle herd crashes in many parts of eastern Africa occurred once every 5 to 6 years, corresponding to the time required for the regional herd to grow to over 20 head per square kilometer. These boom-bust cycles in parts of Kenya are occurring even more frequently. While droughts significant enough to cause a major loss of livestock happened only once every 10 years in the 1970s, the frequency of such droughts increased to every 5 years in the 1980s, and every 2-3 years in the 1990s, which has been the norm since then (Howden 2009, Huho et al. 2011). In fact, the Kenyan government declared five national disasters due to drought in the past two decades alone: 1992-1993, 1995-1996, 1999-2001, 2004-2006 and 2008-2009 (Huho et al. 2011).

ERAMAT's target audience: Maasai pastoralists in Southern Kenya

While the case studies on which this paper draws are set in southern Kenya, the modeling and problem-solving paradigm described herein has potential application to all pastoralists in the region. Maasai are one of many pastoral or nomadic groups that primarily rely on livestock for their livelihood. Depending on the local conditions, some self-identifying Maasai have diversified to other means of livelihood, including crop farming and/or a wide variety of wage labor, but ERAMAT focuses on communities for which pastoralism remains a key component of subsistence.

Livestock play an important role in Maasai culture as the main source of food and wealth, and thus livestock are integral to many cultural practices. Cattle in particular can be described as wealth on the hoof, providing dairy products and blood, symbolizing status, and serving significant social and ritual functions through exchange as bridewealth, inheritance and/or gifts (Coffman 2007). Among pastoral Maasai, cattle are the most valued of livestock, as indicated by the common Maa greeting of "Kesidan nkera o nkishu" ("How are your children and cattle?"). While smaller livestock, such as sheep and goats, are regular sources of meat, cattle are rarely slaughtered. Major ceremonies and rituals, such as coming of age ceremonies, circumcisions, marriages, or formation of an age age-group, may require the slaughter of cattle, and the animals are selected according to particular characteristics relevant to the event. Large herds of cattle also act as a symbol of social status among most pastoral communities and certainly among

Figure 1: A Maasai woman milking. Photo courtesy of http://mikewadejournalist.blogspot.com/

Figure 2: Maasai men collecting blood from a live cow. Photo courtesy of Doranne Jacobson

Maasai. For instance, if one family owns a large herd of cattle, the owner is afforded a high level of respect from the rest of the community and carries greater weight in community decision-making. Part of this status is attributable to the fact that the "affluent" can afford to contribute resources (cattle, small stock, other support) to cultural functions without hardship. In addition, individuals with large livestock holdings may create employment opportunities for those who do not have large herds by hiring them as shepherds. The shepherd is often compensated in cash and/or livestock after tending cattle for a certain period of time.

Hence, being Maasai equates with being people of the cattle, since cattle represent far more than merely a source of income.

The Study Region: Kajiado County Kenya

Kajiado County falls under the ASALs part of southern Kenya – an area totaling 21,105 km^2 (Boone et al. 2005). Our pilot study was conducted in two parts of the county: Lenkisem, which borders the world-renowned Amboseli National Reserve (shown in green shading and represented at the legend as Kajiado (KJD) protected areas), and Melepo Hills (see Figure 2). The distinguishing characteristic between these two locations is that the homesteads in the Melepo Hills region are situated on properties that are held through individual land titles, while Lenkisem land is shared communally, although the process for subdivision has begun in neighboring group ranches.

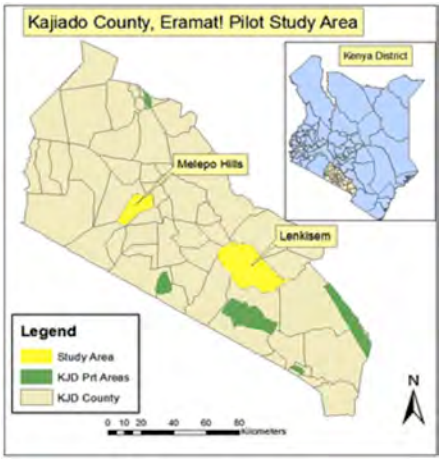


Figure 2: the study area Lenkisem and Melepo Hills shown in yellow, Kajiado County in southwestern Kenya (see insets map)

The climate of the Greater Amboseli Ecosystem (GAE) is characterized by bimodal rainfall with the "short rains" typically falling from October through December, followed by a short dry period from January to February, and "long rains" in March through May, followed by a long dry season from June to September. While the overall precipitation in the district ranges between 400 and 800 mm annually (Boone et al. 2005), precipitation in most areas around the GAE where Lenkisem falls, receive much less with an average annual rainfall of 240 mm, with 160 mm during the heavy rains season (March–May) and 88 mm during the short rains from (October–December) (Okello et al. 2008). As noted above and with regard to human livelihoods, this region is not well suited to agriculture but is indeed well-suited to sparse human populations and varied livestock holdings, in addition to a variety of wildlife.

Why a game board simulator?

The ERAMAT game serves as a system dynamics simulator for those dynamics behind the boom-bust cycle in the study region. A board game format was used for the following reasons:

1. Target audiences among Maasai pastoralists were largely unfamiliar with computers and with the abstract representations that a computer simulator would use. Hence, a computer-based model or game would not have been practical or credible.
2. The rules that govern the behavior of a computer-based simulator would be "hidden" from the users, thereby creating a "black box" feel to the output, further jeopardizing credibility.

3. The target audience of pastoralists is comprised of avid game players. They typical Maasai pastoralist lifestyle includes significant periods of time during which games are played by adults and children alike.
4. The cattle management strategies employed by the users emerge out of deeply-held cultural beliefs, as well as the dynamic give-and-take between the environment and the people who live in it. In addition, the collective actions of the people in the region are of interest, more than the actions of any one individual. Hence, we wanted to create a learning environment that would provoke discussion and self-reflection.

We refer to ERAMAT as a Culturally Anchored Board Game Simulator (CABGS). It is culturally anchored because it addresses a specific issue in a particular region and cultural context. The game design (physical artifacts and rules) reflects the material realities of the issue, as well as the cultural practices and values of the people involved. A CABGS is a board game because it has physical elements (game board, cards, etc.), and because it is played by people in face-to-face interaction. A CABGS is a simulator because it mimics the system dynamics that are important to the problem.

A CABGS is similar to a computer simulator, but provides an alternative, more culturally credible mode of simulation. A CABGS uses rules that are visible and understandable to all players, and therefore are more readily subject to evaluation and validation by the target audience. It represents system elements and behavior in ways that physically resemble their real-life counterparts.

A dynamic hypothesis for the boom-bust cycle

Figure 3 shows an overview of dynamic elements important to the boom-bust cycles in the study region. These dynamics occur on an individual scale as individuals make decisions regarding the number of cattle to keep and as they respond to weather conditions. The dynamics in Figure 3 are also relevant when considering the community in aggregate. In this case, the cattle holdings refer to the total holdings across all individual herds. In what follows, we briefly describe each of the key elements in the diagram.

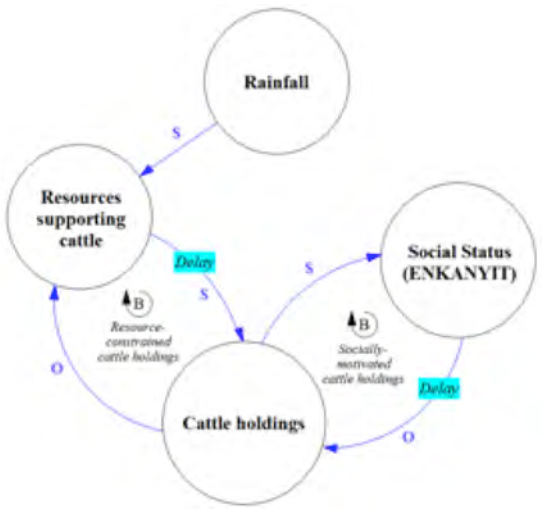


Figure 3: Overview of dynamic elements creating the boom-bust cycle

Rainfall follows a seasonal cycle, with two wet seasons (with possibly heavy rains) and two dry seasons (with no rain), as noted above. Global climate change is expected to reduce rainfall levels in southern Kenya over the long term. However, the game incorporates random variations around a general seasonal cycle.

The **resources supporting cattle** consist of the available water (both surface and ground water), and the amount of forage, which is itself highly dependent on water levels. ERAMAT uses water as an aggregated surrogate for both of these resources. Water is stored in both surface water reservoirs and groundwater reservoirs that players can access as needed, according to the size of their cattle herds. Hence, the larger the collective cattle holdings among all the players, the more rapidly are the resources

consumed. If the cattle holdings exceed the carrying capacity of the system, cattle mortality increases dramatically, leading to a collapse of the cattle population – the "bust" part of the cycle. The delay between water reserve amounts and cattle holdings indicates that reserves must drop below a threshold level, depending on the size of the cattle herd, before the cattle herd size is affected. This delay contributes to the overstocking of cattle holdings (the "boom" part of the cycle).

The **cattle holdings** refer to all the dynamics associated with the growth or decline of the collective cattle holdings among the players. These dynamics include birth and death dynamics, as well as changes in the cattle holdings through the purchase or sale of cattle, bridewealth exchange, and other exchanges. ERAMAT includes a cattle market in which players can buy or sell cattle, thereby affecting their cattle holdings.

The **social status (*enkanyit*)** circle refers to one of the most important elements in this system. *Enkanyit* is the Maa word for "respect." This is an important concept in Maasai culture that represents the regard that an individual has among peers in the community. This respect is earned through an individual's capacity to live in ways that honor and support the social norms in the community, including the degree to which that individual is able to provide for immediate and extended family, generosity in helping community members who in need, and support of important cultural gatherings or events (such as weddings or other celebrations) (see Aktipis et al. 2011). Many, if not all of these, require an individual to have adequate assets to fulfill cultural obligations. In Maasai culture, the possession of cattle is one of the most important assets that a person can have. Hence, as a person increases his or her cattle holdings, social status will rise. Likewise, the greater a person's social status, the less effort he or she needs to put into building an ever larger herd.

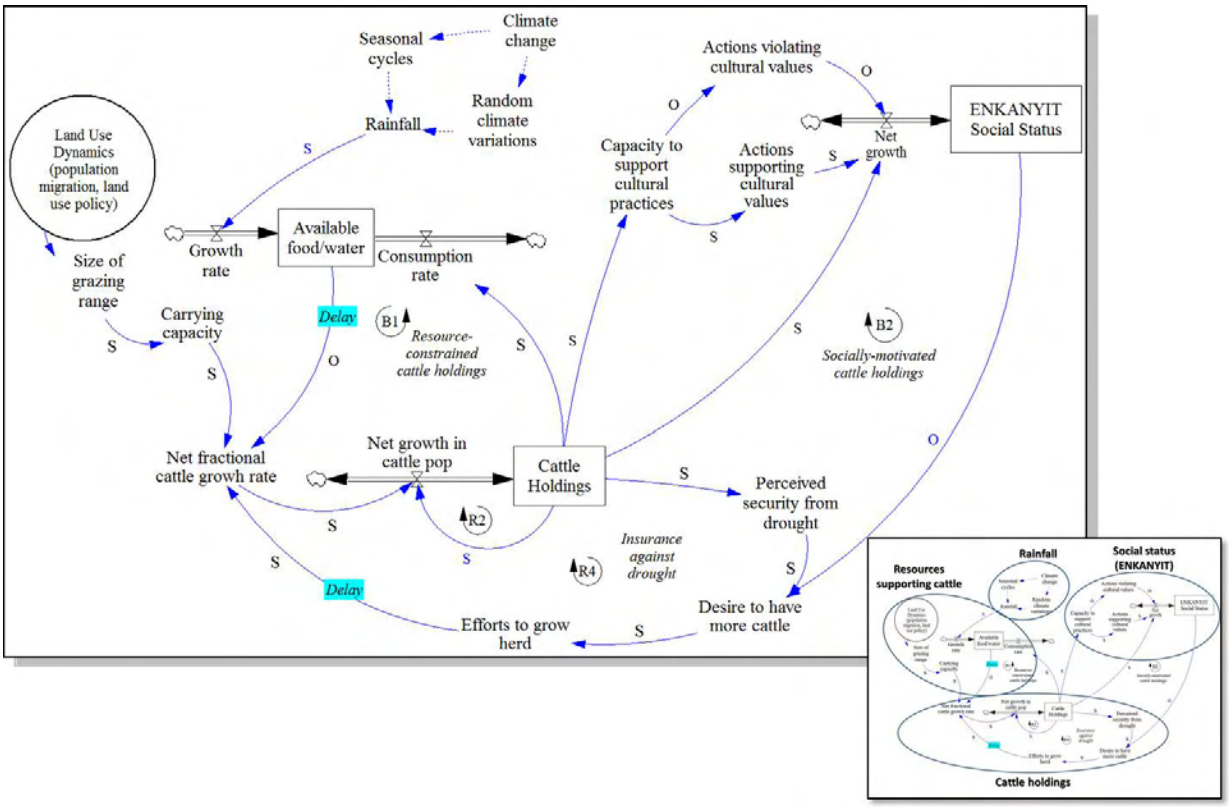
Figure 3 has two balancing feedback loops that together create an escalation dynamic. As the available resources are gradually depleted, the cattle holdings will collapse (*resource-constrained cattle holdings*), leading to a corresponding loss of social status. This loss in status motivates individuals to work hard to rebuild their herds (*socially-motivated cattle holdings*), setting the scene for another collapse whenever the rains fail. The delays in these two loops are also the source of the oscillation from "feast" to "collapse." Since this cycle can take many years to play out, the role that cattle management strategies have in this cycle are not readily observed or appreciated. ERAMAT was designed to make these dynamics visible in order to allow participants to reflect on their individual and collective choices when trying to survive in the often harsh environment in which they live.

The stock and flow structure behind the cycle

Figure 4 shows a stock and flow diagram associated with the dynamic hypothesis in Figure 3. The inset in the figure shows the four main groups of dynamics in that hypothesis. Notice that there are two additional reinforcing feedback loops beyond those in Figure 3. Loop R2 is simply a reinforcing feedback associated with normal population growth dynamics. Loop R4 (insurance against drought) represents a feedback mechanism that we observed when the game was piloted in 2012. Players exhibited a desire to overstock their herds beyond what they really needed for their family and social obligations, merely as a kind of "insurance" against future drought losses. This of course would lead to even greater strains on the water and food supply. However, this connection was not initially highly valued by players. When queried about their choices to expand their herds even when they knew that the water/food supply was low, players often responded with an explanation about "protecting against drought." This created a positive feedback loop in which players lost cattle to drought and then built their herds up even more, in fear of the next drought (even when the current water supply was low). This further exacerbated the strain on the resources,

leading to even greater cattle mortality and more urgency to build up their herds. This kind of behavior might continue until the collective herds of the players were completely eliminated.

Figure 4: Stock and Flow Structure Behind ERAMAT!



Overview of the ERAMAT board game simulator

The proto-version of ERAMAT was initially designed by two of the authors, one of whom is a member of the Maasai community. Several design concepts were explored and piloted with Maasai from southern Kenya but who were in graduate school at or near James Madison University, where all the authors either attend school or are faculty members. The game was also tested with faculty and staff members at James Madison University who had extensive experience with the target audience and with agricultural practices in Eastern Africa. Based on these sessions, the initial game design was significantly altered to produce the version used in the pilot during May-July of 2012.

Figure 5 shows another view of the stock and flow diagram from Figure 4, but this time highlighting how the initial design of ERAMAT addressed the dynamic elements represented there. As shown in the figure, ERAMAT's pilot design handled the system dynamics in two distinct ways.

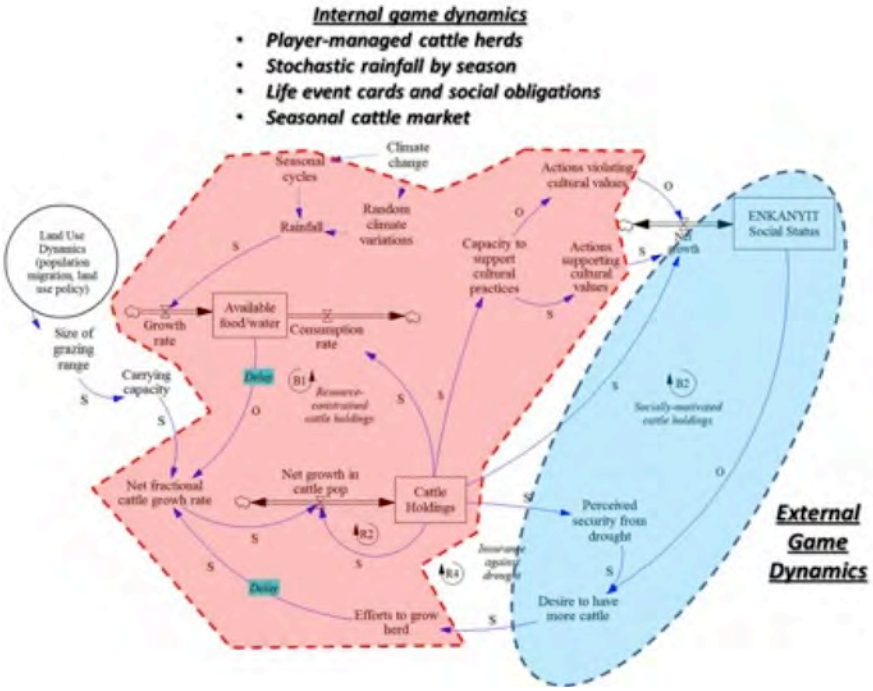


Figure 5: ERAMAT! team's approach to modeling the system dynamics

1. ***Internal game dynamics***. These dynamics were "hard-wired" into the rules and structure of the game.
    - The ebb and flow of the cattle holdings were modeled by *player-managed herds*. This was done through buy/sell decisions, natural reproduction, and by the availability of resources (water). The relationship between water supply and herd mortality was dictated by the rules of the game.
    - A single die was rolled in each wet season provide *stochastic rainfall by season*. This in turn determined the rate at which the water resources available for cattle were renewed.

- Actions supporting or violating cultural values (and hence impacting enkanyit status) were modeled through randomly chosen *life event cards and social obligations* at the beginning of each year (Oladalu season). Each life event card represented a realistic event or scenario that could impact a player's holdings and social status (lion attack on a player's herd, a marriage alliance with another player, livestock disease, etc.). One important social obligation was built into the game through a seasonal school fee that had to be paid for each child in the player's imaginary "family."
- The game rules defined a *seasonal cattle market* through which players could buy or sell cattle at seasonally appropriate prices. Players could also buy/sell/trade cattle with one another.

2. ***External game dynamics***. These dynamics were not built into the original game design, but were instead implicitly modeled through player actions based on the enkanyit value system that is central to Maasai culture. Because of the subtlety and potential complexity of those dynamics, the team elected to let the players demonstrate how those values impacted their decisions. Later versions of the game have more explicitly incorporated those dynamics into the game rules.

During the summer 2012 pilot sessions, each ERAMAT player assumed a role as the head of a Maasai household. Players each began with two children, although that number could increase through the drawing of "life event cards" at the beginning of each year. Children also represented earned income for the family, with income given in the form of coins at the beginning of the year. Each player was also given an initial herd of cattle. The overall herd size was chosen to be slightly below the carrying capacity of the system, and then divided equally among the players. The resource for supporting the cattle was represented by separate surface and groundwater stocks with an open bowl for surface water, and a small bag for groundwater. Green chips were used to represent units of water, with each chip accounting for enough water for 10 cows in a single season.

Time progressed in seasonal increments laid out on a circular playing board (see Figure 6). At the beginning of each season, every player made decisions based on the amount of water left in the supply, a hypothesis of what might occur in the next season, and a series of steps that included paying school fees for each child, experiencing the exchange of livestock and currency in the market or among other players, and reacting to life event cards. Income (based on family size) was received at the beginning of each year.

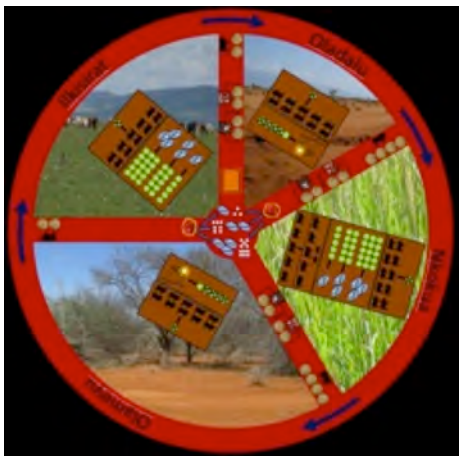


Figure 6: Earlier ERAMAT game board. The four divisions correspond to the four seasons of the year. The game starts at the beginning of Oladalu (dry season) and progresses around the board. Reproduction (calving) is during Nkokua.

Rainfall occurred only during the wet seasons, *Nkokua* and *Ilkisirat*. The amount of rain was determined by a roll of a six-sided die. A roll of 1 or 2 indicated light rainfall, resulting in the addition of five water chips to both the ground and surface water reservoirs. A roll of 3 or 4 represented medium rainfall, adding 10 water chips to ground and surface water. A roll of 5 or 6 (heavy rain) yielded 15 chips of water to each reservoir. In addition, at the beginning of each dry season, 80% of the surface water was

removed, thus representing evaporation rates typical for this region. Hence, what initially appeared to be an ample supply of water was quickly depleted. This setup led to a carrying capacity of 80 cows.

Each season, water was removed from the water stocks according to the size of the collective cattle holdings across all players (1 water chip for every 10 cows, with 1 chip taken for any remainders below 10 cows). Water was drawn first from surface water until it was depleted; then from groundwater. A trajectory of the individual cattle holdings, linked to water and thus forage availability, from one of the pilot games is shown in Figure 7.

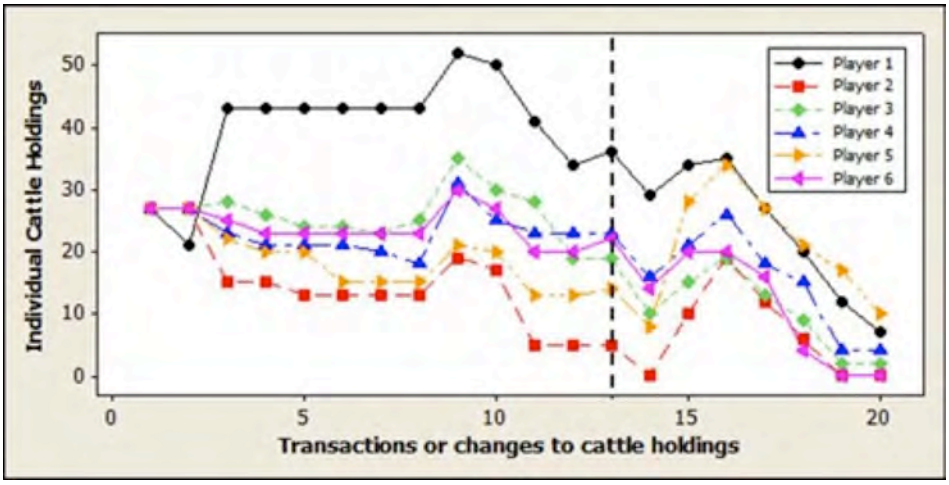


Figure 7: Individual player cattle holdings during part of a typical game: An example of "insurance against drought" behavior.

Note: This game was inadvertently started with a collective cattle herd that exceeded the carrying capacity of the system. Each time-step on the graph represents a round of transactions affecting cattle holdings (several transactions per season). The vertical dashed line indicates the beginning of a drought (low rain). Prior to this, one player had aggressively built up his herd, hence depleting the water supply and resulting in a decline of the collective cattle holdings. At the dashed line, a low rainfall was realized, and yet players continued to expand their cattle holdings to recoup cattle losses and "insure against the drought."

Overview of the 2012 summer pilot

An important question to be answered in this project was whether a CABGS such as ERAMAT had potential as a problem solving and learning tool with the target audience of Maasai pastoralists. This means that the game had to accomplish the following:

1. Provide a credible depiction of the relevant lifestyle, cultural values, physical environmental constraints, and decision-making options that pastoralists experience.
2. Adequately mimic the actual dynamics of the year-in and year-out ebbs and flows of cattle holdings in the region.
3. Provoke meaningful discussion about the role of human decision-making in the boom-bust cycles in the region.

In addition to the above criteria, the authors believed that ERAMAT had potential as an educational tool to help American students learn about another culture and the dilemmas faced by people in that culture. Hence, we also sought to determine if ERAMAT could:

4. Provide a useful platform for educating American students about pastoralism and Maasai culture.

The summer 2012 pilot in Kenya provided the field experience through which we could evaluate ERAMAT against these criteria. In the first few weeks of the study, ERAMAT gaming sessions were held with approximately 60 different Maasai adults (who had their own livestock holdings) from eight different homesteads or villages. The sessions were facilitated in the Maa language by Jacob Mayiani, one of the authors and a Maasai native of that region, and Sauna Lemiruni, a Maa speaker from Samburu region. Each session lasted 1-3 hours, including some extended discussion after playing in which feedback about the game was solicited from the participants and in which the implications of the game for cattle management practices were discussed. In addition to these sessions, American students participating in JMU's Kenya Field School also played the game, sometimes only with other Americans, and other times with a mix of Americans and Kenyans.

Conclusions

ERAMAT's rules, symbols and language being attuned to Maasai core values and pastoral praxis allowed players to engage in conversations about past experiences and outcomes, as well as explore alternative strategies for livestock and livelihood survival. Some players, who thought they had well-planned strategies for the year, were caught off guard by life cards that would require them to manage losses and reevaluate their plans for the next season. Maasai participants generally praised the game with such comments as, "Whoever made this game understands our lives." One elder said, "This feels real. What should we do?" Another stated, "I need to play this game over and over to learn." Part of the game's success was that players built on the structure the game provided to make it still more meaningful and relevant to their own experiences. For example, several Maasai players projected their own aesthetic ideals onto their otherwise generic cattle (represented via cards), courted other players for strategic alliances through marriage exchanges of offspring, and launched into historical and aspirational conversations about their herds. Meanwhile, the US students who played the game were overall less sentimental about livestock but would gladly enter into alliances with Maasai players, though more because the students were flattered by the invitation than because of specific proactive strategizing (Coffman et al. 2013). In addition, the US students employed a set of values regarding cattle ownership in which cattle were viewed as a more liquid asset that could readily be exchanged for money. As a result the dynamics associated with enkanyit (respect) in Figures 4 and 5 were of minimal importance in games played by only US students. Based on the observations from the pilot study, the 2013 edition of the game explicitly "hard wires" the enkanyit dynamics into the game by modeling an *enkanyit stock* that can increase or decrease over time based on strategic choices by players and by their capacity to fulfill cultural obligations. In this way, the game will serve as a useful tool for Maasai players and as an educational tool for non-Maasai players.

The summer 2012 version of ERAMAT proved to be an enjoyable, portable board game that provided insights and self-awareness about decision-making in the presence of complex dynamics. This enabled Maasai pastoralist players to consider new strategies, and allowed non-Maasai players to "virtually immerse" themselves in another culture's experiences. This piloting phase also allowed the four of us to consider strengths and weaknesses of the game and further modify it.

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