

SHORT REPORT

Open Access



Paired comparison of visions for the future among young pastoralists and students in Samburu, Kenya

Brett L. Bruyere^{1*}, Chelsea Kincheloe¹, Tomas Pickering¹, Sara Heisel² and Francis G. Lekanta³

Abstract

Land fragmentation, population growth, climate change and modernization are creating challenges for traditional pastoral livelihoods worldwide. These changes are forcing many young pastoralists to make new types of decisions about their future. In our study in the Samburu region of Kenya, we conducted a paired comparison about preferences for the future by adolescent male pastoralists, who practice herding as their primary livelihood, and their male peers who attend secondary school in lieu of herding. Participants were presented with all possible pairings of 15 options that represented a mix of traditional and contemporary livelihoods and traditions, and asked to select their preference between each pairing. Results were tabulated to elicit a ranked preference list of one (1) to 15. Results indicate strong favourability by both herders and students toward education for their future children as well as a desire to work for community conservancies. Beyond those commonalities, however, student and herders differed significantly. Students generally rated non-pastoral options highest, and their ratings had a high level of within-group agreement. In contrast, herders were more mixed about options for their future, with both pastoral and non-pastoral options receiving a diversity of ratings from very high to very low. These conclusions raise questions about the future of pastoralism in Samburu, and the identity and cultural roles of young male herders for the future.

Keywords: Pastoralism, Herders, Samburu, Education, Livelihood, Kenya

Introduction

Like pastoralism in other parts of the world, East African pastoralist societies have adapted to changes to remain viable throughout their history (Kardulias 2015). Changes to the social-ecological systems specifically in Samburu in northern Kenya are representative of the same challenges that exist in many rangelands around the world: human population growth, land tenure change, changing land use, land fragmentation, and climate change (Reid et al. 2014). For the pastoral tribes of northern Kenya, who have sustained their nomadic lifestyles for hundreds of years with goats, sheep, donkeys, cattle and camels (Spencer 1965), an estimated 90% of inhabitants participate in at least semi-nomadic pastoralist livelihoods (Samburu County n.d.), and adapting to

change has been a necessary way of life for these systems to endure over time. The socio-ecological changes in Samburu today are arguably unprecedented in scale and impact, and it is timely to consider how these changes will influence the future of pastoralism.

Nomadic pastoralist cultures historically adapted to challenges to raising livestock by augmenting and diversifying their income. These strategies often involve temporarily settling in one place but resuming a nomadic pastoralist lifestyle when conditions allow (Kardulias 2015). Due to unprecedented changes affecting rangelands today, however, more pastoralists are forced to settle permanently and pursue wage-labour occupations (Galvin 2009), in crop farming, energy production, tourism or mining (Reid et al. 2014). An additional strategy used by pastoralists is to adapt to change through an increasing emphasis on education as a way for youth to pursue alternate careers to pastoralism (Little et al. 2009). These changes coincide with a global shift in values toward education, which is viewed by many

* Correspondence: Brett.Bruyere@colostate.edu

¹Human Dimensions of Natural Resources Department, Campus Delivery 1480, Colorado State University, Fort Collins, CO 80523, USA
Full list of author information is available at the end of the article

international agencies, including the United Nations, as a viable poverty alleviation strategy (Tarabini 2009).

The goal of our study was to assess perceptions about the future among adolescent male herders, who raise livestock as their primary livelihood, and to compare their perceptions to their male school-going peers, specifically in terms of differences in how each group rates traditional (e.g., pastoral) and contemporary options. While our study took place in one region of Kenya, given that the changes in Samburu are generally similar to some other rangeland areas around the world, our results can help contribute to an understanding at a larger scale about adaptive strategies by pastoralists.

Study area

The Samburu region lies in the northern central part of Kenya, approximately 300 km north of Nairobi (the capital), covers 21,022 km² of arid and largely barren land, and supports approximately 224,000 people (see Figure 1). The rugged Samburu landscape provides vital wildlife habitat, supporting dozens of species, including elephants (*Africana loxodonta*), lions (*Panthera leo*), and the endangered Grevy's Zebra (*Equus grevyi*). The region receives an average rainfall of 200–250 mm annually, mostly during two periods—March to early June and November to December. The area is supported by one primary water source for wildlife and people, the Ewaso Ngiro River, which starts approximately 120 km upslope from Samburu on the western side of Mount Kenya.

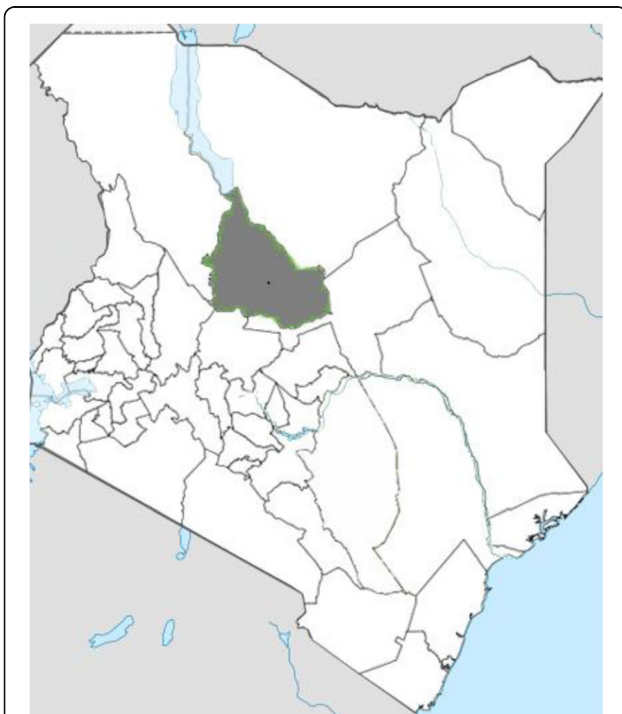


Figure 1 Samburu County, Kenya

Socio-ecological change in Samburu

Pastoralist herders in Samburu face many of the same challenges that exist globally (Greiner 2012), such as shifts from community-held lands to privatization so as to diversify and increase wealth (Fratkin and Roth 2005), as well as to secure lands from outside interests (Lesorogol 2003). Further, climate change presents unprecedented challenges to rangelands in Samburu. Regions of northern Kenya, such as nearby Turkana County, are expected to become hotter and drier (Human Rights Watch 2015) and will create more extreme hardship on pastoralism as a result. Water and fodder, already scarce during dry seasons, are expected to become more limited (Russell 2014). Further, the emergence of community conservancies and grazing management plans in the past decade has led to decreased mobility and flexibility for pastoralists (Bedelian and Ogotu 2017).

In addition to climate-related challenges, herders in Samburu endure common and often intense conflicts with other pastoralists. Further, increased availability of weaponry (Mbutu 2007) has intensified inter-ethnic conflict and livestock raiding as a result. Even without limited resources, such conflict often persists, as it has for many generations (Opiyo et al. 2012; Schilling et al., 2012).

While challenges persist, there are changes that can contribute positively to social-economic change in the region, as well. The Kenya Vision 2030 project includes substantial road-building and similar infrastructure improvements, which can lay the groundwork for new economies in local communities; albeit such development can have trade-offs if not managed strategically (see Kochore 2016). Similarly, improvements in cellular coverage throughout northern Kenya has led to development of smart-phone applications to monitor rangeland condition (i.e., Land Potential Knowledge Systems), although Asaka and Smucker's (2016) study noted that improved cellular coverage (and therefore, communication potential) has not led to changes in herding behaviour.

Based on relationships and trust with various elder groups, we conducted our study in and near Archer's Post in Samburu County, a community of approximately 4,000 people that is a gateway community to nearby Buffalo Springs, Shaba and Samburu National Reserves. While pastoralism continues to be a primary livelihood, with cows, sheep and goats the most common animals being raised, recent improvements in infrastructure (e.g., tarmac roads, cellular network coverage, electricity) have facilitated new livelihood options related to shop-keeping, service industry and government services (e.g., schools, medical clinics).

Methods

Study design and sampling

In this study, 23 adolescent male herders and 23 secondary school boys, ages approximately 14 to 25, were recruited to participate. The herders were recruited from a

weekly livestock market, which attracts pastoralists from around the region. This convenience sampling approach was used rather than a more randomized approach due to practical considerations such as the difficulty in determining a viable sampling frame, difficult terrain to navigate and the frequent mobility of pastoralists. Students were selected from a local organization which convened students for various life skills programming during the school breaks. Student participation was voluntary and unrelated to the main scheduled activities in the programme.

Paired comparison

Participants were presented with 15 possible scenarios that represented a mix of traditional and contemporary ways of living and earning an income. The 15 options were derived with input from local advisors about what would represent a) traditional and b) contemporary or emerging livelihoods. For example, “live in a house made of stone” and “own rooms that you can rent to others” represented contemporary options, and “own mostly cows in your herd” and “graze freely wherever you want” represented traditional ways of living. In some instances, specific items represented both, such as “hire somebody to herd your livestock” in which hiring someone is a contemporary practice, but retaining livestock is traditional. See Table 1 for a list of the 15 items.

Paired comparison was selected as the preferred method in this study because of the effectiveness with which it can be facilitated in groups with limited formal education and its prior use in similar contexts (see Bett et al. 2008; Sorokowski et al., 2015). Participants compare two items at a time from a larger set, and must choose one option as their preference. Previous researchers have successfully applied paired comparison in conservation contexts, including perceptions of wildlife conservation funding (Dayer et al. 2016) and sea turtle management in Japan (Ishizaki et al. 2011).

Data collection

Two trained local research assistants presented pairings of two options at a time (out of 15). Participants indicated which of the two they preferred for their future. This continued until all possible comparisons—a total of 90 pairings—were presented. Each herder was paid 500 shillings (approximately USD 5) for their participation while students were not compensated. This strategy was recommended by local advisors since herders are self-employed, and their participation potentially took them away from potential income-earning activity at the market. Students, on the other hand, participated during their holiday break. Depending on participant preference, research assistants administered the paired comparison in Maa/Samburu (the local language), Swahili or English (both are national languages in Kenya).

Table 1 List of 15 contemporary (C) and traditional (T) items in paired comparison study

All sons attend school (C)
All daughters attend school (C)
Hire somebody to herd your livestock (T&C)
Work for a conservancy (C)
Graze freely wherever you want (T)
A healthy balance of wildlife (T & C)
Never lose livestock to a predator (T)
Purchase more livestock (T)
Keep extra money in a bank (C)
Own your own plot (C)
Live in a home made from stone (C)
Own rooms that you can rent to others (C)
Own mostly cows in your herd (T)
Own mostly goats and sheep in your herd (T)
Own mostly camels in your herd (T)

Analysis

Following the paired comparison, we counted how often a given option “won” when matched with each of the other 14 options. From this, we generated a ranked list of all options. For example, if a herder indicated that “all of my sons attend school” was the preferred option in 10 out of 14 pairings, and no other option had more than 10 “wins,” it was ranked as the herder’s top priority. The item with the lowest number of “wins” was ranked as 15.

The rankings were analyzed in the Statistical Program for the Social Sciences (SPSS). Descriptive statistics were generated to quantify the mean and standard deviation for each item’s ranking. Additionally, independent sample t-tests were run to compare differences between herders’ and students’ rankings. Statistical significance was set at $p \leq 0.05$.

Results

The top two ranked items—(1) all sons attend school and (2) all daughters attend school—were the same for both groups. “Work for a conservancy” was also similarly ranked for both groups, in the top four for each. The remaining items varied notably between the two groups. For example, “a healthy balance of wildlife” on average was ranked by students as a third highest priority (3), while herders gave the same item an average ranking of 12. Herder’s average rank for “own mostly cows in your or your family’s herd” was third (3), but 11th for students. The five lowest ranked items for students (rankings 11 through 15) were the five items related to pastoralism (see Table 2).

Independent sample t-tests were run to compare the two groups’ rankings on all 15 items. Results

Table 2 Ranked options for herders and school-enrolled youth in order of preference

Overall preference	Herders	Students
1 (highest)	All sons attend school	All sons attend school
2	All daughters attend school	All daughters attend school
3	Own mostly goats and sheep in your herd	A healthy wildlife population
4	Work for a conservancy	Work for a conservancy
5	Own mostly cows in your herd	Own rooms that you can rent to others
6	Keep extra money in a bank	Live in a house made from stone
7	Own rooms that you can rent to others	Own your own plot
8	Purchase more livestock	Never lose livestock to a predator
9	Live in a house made from stone	Keep extra money in a bank
10	Own mostly camels in your herd	Hire somebody to herd your livestock
11	Own your own plot	Own mostly cows in your herd
12	A healthy wildlife population	Own mostly camels in your herd
13	Hire somebody to herd your livestock	Purchase more livestock
14	Graze freely wherever you want	Own mostly goats and sheep in your herd
15 (lowest)	Never lose livestock to a predator	Graze freely wherever you want

showed 11 statistically significant differences (see Table 3). The standard deviations for the 15 items ranged between 0.84 and 3.98 for students, and 2.27 and 4.79 for herder. Herder standard deviations were higher for all 15 items compared to students (see Table 3).

In terms of similarities between students’ and herders’ findings, Figure 2 shows boxplots of both groups’ high ranking of their sons and daughters attending school and the wider distribution of responses by herders on these two items.

Figure 3 presents boxplots for two variables that represent differences between the two groups on a traditional livelihood, *owning mostly goats/sheep in your herd*, and a contemporary way of living, *living in a house made of stone*. In the former, Figure 3 shows students placed a lower priority on goats/sheep compared to herders. For *living in a house made of stone*, students generally gave this outcome a higher ranking, and herders were more widely distributed as a group in how they felt about both items. This was a common trend among nearly all of the 15 items.

Discussion

The results of this study show that both herders and students place a high value on education; their future sons and daughters attending school were the top two ranked items for both groups (though with a higher standard deviation among herder). According to prior research by Tarabini (2009) and Lesorogol et al. (2011), this result can be interpreted as an adaptive strategy to address poverty and its associated consequences, due in part to emerging challenges to pastoralism.

The high value on education is particularly notable for herders, given that few of the herders in this study completed even a few years of primary school. An informal follow-up discussion with a subset of herders to share results revealed they want their children in school for them to get a good job and have a more prosperous life than their own. This aligns with prior research, including work in this region (Lesorogol et al. 2011) which showed favorable attitudes about school attendance were linked to the potential for income and poverty alleviation.

This finding should also be considered in context with Little et al.’s (2009) study of pastoralism, which concluded that education led to increased food security and enhanced general welfare, and also a decrease in livestock ownership. The implication of the results of this study, if Little et al.’s (2009) findings are applicable here, is that since both students and herders see education for their children as a high priority, and should that come to fruition for most of them, it could have a positive impact at a notable scale in terms of the improvements in poverty levels and health.

A second similarity between students and herder was their desire for a job with a conservancy, which are community-based protected areas managed to support both wildlife conservation and livestock grazing. The desire for these jobs was rooted in different motivations for the two groups. For students, the desire for a conservancy job was based on a blend of interests that included earning a steady income while also working in the field of conservation, a field that many associated with tourism and opportunities to interact with foreigners. The motivations for herders was different; they expressed a motivation rooted in reliable income and poverty alleviation. This also shows the willingness of some herders to potentially supplement their income-earning options to include non-pastoral means of making of living, though research by Kardulias (2015) suggests that most pastoralists return to herding after settling temporarily to pursue other income-earning opportunities. Overall, the findings about participants’ children attending school and a desire for a conservancy job show both groups are willing to adapt from some long-standing aspects of their prevailing culture.

Table 3 Differences between herders and students on 15 possible future outcomes, in order of statistical significance

Rated items	Group ¹		t-value	p-value
	Mean (\bar{x}) student ranking ² and (s.d.)	Mean (\bar{x}) herder ranking ² and (s.d.)		
Work for a conservancy	4.87 (2.78)	5.13 (3.43)	-.28	.78
Hire somebody to herd your livestock	8.91 (3.07)	9.91 (3.96)	-.96	.34
Own mostly camels in your herd	10.26 (2.53)	8.74 (4.72)	1.36	.18
Own rooms you can rent to others	5.74 (2.99)	7.39 (4.27)	-1.52	.14
Keep extra money in a bank	8.65 (3.02)	6.91 (4.18)	1.62	.11
All daughters attend school	2.09 (1.16)	4.17 (3.83)	-2.50	.02
Own your own plot	6.78 (2.41)	8.73 (3.28)	-2.31	.03
Graze freely wherever you want	12.78 (3.21)	10.34 (3.41)	2.49	.02
Purchase more livestock	10.30 (3.11)	8.09 (3.12)	2.42	.02
Live in a house made from stone	6.30 (2.26)	8.65 (3.91)	-2.49	.02
Never lose livestock to a predator	8.04 (3.98)	11.52 (4.79)	-2.68	.01
A healthy wildlife population	4.22 (3.46)	8.83 (4.06)	-4.16	<.01
All sons attend school	1.61 (.84)	3.17 (2.27)	-3.10	<.01
Own mostly cows in your herd	9.87 (2.86)	6.00 (4.01)	3.73	<.01
Own mostly goats and sheep in your herd	10.83 (2.59)	4.96 (3.56)	6.40	<.01

¹n = 23 for herders and 23 for students

²scale of 1 (highest ranked preference) to 15 (lowest ranked preference)

Beyond the similarities discussed above, the two groups differed notably. Student results indicated the group, as a whole, are willing to go further in adapting their lives and leave pastoralism for more contemporary livelihood options, while herders' sentiments were mixed. Students rated items such as "own rooms that you can rent to others," "live in a house made from

stone," and "own your own plot" highly. These each represent a departure from traditional ways of living. In fact, the five lowest ranked items for students were all related to pastoralism. However, a decline in pastoralism raises compelling social and cultural questions, since herding has long carried extraordinary cultural significance and meaning in the region.

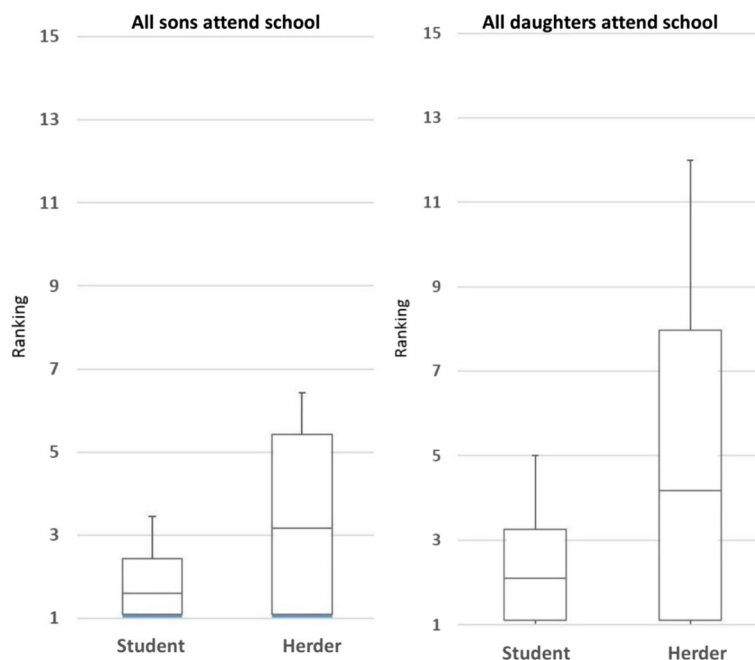


Figure 2 Boxplot of student and herder rankings of sons & daughters attending school

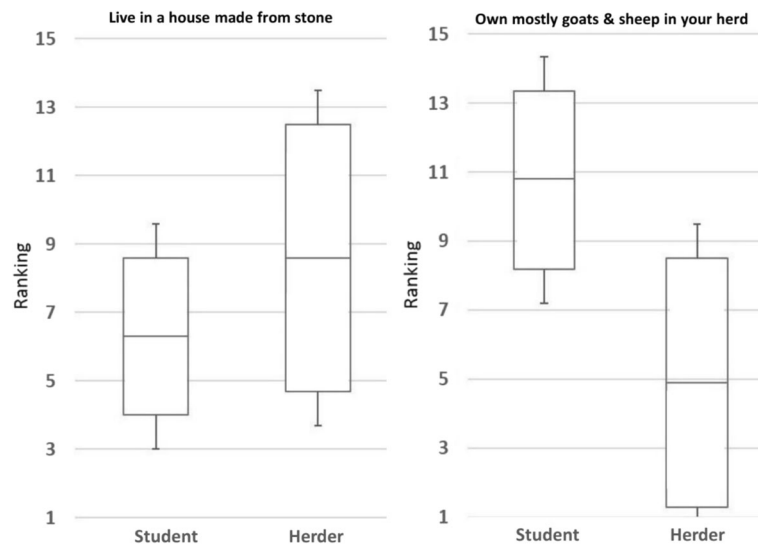


Figure 3 Boxplot of student & herder rankings on a) living in a house made of stone (contemporary), and b) owning mostly goats/sheep in your herd (traditional)

As the descriptive statistics indicate, the distribution of herders’ responses is wide. There are seven (7) items with means between seven (7) and nine (9) [the midpoint of the total range of one (1) to 15], and upon closer inspection, this is the result of many items having both very low and very high ratings (a finding supported by the high standard deviations for herders). There are herders who strongly want to own a plot, to own rooms they can rent to others, and to have a house made from stone, for example, and there are those who do not, and who prioritize pastoralism-related options more highly. From a standpoint of sociology’s role theory (see Hindin 2007), the implications of these differences could be stark. Traditionally, herders kept livestock, and those roles bound them together in a type of brotherhood. Today, changing conditions challenge the viability or need for that role – many families have chosen for their sons to attend school rather than herd animals – and this can cause tension and conflict, as individuals navigate between which social norms to follow. (i.e., herder or student norms) and experience the respective social rewards or consequences. A herder who chooses to live in a house made from stone might be favourably perceived by some of their peers, but shamed by others for “leaving” a traditional livelihood. Similarly, students, most of whom attend boarding schools where their student identity is supported and rewarded daily, return home during school breaks, often to families and a culture that see them as a herder, according to their age. It is common for a family to have some sons attend school and others who herd, creating a complex situation when it comes to expected social roles.

The future of pastoralism is difficult to envision in Samburu. Since herders are strongly inclined for their children to attend school, and students in this study showed weak preferences for herding animals, there are uncertainties about what the future of pastoralism might look like as education becomes a more highly-valued option. Particularly if young males are attending school, questions arise about how livestock will be tended to in the future, and by whom. Already some fathers, grandfathers and females (of many ages) are taking up the responsibilities in places. These are key areas to consider as herders work to retain their herding traditions, while expressing interest in pursuing modern activities and supporting their children to go to school.

Recommendations

The region where this study was conducted is wrought with high levels of poverty and limited opportunities to earn an income that is sufficient for families to afford education. In Kenya, secondary school is not free, and costs range from a few hundred (USD) dollars to upwards of one thousand dollars for the country’s best performing national schools. Primary school carries no tuition cost, but typically requires uniforms, supplies and other costs that are difficult for many families in the region to afford. Given that education is known to effectively address poverty, food security and other related measures of well-being, and further as evidenced by this study, there is high desire for schooling among herders and students for their future, therefore public and non-governmental actors in the region need to work together to make education more accessible.

In addition, results of the herders' opinions in this study point to increasing uncertainty that has likely infiltrated this peer group. As noted above, this can contribute to tension and conflict within a group. Further, it appears that at least some herders desire alternatives to pastoralism as their primary or sole livelihood, but with low levels of formal education and literacy, successful pursuit of employment could be frustrating. All of this points to a need, at this stage, for government and NGOs involved in community development and conservation to initiate and maintain dialogue with herders directly, to listen and consider how to integrate herders into plans for the region's future.

Limitations

This pilot study of 46 young male individuals should be considered as an initial indicator of a trend toward education and away from pastoralism, but however needs much deeper investigation as our sample is insufficient for results to be generalized broadly. In addition, interview participants were not selected randomly, and while randomized sampling in this region carries substantial practical barriers, results should take our non-randomized approach into account.

Acknowledgements

The authors thank the participants in this study for their willingness to share their perspectives and input, and to Apin Yasin and Isaya Lemereto for their assistance in data collection.

Funding

This project was funded in part by the Conservation Leadership program in the Warner College of Natural Resources at Colorado State University.

Availability of data and materials

Data is available at the Colorado State University Digital Repository (<https://dspac.library.colostate.edu/>)

Authors' contributions

BB conceptualized the research and its methodology; led the data analysis; led writing of the manuscript and revisions. CK co-led the literature review and conceptualization of the project, collected data and co-led writing of the first draft of the manuscript. TP participated in data analysis and development of the discussion section of the paper, particularly in sections related to the literature review. SH provided editorial contributions and helped develop applied meaning from the data and to the manuscript. FL participated in methodological design, data collection, and assisted in addressing revisions to the original manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare they have no competing interests.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Author details

¹Human Dimensions of Natural Resources Department, Campus Delivery 1480, Colorado State University, Fort Collins, CO 80523, USA. ²Odum School of Ecology and Integrative Conservation, University of Georgia, Athens, GA 30602, USA. ³Kenyatta University, Nairobi, Kenya.

Received: 1 February 2018 Accepted: 28 May 2018

Published online: 31 July 2018

References

- Asaka, Jeremiah, and Thomas A. Smucker. 2016. Assessing the role of mobile phone communication in drought-related mobility patterns of Samburu pastoralists. *Journal of Arid Environments* 128: 12–16.
- Bedelian, Claire, and Joseph O. Ogutu. 2017. Trade-offs for climate-resilient pastoral livelihoods in wildlife conservancies in the Mara ecosystem, Kenya. *Pastoralism* 7: 10. <https://doi.org/10.1186/s13570-017-0085-1>.
- Bett, Bernard, Christine Jost, and Jeffrey Mariner. 2008. Participatory investigation of important animal health problems amongst the Turkana pastoralists: relative incidence, impact on livelihoods and suggested interventions. International Livestock Research Institute. <https://cgspace.cgiar.org/handle/10568/303>. Accessed 17 Jan 2018.
- Dayer, Ashley A., Alan D. Bright, Tara L. Teel, and Michael J. Manfredo. 2016. Application of a stated choice approach to assessing public preferences for wildlife conservation. *Human Dimensions of Wildlife* 21 (5): 379–390.
- Fratkin, Elliot, and Eric A. Roth. 2005. *As pastoralists settle: Social, health, and economic consequences of pastoral sedentarization in Marsabit District, Kenya*. New York: Springer.
- Galvin, Kathleen A. 2009. Transitions: Pastoralists living with change. *Annual Review of Anthropology* 38: 185–198.
- Greiner, Clemens. 2012. Unexpected consequences: Wildlife conservation and territorial conflict in northern Kenya. *Human Ecology* 40 (3): 415–425.
- Hindin, Michelle J. 2007. Role theory. In *The Blackwell Encyclopedia of Sociology*, ed. George Ritzer, 3959–3962. Hoboken, NJ: Wiley.
- Human Rights Watch. 2015. www.hrw.org/report/2015/10/15/there-no-time-left/climate-change-environmental-threats-and-human-rights-turkana. Accessed 29 Dec 2017.
- Ishizaki, Asuka, Tara L. Teel, and Manami Yamaguchi. 2011. Contextual factors influencing support for sea turtle management actions in Ogasawara Islands, Japan: An application of conjoint analysis. *Human Dimensions of Wildlife* 16 (5): 297–298.
- Kardulias, P. Nick. 2015. *The ecology of pastoralism*. Boulder, CO: University of Colorado Press.
- Kochore, Hassan H. 2016. The road to Kenya? Visions, expectations and anxieties around new infrastructure development in northern Kenya. *Journal of East African Studies*. <https://doi.org/10.1080/17531055.2016.1266198>.
- Lesorogol, Carolyn K. 2003. Transforming institutions among pastoralists: Inequality and land privatization. *American Anthropologist*. 105 (3), 531–541.
- Lesorogol, Carolyn, Gina Chow, and David Ansong. 2011. Livestock or the pen: The Effects of Inheritance and Education on Poverty Among Pastoralists. Chronic Poverty Research Centre Working Paper No. 188.
- Little, Peter, Abdillahi Aboud, and Clement Lenachuru. 2009. Can formal education reduce risks for drought-prone pastoralists?: A case study from Baringo District, Kenya. *Human Organization* 68 (2): 154–165.
- Mbutu, Kennedy A. 2007. Small arms and light weapons among pastoral groups in the Kenya-Uganda border area. *African Affairs* 106 (422): 47–70.
- Opiyo, F.E.O., Oliver V. Wasonga, Janpeter Schilling, and Stephen M. Mureithi. 2012. Resource based conflicts in drought prone northwestern Kenya: The drivers and mitigation mechanisms. *Wudpecker Journal of Agricultural Research* 1 (11): 442–453.
- Reid, Robin S., Maria E. Fernandez-Gimenez, and Kathleen E. Galvin. 2014. Dynamics and resilience of rangelands and pastoral peoples around the globe. *Annual Review of Environment and Resources* 39: 217–242.
- Russell, Nathan. 2014. Ecosystem action: Renewing rural landscapes for improved food security and livelihoods. CIAT Strategy 2014–2020. Cali, Colombia: International Center for Tropical Agriculture. <https://cgspace.cgiar.org/handle/10568/52271>. Accessed 29 Dec 2017.
- Samburu County (n.d.). County Integrated Development Plan. http://www.laikipia.org/wp-content/uploads/2017/05/Samburu_CIDP.pdf
- Schilling, Janpeter, Francis E.O. Opiyo, and Jürgen Scheffran. 2012. Raiding pastoral livelihoods: Motives and effects of violent conflict in North-Western Kenya. *Pastoralism: Research, Policy and Practice* 2 (25): 1–16.
- Sorokowski, Piotr, Agnieszka Sorokowska, Tomasz Frackowiak, and Corinna E. Lockenhoff. 2015. Aging perceptions in Tsimane' Amazonian forager: Farmers compared with two industrialized societies. *Journal of Gerontology* 72 (4): 561–570.
- Spencer, Paul. 1965. *The Samburu: a study of gerontocracy in a nomadic tribe*. London: Routledge and Kegan Paul.
- Tarabini, Aina. 2009. Education and poverty in the global development agenda: Emergence, evolution and consolidation. *International Journal of Educational Development* 30 (2): 204–212.