

## Recent Publications of ILRI

### Research reports

Implicit prices of indigenous cattle traits in central Ethiopia: Application of revealed and stated preference approaches. Kassie, G.; Abdulai, A.; Wollny, C.; Ayalew, W.; Dessie, T.; Tibbo, M.; Haile, A.; Mwai, O. 2011. ILRI Research Report 26.

The Impacts of the Arid Lands Resource Management Project (ALRMPII) on Livelihoods and Vulnerability in the Arid and Semi-Arid Lands of Kenya. Johnson, N.; Wambile, A. (eds). 2010. ILRI Research Report 25.

Demand for livestock products in developing countries with a focus on quality and safety attributes: Evidence from Asia and Africa. Jabbar, M.A.; Baker, D.; Fadiga, M.L. (eds). 2010. ILRI Research Report 24.

Consumer preferences and demand for livestock products in urban Bangladesh. Islam, S.M.F.; Jabbar, M.A.; 2010. ILRI Research Report 23.

### Discussion papers

Livestock and Women's Livelihoods: A Review of the Recent Evidence. Kristjanson, P.; Waters-Bayer, A.; Johnson, N.; Tipilda, A.; Njuki, J.; Baltenweck, I.; Grace, D.; and MacMillan, S. 2010. ILRI Discussion Paper 20.

### IPMS

Gender—Empowering women through value chain development: Good practices and lessons from IPMS experiences. Aregu, L., Puskur, R., Renard, G., Hoekstra, D. and MacMillan, S. 2011.

Shifting towards market-oriented irrigated crops development as an approach to improve the income of farmers: Evidence from northern Ethiopia. Gebremedhin Woldemahid, Berhanu Gebremedhin, Kahsay Berhe and Dirk Hoekstra. 2011. IPMS Working Paper 28.

Interdependence of smallholders' net market positions in crop and livestock markets: Evidence from Ethiopia. Jaleta, M. and Gebremedhin, B. 2011. IPMS Working Paper 27.

Breeding strategy to improve Ethiopian Boran cattle for meat and milk production. Haile, A.; Ayalew, W.; Kebede, N.; Dessie, T.; Tegegne, A. 2011. IPMS Working Paper 26.

## Briefs

Agriculture-associated diseases: Adapting agriculture to improve human health. McDermott, J. and Grace, D. 2011.

Key economic performance indicator. East Africa Dairy Development Project Baseline Survey Brief 5. Gelan, A., Muriithi, B. and Baltenweck, I. 2011.

Livestock disease challenges and gaps in delivery of animal health services. East Africa Dairy Development Project Baseline Survey Brief 4. Njehu, A., Omore, A., Baltenweck, I. and Muriithi, B. 2011.

Feeds and feeding practices. East Africa Dairy Development Project Baseline Survey Brief 3. Lukuyu, B., Duncan, A.J., Kariuki, K. and Baltenweck, I. 2011.

Constraints to the use of artificial insemination service and possible solutions. East Africa Dairy Development Project Baseline Survey Brief 2. Mburu, J., Ojango, J.M.K., Kariuki, K. and Baltenweck, I. 2011.

Survey methodology. East Africa Dairy Development Project Baseline Survey Brief 1. Baltenweck, I., Gelan, A., Poole, J. and Kariuki, E. 2011.

### Other reports

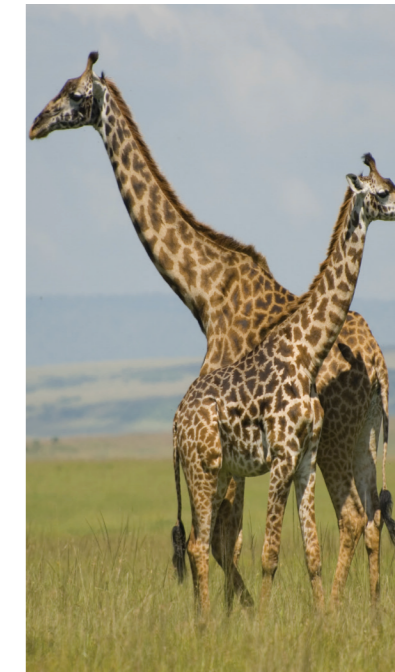
Feed, food and fuel: Competition and potential impacts on smallscale crop-livestock-energy farming systems. Dixon J et al. 2010. CGIAR SLP Project Report.

Balancing Livestock Needs and Soil Conservation: Assessment of Opportunities in Intensifying Cereal-Legume-Livestock Systems in West Africa. IITA. 2010. CGIAR SLP, Project Final Report.

Considering pastoral issues in Ethiopia: Report of an informal learning 'conversation' at ILRI, Addis Ababa. 2010.

Participatory evaluation of fodder species planted in 2009 in Ada'a, Mieso and Alamata woredas. Adie, A.; Tedla, A.; Duncan, A.; Ergano, K.. 2010.

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## Wildlife numbers in Kenya's Mara region in decline

*Joseph Ogutu, Norman Owen-Smith, Hans-Peter Piepho and Mohammed Said*

In May 2011, ILRI researchers released a journal article reporting on 'continuing wildlife population declines and range contraction in the Mara region of Kenya during 1977–2009.

Based on previous work, the authors knew that populations of large mammals were declining in the Mara. The declines were extreme and worrying and involved seven of the large mammal species then studied. However, the earlier research of only counted 7 species of large mammals over a 15-year period covering July 1989–December 2003. Moreover, the counts were done almost exclusively within the confines of the Masai Mara National Reserve itself and were just samples taken from relatively few transects and hence did not provide estimates of absolute population sizes.

There was, therefore, the question of how exactly other species not covered in our 2009 study were faring and how the declines within the reserve compared with the declines in the pastoral Masai ranches bordering the Mara reserve. Also, others had argued that the 2009 study covered only the period up to 2003 and that much may have changed in the intervening period. In fact, some argued that there were probably no declines at all since a lot of management effort was being directed towards solving the problems that were identified as causing the declines. Others wanted us

to pinpoint where the declines were occurring in the Mara. We set out to update the earlier analyses using more recent data covering up to 2009. We looked at a longer time window going back to 1977 when the Department of Resource Surveys and Remote Sensing of Kenya (DRSRS) began aerial monitoring of wildlife and livestock in the Mara region of Kenya. The current work thus covers 1977–2009 and all the common large mammal species in the Mara (13 wildlife species and 4 livestock species). The new study also covers trends in wildlife numbers in the entire reserve and adjoining Masai pastoral ranches. In addition to wildlife, we also considered changes in livestock numbers (cattle, sheep and goats and donkeys) over the same period to understand if livestock numbers may be increasing or extending their distribution and thus displacing or outcompeting wildlife in the region. Since the DRSRS counts were conducted in the same way from 1977 to 2009 and since they covered the entire Mara region, the aerial counts allowed us to assess the extent to which livestock incursions into the reserve, especially its edges, may have contributed to wildlife declines. Finally, we looked into the question of whether the numbers of migratory wildebeest and zebra coming to the Mara each year have reduced in recent years, and the relative contributions of climate change, land use change and other human activities such as poaching on any wildlife declines.

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## Approach

We looked at changes in numbers of 12 species of large mammals, ostrich and 4 species of livestock over 1977–2009. This is a difficult task because we had to check the aerial survey data to ensure they were properly recorded and had no errors. Since the counts are conducted using long transects divided into 5 × 5 km<sup>2</sup> grid cells and there are a maximum of 289 such cells for each species during each of the total of 49 counts conducted during 1977–2009, this involved looking a lot of data. Since the aerial counts take only a sample of the animals, we had to estimate the total population size of each species in the reserve and the adjoining ranches from the 289 cells each year.

We identified ranches that are immediately adjacent to the Reserve (inner ranches), where human population density and settlement is low and cultivation is less common. Cultivation in the inner ranches is limited to small-scale subsistence maize farming. The inner ranches included two large ranches called Koyiaki, to the north, and Siana, to the east, of the Mara Reserve. We grouped the other more distant ranches together as outer ranches, where human population density and settlements are more prevalent and cultivation is more widely practiced and includes large-scale mechanized commercial wheat production. Thus, we obtained 49 estimates of total population size for each species in the reserve, the inner ranches and the outer ranches during 1977–2009.

We then looked at how the total population sizes of each species had changed in each of the three areas during 2009 and calculated the percentage changes in population sizes of each species in each region between 1977–1979 (average population size) and 2007–2009 (average population size) periods. We did this so that we could minimize the effect of random noise on the estimated percentage change in population size between the two periods.

For the migratory wildebeest and zebra, we looked at changes in their numbers in the wet season and, separately, in the dry season so that we could control for the effect of the annual migrations on our results.

We also looked at the average population size of each species of wildlife and livestock, calculated over all the counts conducted in the 1970s, 1980s, 1990s and 2000s, and within a 5-km band along the edge of the reserve, further inside the reserve core, and in the inner and outer ranches, to see where wildlife may have declined most.

Finally, we interpreted the changes we found by seeking to understand what they mean for wildlife conservation in the Mara, the future of the Mara as one of the wonders of the modern world and what actions need to be taken to stop the declines.

## Results: Declining wildlife

Over the last three decades (33 years) populations of almost all large wildlife species monitored in the Mara have fallen by more than two-thirds and are now only one-third or less of their former levels. Over the same period, livestock distribution has widened and their numbers increased tremendously, especially small stock (sheep and goats).

Two species became locally extinct in this period: The roan antelope and wild dogs. Sadly, wildlife are apparently being monitored into extinction in the Mara. Without urgent, decisive and resolute actions, more local extinctions may yet occur and the spectacular migration for which the Mara is world famous may continue to dwindle.



We were very surprised by what we found. We expected the situation to be better given the many conservancies that have been established and the awareness created about wildlife declines in the Mara reserve. We expected the declines in wildlife numbers to have reduced, or stopped altogether given the increased law enforcement by the Mara Conservancy management since 2000–2001 and the formation of several new conservancies involving voluntary partnerships between private investors in tourism and land owners in the Mara ranches since 2005–2006. Neighbouring land owners pool their land together and voluntarily vacate their land and let it be managed for wildlife conservation by private investors in tourism in exchange for regular monthly land rents.

To our great surprise, the extreme wildlife declines have continued unabated in the Mara. We were surprised in several ways by our findings. First, the Mara has lost more than two-thirds of most of its wildlife. [The] majority of the wildlife species such as impala, warthog, giraffe, topi and Coke's hartebeest have declined by over 70% in the Mara reserve, and only eland, Grant's gazelle and ostrich are showing any signs of population recovery in the later

part of the last decade. The declines are similarly extreme outside the reserve where buffalo have all but disappeared (99% decline) primarily by being outcompeted by livestock. Warthog, topi, giraffe, Coke's hartebeest and eland have also fared very badly outside the reserve, having reduced by more than 75%. Elephant and ostrich have not fared as badly in the ranches.

The great wildebeest migration now involves 64% fewer animals than it did in the early 1980s, yet the source population in the Serengeti has changed little over this period. Even more startling is that the migratory wildebeest visiting the pastoral ranches adjoining the reserve have become 82% fewer over the same period. The migratory zebra visiting the reserve have reduced by 41% while those visiting the ranches have reduced by 60% over the same period.

The number of wildebeest resident in the Mara reserve in the wet season, when there is no migration, has declined by at least 97% compared to their number in the late 1970s. In the ranches outside the reserve, the resident wildebeest numbers have declined by 66%. The number of zebra resident in the Mara all year round has declined by more than twice as much in the reserve (-76%) than in the ranches (-37%).

What is even more surprising is that the number of cattle grazing in the reserve (although this is illegal) increased by 1104% over the study period. Similarly, the number of sheep and goats grazing in the reserve illegally increased by 744% at the same time. In the pastoral ranches the number of cattle increased by a modest 8% but sheep and goats nearly doubled (increase of 79%) between 1977–2009, most especially in the last decade.

Not only have the numbers of cattle, sheep and goats increased but their distribution has widened, with the density of cattle increasing more than three-fold and that of sheep and goats more than seven-fold up to 5 km inside the reserve. Sadly, wildlife distribution has greatly contracted throughout the entire Mara region over the same period.

## Implications

The continued extreme wildlife declines in the Mara is very worrisome and is linked mostly to the activities of poachers, changing land-use patterns in the Mara ranches, and the increasing numbers and expanding distribution of livestock in the Mara ranches. Over 1500 poachers have been arrested and over 17300 snares were collected by rangers in the Mara conservancy between 2001–2010 showing that poaching continues to be a major menace to wildlife. It is not known how many poachers are active in the other parts of the Mara since no arrest records are available. It is probably very high.

Heavy grazing by livestock is displacing wildlife and making them more vulnerable to starvation during severe droughts

that were experienced in recent decades (e.g. in 1984, 1993, 1997, 1999–2000, 2005, 2008–2009). Competition with livestock due to food scarcity during such droughts is largely responsible for the disappearance of buffalo in the Mara ranches and severe reductions in buffalo numbers in the reserve. For example, buffalo numbers dropped in the Mara Reserve by 76% following the 1993 drought.

Since the Mara ranches still support large numbers of wildlife, it is prudent not to fence the Mara reserve boundaries. Promoting the establishment of conservancies that enable land owners to benefit from wildlife alongside livestock should be supported to encourage wildlife conservation. There is a strong interest and good will on the part of land owners to form these conservancies at present.

Once the benefits from conservancies are flowing to landowners, future expansion of settlements and fences and livestock stocking levels need to be regulated. Otherwise the migration routes, the time spent by migrants in the Mara and the number of migrants visiting the Mara are likely to continue to decline.



The currently high rates of poaching and snaring of wildlife also need to be controlled through enhanced and expanded patrols.

Otherwise, the status of Masai Mara as a prime conservation area and premier tourist draw card in Kenya may soon be in jeopardy, especially given the rapid decline in the number of animals involved in the migration.

Read more: Read more: Ogotu, J. et al. 2011. Continuing wildlife population declines and range contraction in the Mara region of Kenya during 1977–2009, *Journal of Zoology*. <http://cgspace.cgiar.org/handle/10568/3775> DOI: 10.1111/j.1469-7998.2011.00818.