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Impact of resettlement on livestock production and performance among the Maasai pastoralists of RAPland village, Olkaria Kenya

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Abstract

Displacements from developmental-related projects such as dams, conservancies, and geothermals displace 15–20 million people annually, necessitating the relocation of project-affected persons (PAPs). Most resettlement action plans (RAPs) fail in resettling the PAPs fully, causing loss of livelihoods and impoverishment. In 2014, Kenya Electricity Generating Company Limited (KenGen) displaced 155 Maasai pastoral households to create space for the expansion of existing geothermal electricity generation plants at Olkaria. The PAPs were relocated into a newly created area called RAPland village. The study aimed at answering the question: how did displacement and relocation affect livestock production and performance of the resettled pastoralists. Data on livestock population structures and cattle herd structures and performance (age at first calving, calving interval, lactation length, and milk yields) before and after the relocation were collected by a survey of 105 household heads of the intended census of 155. Data collected were summarised using Excel and analysed with Statistical Package for Social Sciences (SPSS). Results showed that daily milk yield per cow decreased from a mean of 3.8 ± 0.19 to 2.38 ± 0.19 l, while total livestock populations reduced from 8383 to 3124 tropical livestock units (TLU) after the relocation. The mean livestock holding per household (TLU) before the relocation was 75.7 ± 8.83, 15.5 ± 1.78, 5.83 ± 0.67, 1.46 ± 0.22, and 0.14 ± 0.02; this decreased after the relocation to 26.4 ± 8.3, 4.62 ± 1.7, 2.5 ± 0.63, 0.34 ± 0.21, and 0.3 ± 0.02 for cattle, sheep, goats, donkeys, and poultry, respectively. Young cattle proportions reduced from 27.6 to 20%, while that of cows increased from 51.7 to 60% after resettlement. Relocation affected livestock production and performances through reduced daily milk yield and livestock populations, thus reducing pastoralists' resilience for food, nutritional security, and coping with catastrophes. As such, future displacement and resettlement programmes involving pastoral communities should address grazing needs and pastoral resilience to avoid impoverishment.

Keywords: Livelihoods, Resilience, Project-affected persons, Relocations

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Introduction

Developmental projects that include hydroelectric dams, mines, agricultural, conservancies, and urban infrastructures have both positive and negative implications on the people they affect. Jobs' creation/employment opportunities and improved services delivery are some of the benefits that come with development projects with displacements, environmental degradation, and poverty as shortcomings. Globally, development-induced displacement and resettlement (DIDR) projects on estimates displaced between 15 and 20 million persons annually (Cernea and Mathur 2008; Terminski 2015; Cernea and Maldonado 2018). This number however could be higher when those restricted from accessing land and other resources are included (Abbink et al. 2014). According to Cernea (2007), displacement is not only the physical eviction of the people from their dwellings; it also involves expropriation of productive land and restricting access to other livelihood resources. Currently, development-induced displacement of persons is regarded as the most important forced migration worldwide (Pankhurst and Piguet 2009). In Eastern Africa, the take-over of rangelands by investment projects is putting the sustainability of extensive pastoralism in jeopardy, thus the lives of people depending on it.

Some of DIDR projects that displace people include dams/hydropower plants, highways, railways, airports, mines, national parks, conservancies, and agricultural (Terminski 2013; Vanclay 2017). For example, Three Gorges Dam in China displaced 1.13 million people (Wilmsen 2016), the Marange diamond fields in Zimbabwe with 4700, Kariba Dam in Zambia had 57,000, Akosombo Dam in Ghana with 80,000, and Narmada Sardar Sarovar Dam in India with 127,000 (Stanley 2004). Due to their multidimensional, multifactor, multi-actor, multi-scalar, and multilevel in nature, resettlement action plans (RAPs) are regarded as being projects within projects (Reddy et al. 2017).

Although justified by the principle of "greater good for the larger number of people", most DIDR projects do fail in resettling the PAPs fully, but instead exposed them to risks that include loss of access to common resources, landlessness, joblessness, marginalisation, homelessness, food insecurity, increased morbidity, and community disarticulation as outlined in the impoverishment, risks, and reconstruction (IRR) model (Cernea 2007). These impacts are more severe on children, women, and the elderly owing to their inherent social vulnerabilities (Mehta 2009). India, for instance, displaced 20 million people during the last four decades, of which 75% of these people became impoverished, as their livelihoods have not been fully restored (Mahapatra 1999). Such impoverishments are not limited to India only but do occur in the Global South where most of these developmental projects are implemented.

Driven by the need for cheaper, sufficient, and clean energy, the Kenya Electricity Generating Company Limited (KenGen)—a parastatal mandated with electricity generation in Kenya, secured a one billion Euro funding from World Bank (WB), European Investment Bank among other donors in 2010 to expand existing geothermal production stations at Olkaria area. To implement this, four villages that include OlooMayana Ndogo, OlooNongot, OlooSinyat, and Cultural Centre inhabited by Maasai pastoral communities were displaced and had to be relocated. In effect, 155 households were moved into a single piece of communal land, called resettlement action plan land (RAPland) village, between August and September 2014.

As resettlement action plans (RAPs) are inadequately planned and executed, most resettled persons are deprived of their livelihoods and impoverished after the relocation. These effects have not been exhaustingly discussed, and thus, planning for displacement is challenged by inadequate information on its probable consequences. Using the case of Olkaria Geothermal developments, this study sought to answer the question "how displacement and relocation did affect livestock production and performance of the resettled Maasai pastoralists of the RAPland village of Olkaria area, Kenya?"

The study area

This study was conducted at RAPland village that covers an estimated area of 688 hectares. It is located within the greater Olkaria Area, on the floor of Kenya's Great Rift Valley Systems. Administratively, the RAPland village is in Naivasha, Nakuru County. It is about 120 km northwest of the capital, Nairobi. In terms of climate, the greater Olkaria area falls under agro-ecological zone V or semi-arid climate, receiving 634 mm rainfall annually in a bimodal pattern, with longer rains coming in March–May and shorter ones in October–November. Generally, the elevation of the Naivasha sub-county is 1829 m above sea level with minimum and maximum daily temperatures of 11.4–16.6 °C and 25.4–35.5 °C, respectively with an average temperature of 18.4 °C for the area with July and February as the coldest and hottest months, respectively.

The key economic activity of the area is cattle, sheep, and goat pastoralism. Like most pastoralists in Kenya, the system is not commercially oriented. However, in times of need, livestock may be sold at the nearby Naivasha or Suswa urban areas. The area is served by an excellent road network created as a part of the geothermal developments in the area (Fig. 1).

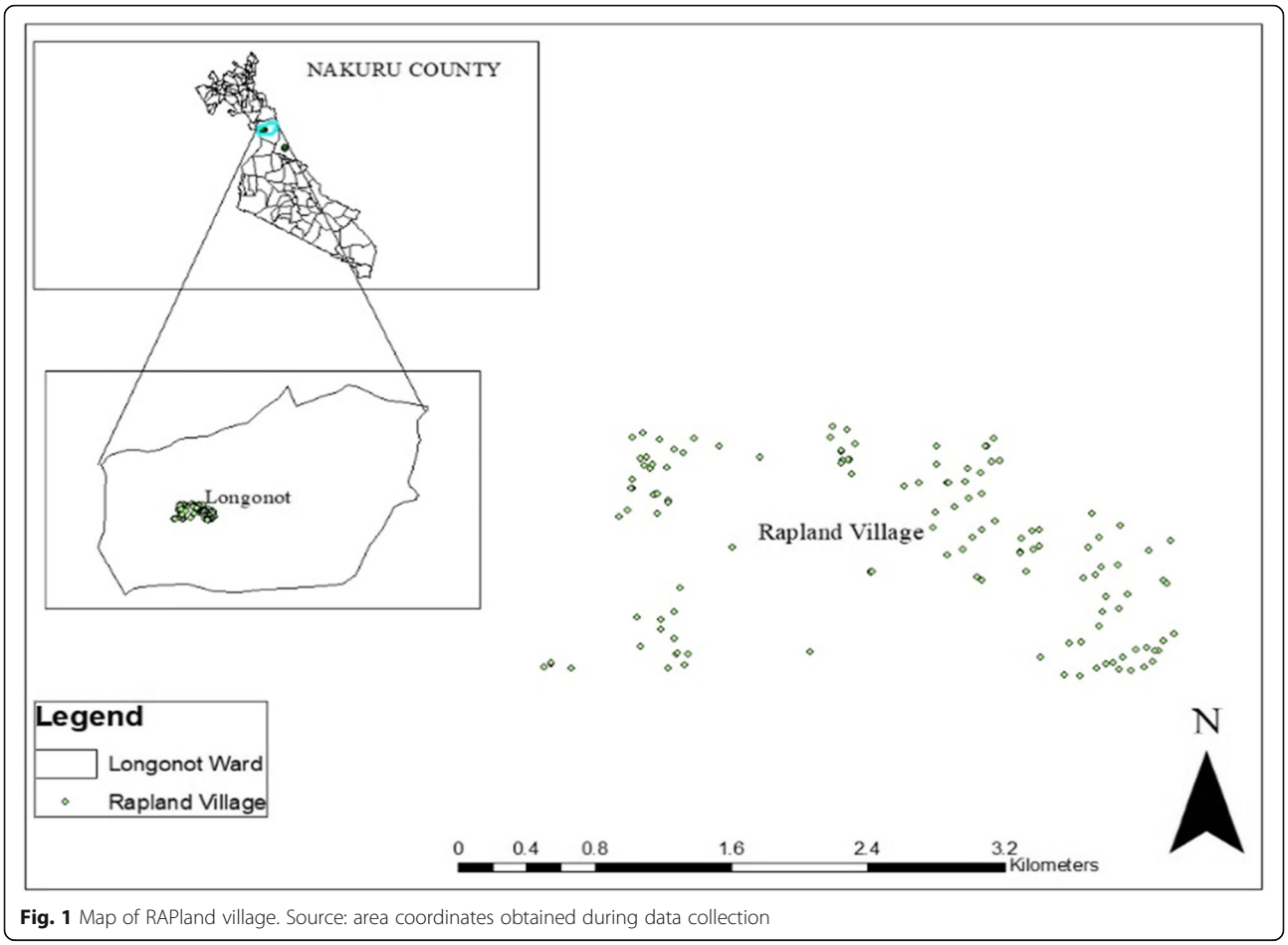

Fig. 1 Map of RAPland village. Source: area coordinates obtained during data collection

Materials and methods

Research methods/approaches

Data collection was carried during the months of May and June 2019, 5 years after the conclusion of the resettlement programme. Most of the data was based on recall by the respondents, and hence, its veracity may be questioned. However, the pastoralists have the reputation of recall of livestock-related information, and the information they provided may be considered reliable. As the displaced population was relatively small, the study aimed at interviewing representatives of all the 155 households that were displaced and resettled into RAPland village. However, only 105 household heads were available for the interview during the study period. Some of the remaining 50 households refused to participate in the interviews, and others had no livestock, while others had moved out of the RAPland village.

A pretested and structured questionnaire with information on land size, livestock owned, cattle proportions, and cattle production parameters (age at first calving, calving interval, lactation length, and milk yield) before and after the relocation was administered to the 105 household heads. Enumerators who understood and spoke the Maa language (Maasai vernacular) were identified, trained, and administered the questionnaires. To validate data on communal land availability, collected through the questionnaires, key informants interviews (KII) were conducted. As such, three elderly men considered to be the custodian of tribal roles and history and familiar with the displacement and relocation process were identified and interviewed.

Data analysis

The quantitative data collected were checked for inconsistency, organised, and summarised using Microsoft Excel 2019. The summarised data were later imported into the Statistical Package for Social Sciences (SPSS, version 21). Inferential statistics that include tables of means, percentages, averages, and the ANOVA were obtained. Data on communal grazing land availability was a consensus from KII and thus validated the information collected from other interviewees/household heads.

Results and discussion

Demographic characteristics of the respondents

Respondents' demographic characteristics are presented in Table 1. The majority (68%) of the respondents were

Table 1 Demographic characteristics of respondents

Variable	Category	Frequency	Percentage
Village	OlooManyana Ndogo	22	23
	OlooNongo	27	26
	OlooSinyat	21	22
	Cultural Centre	31	33
	Total	105	100
Gender	Male	34	32
	Female	68	71
	Total	105	100
Marital status	Married	91	87
	Unmarried	14	13
	Total	105	100
Age group	18–30	50	47
	31–45	27	25
	46–60	19	19
	Over 60	9	9
	Total	105	100
Education level	No formal education	57	54
	Primary education	20	19
	Secondary education	23	22
	Tertiary education	5	5
	Total	105	100

women. Most men were engaged in informal employment with KenGen or other companies operating in the area and thus were not available for the interview during the time of data collection. Despite this, men were still considered by the respondents as owners of the primary pastoral resources (livestock and land assets and responsible for the grazing decisions). This was because culturally, the women were not allowed to own pastoral assets. Therefore, their access and activities were regulated and controlled by their husbands or fathers. Earlier studies by Blench (2001) and Ngowi et al. (2008) have similarly reported that pastoral women are forbidden from owning livestock, although they perform routine livestock practices including herding, milking, milk processing and selling of dairy products, calves and small ruminants rearing. Children's duties were not so distinct from those of their parents; they performed herding/grazing, rearing of calves, attention to sick animals, and small ruminants. In this regard, division of labour and allocation of functions were based on age and gender, as previously observed by Blench (2001), Tadesse et al. (2015) and Homewood (2018).

For continuity of family lineage and labour, matured household members are encouraged to marry and, as such, about 87% of the respondents were married, with those within the youth age (18–45 years) representing 72%. Illiteracy was high among the Maasai pastoralists of RAPland village as majority of the respondents (54%) had never been to school. This is commonly observed among mobile pastoral communities. Of those considered literate, 19%, 22%, and 5% had attained primary, secondary, and tertiary education respectively. This high illiteracy rate could be attributed to the lack of basic infrastructures including roads, running water systems, schools, and social amenities in the former four villages occupied by the Maasai pastoralists before relocation. With the presence of primary and secondary schools in RAPland village, the respondents were optimistic about improved educational status. In addition, resettlement in permanent houses rendered them less mobile and offering opportunities for more children to enrol in the newly established schools. Literacy is usually higher among the agro-pastoral communities than in pastoralist ones. Ocaido et al. (2005) observed a 62.9% literacy level among the agro-pastoralist communities of Serere County in Uganda.

Livestock production systems before and after the relocation

Livestock species composition and populations are presented in Table 2. Before relocation, they kept indigenous breeds of cattle, sheep, goats, donkeys, and chickens under extensive systems. This largely remains the same after the relocation. The pastoralists kept multi-species to optimise herbage variations in rangelands, produce a range of products (meat, milk), and minimise risks emanating from environmental extremes (droughts, famines, flood), owing to their varying degree of coping with the challenges. The higher proportion of cattle at 77.2% and 78.9% before and after the relocation implies the cattle-based pastoralism among the Maasai, similarly observed among pastoralists of the Oyo area of Southwest Nigeria (Daodu et al. 2009). This is unlike other production systems in northern Kenya (Somali pastoralists) where camels and the small ruminants are the preferred species. They kept cattle purposely, as also discussed by Mgongo et al. (2014) in other studies for the provision of milk for the households.

Among the small ruminants, there were more sheep before and after relocation (15.5%; 13.1%) than goats (5.7% and 7.1%). The higher composition of sheep is attributed to ease of management since they can be grazed together with the cattle, something that is difficult to do with goats. This is in agreement with Daodu et al. (2009) who indicated that sheep are always more in small stock mixture due to the ease of management. Goats' proportion increased from 5.7 to 7.1% after the resettlement. This increase could be due to the adaptive nature of goats to bushy vegetation, which comprised most of the vegetation in the RAPland village.

Table 2 Livestock species composition, populations, and mean household holding before and after the relocation

Species	Before the relocation			After the relocation		
	Population TLU	Mean TLU/HH	Proportion % TLU	Population TLU	Mean TLU/HH	Proportion % TLU
Cattle	6468	75.7 ± 8.83	77.2	2480	26.4 ± 8.3	78.9
Sheep	1298	15.5 ± 1.78	15.5	412	4.62 ± 1.7	13.1
Goats	481	5.8 ± 0.67	5.7	222	2.5 ± 0.63	7.1
Donkeys	123	1.46 ± 0.22	1.4	25	0.34 ± 0.21	0.8
Poultry	13	0.14 ± 0.02	0.2	3	0.3 ± 0.02	0.1
Total	8383		100	3142		100

Tropical Livestock Unit (TLU) is equivalent to an animal of 250 kilogrammes (kg). Thus, a cattle = 1 TLU, donkey = 0.5 TLU, sheep/goats = 0.1 TLU, and poultry = 0.01 TLU (FAO 2002). *HH* households

Among most rural communities in Africa, donkeys provide transportation draught power during short and long walks. Before the Maasai pastoral communities were relocated from their homes/Manyattas, donkeys were primarily used for fetching water from various collection points around their settlements. After resettlement, this role was no longer important, as the water was piped to water kiosks within the village. Thus, the donkey proportions decreased from 1.4 to 0.8%.

Although poultry/indigenous chicken is not regarded as a pastoral species—as they cannot be grazed together with other species, as observed by Blench (2001), they were included in the survey to assess the community's adoption of new species. According to respondents, it is primarily for immediate home consumption and income especially for women who were staying at home. Although being the least kept species in RAPland village and having reduced in population after the relocation, the indigenous chicken had been gaining in popularity, especially among the less mobile and more venturesome women as revealed during the FGD. It was not explained adequately why the numbers had decreased after relocation. The Maasai pastoralists do not move with chickens, but instead, they were kept at home, unlike the Fulani nomads of West Africa who carried theirs along with the grazing herds to feed on worms and dung (Blench 2001).

Livestock populations before and after the relocation

Our findings showed a significant ($P < 0.05$) decrease in mean livestock holdings—expressed in tropical livestock unit (TLU) per household after the relocation, as shown in Table 2. As such, total livestock populations had reduced from 8383 to 3142 TLUs at times of the study. According to the residents, many factors were responsible for such massive loss (62.5%) of herds. Before the relocation, the pastoralists had access to sufficient grazing fields as they managed 4200 acres and could access surrounding rangelands. Pastures became insufficient in RAPland village, which was only 1700 acres, with some 200 acres used to build residential houses, schools, health centres, and churches. Not only was the land insufficient, but also it contained less grazing as the vegetation was dominated by woody shrubs. The area was also fractured with steep gulleys making a difficult terrain for cattle. This may explain the slight increase in the proportion of goats.

The reduction (60%) in communal land affected access to quality pastures and watering points. This affected the nutrition of the herds, thus their production and performance. With fewer grazing points, livestock is confined and grazed in limited rangelands, which became degraded and produced fewer pastures. This is in agreement with studies in Ethiopia by Elias and Abdi (2010) and Yonas et al. (2013) among Karrayu and Borena of Oromiya Regional State and Meinit-Shasha district of Southwest, respectively, which reported massive livestock loss and poor productivity as a result of the reduction in communal grazing lands and quality of grazing.

As a way of coping with declining grazing resources in RAPland village, some pastoralists donated or assigned parts of their herds to relatives and friends living in other pastoral rangelands with adequate pastures and watering points. This is in accordance with Tashi and Foggin (2012) and Yonas et al. (2013) who suggested that pastoral communities would adjust their herds' sizes in response to grazing needs and other environmental dictates. Some households, equally discussed by Elias and Abdi (2010), sold parts of their livestock to raise incomes used in procuring immediate household needs (food, medical services) faced in new homes. These contributed to the reduction in livestock populations in RAPland village according to discussants of FGD.

Wildlife predations and livestock diseases are other factors that contributed to the decrease in livestock populations. Due to its proximity to Hell's Gate National Park, RAPland residents lost much livestock to wild animals (leopards, hyenas, and baboons), especially during the first 2 years of resettling into RAPland. As part of the resettlement package, residents were promised some

veterinary infrastructure that includes dips, crushes aimed at controlling parasites/ticks and livestock diseases. This had not materialised at the time of this study, and as such, pastoralists lost livestock to diseases. Losses were even worse for the very vulnerable and weaker households that could not afford veterinary drugs and services that are sought from distant places.

Cattle proportions and performance before and after the relocation

The proportions of cows, youngstock, and average daily milk yield were significantly ($P < 0.05$) affected by the relocation. The proportion for youngstock drop from 27.6 to 20%, while that for cow increased from 51.7 to 60%, as the proportion for bulls remained almost the same after the relocation, as shown in Table 3.

Youngstock was more susceptible to common livestock production constraints (livestock diseases, predators, and poor nutrition) in RAPland village as its lack veterinary infrastructures and services like cattle dip, vaccination, and treatment programmes. Residents acknowledged that youngstock was killed a lot by the wild animals during the first 2 years of arriving at RAPland village due to massive vegetation cover and many hideouts for the predators. The increase in the cow proportion is attributed to the relative adaptability of mature cows to some of the production constraints encountered after the relocation.

In both scenarios, cows constituted the largest proportion of cattle. This is a typical characteristic of pastoral herds, which are oriented towards milk production, essential food, and income source for pastoral households and herd growth/replacement (Mgongo et al. 2014; Daodu et al. 2009; Majekodunmi et al. 2014; Mwanyumba et al. 2015; Homewood 2018). The above findings contrasted highly with the animal-traction/draught-oriented cattle herds, where the proportion of male to female would be equal, or the male populations would be higher than that of the females (Ocaido et al. 2005). Kenya with 80% arid and semi-arid land, for instance, produced 1.05 billion litres of milk from pastoral areas annually, representing 18% of national total milk production with pastoral cattle milk contributing 0.473 billion litres, approximately 14.4% of national cattle milk, equivalent in value to KES 28.5 billion (Nyariki and Amwata 2019). Reduction in mean cows and youngstock proportions implies a decrease in milk production and herd replacement, growth, and continuity, thus dramatically influencing and destabilising household food and nutrition security, thus exacerbating poverty levels among the resettled populations.

Table 3 Cattle herd structures before and after the resettlement

Category	Proportion (%) of total number of cattle TLU before resettlement	Proportion (%) of total number of cattle TLU after resettlement
Bull	20.7	20
Cows	51.7	60
Youngstock	27.6	20

Table 4 Cattle performance before and after the relocation

Parameter	Mean before relocation	Mean after relocation
Age at first calving in years	4.13 ± 0.17	3.88 ± 0.16
Calving interval in years	1.52 ± 0.11	1.53 ± 0.11
Lactation length in months	5.76 ± 0.51	7.13 ± 0.49
Milk yield in litres	3.80 ± 0.19	2.38 ± 0.19

Cows' performance was evaluated through age at first calving, calving interval, lactation length, and milk yield parameters. Milk yields fell from a daily mean of 3.80 ± 0.19 to 2.38 ± 0.19 after the resettlement (Table 4). However, age at first calving, calving interval, and lactation were found not to have been affected by the relocation. The dropped in milk yield could be attributed to several factors including insufficient pastures and water, and diseases that could have been caused by the relocation. As an elderly RAPland village woman put it during the study, "since we came to RAPland, our cows are not producing enough milk, one has to milk many cows to get enough milk for our children". Livestock mobility, which allows utilisation of varying rangeland resources in time and space, could have been impaired by the decrease in grazing land. As cattle are poorly fed (due to inadequate pasture), they cannot meet the nutrient requirements needed to milk yield potential. They also become more susceptible to diseases.

Conclusions and recommendation

RAPland village is smaller in size compared to the former grazing lands pastoralists managed and had access to; this caused insufficiency in pastures and the quality of grazing, which subsequently affected the nutrition and health of the herds. With compromised health and nutrition, daily milk yields per cow decreased. Also, absolute livestock populations decreased due to the same poorer health/nutrition besides other production constraints like predation. Therefore, future resettlement programmes involving pastoral communities should address pastoral grazing needs and resiliency.

Abbreviations

HHs: Households; KenGen: Kenya Electricity Generation Company; PAPs: Project-affected persons; RAP: Resettlement action plan; RAPland: Resettlement action plan land; TLU: Livestock tropical unit

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Authors' contributions
Abraham Biar Gai collected the data and performed the data analysis and writing of the paper; Raphael Githaiga Wahome and Rawlynce Cheruiyot Bett both assisted in the data analysis, writing, and editing of the paper. The author(s) read and approved the final manuscript.

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Availability of data and materials
The datasets used in this study are available from the corresponding author and upon reasonable request.

Declarations

Ethics approval and consent to participate
Not applicable

Consent for publication
Not applicable

Competing interests
The authors declare that they have no competing interests.

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References
Abbink, G.J., K. Askew, D.F. Dori, E. Fratkin, E.C. Gabbert, J. Galaty, and D. Turton. 2014. *Lands of the future: Transforming pastoral lands and livelihoods in eastern Africa*, Max Planck Institute for Social Anthropology working papers, 154.

Blench, R. 2001. *'You can't go home again': Pastoralism in the new millennium*, 103. London: Overseas Development Institute https://www.odi.org/publications/5155-you-cant-go-home-again-pastoralism-new-millennium.

Cernea, M.M. 2007. IRR: An operational risks reduction model for population resettlement. *Hydro Nepal: Journal of Water, Energy and Environment* 1: 35–39.

Cernea, M. M., and H. M. Mathur. 2008. *Can compensation prevent impoverishment?: Reforming resettlement through investments*. New Dehli: Oxford University Press.

Cernea, M., and J. Maldonado. 2018. *Challenging the prevailing paradigm of displacement and resettlement: Risks, impoverishment, legacies, and solutions*,1–42. London: Routledge.

Daodu, M.O., O.J. Babayemi, and E.A. Iyayi. 2009. Herd composition and management practices of cattle production by pastoralists in Oyo area of Southwest Nigeria. *Livestock Research for Rural Development* 21: 66 Retrieved May 30, 2020, from http://www.lrrd.org/lrrd21/5/daod21066.htm.

Elias, E., and F. Abdi. 2010. *Putting pastoralists on the policy agenda: Land alienation in Southern Ethiopia*. London: IIED.

Food and Agricultural Organization (FAO). 2002. *What are tropical livestock units? Livestock and environment toolbox*. Rome: FAO.

Homewood, K. 2018. Pastoralism. In *The International Encyclopedia of Anthropology*, 1–10 https://discovery.UCL.ac.UK/10066269/1/Pastoralism_Homewood_International%20EncyclopaediaAnthropology.pdf http://125.22.40.134:8080/jspui/bitstream/123456789/2361/1/MEHTA%20LYLA%20%283-33%29.pdf.

Mahapatra, L.K. 1999. *Resettlement, impoverishment, and reconstruction in India: Development for the deprived*. New Delhi: Vikas Publishing House Private.

Majekodunmi, A.O., A. Fajinmi, C. Dongkum, A.P. Shaw, and S.C. Welburn. 2014. Pastoral livelihoods of the Fulani on the Jos Plateau of Nigeria. *Pastoralism* 4 (1): 20. https://doi.org/10.1186/s13570-014-0020-7.

Mehta, L. 2009. *Displaced by development: Confronting marginalisation and gender injustice*. New Dehli: Sage Publications.

Mgongo, F.O.K., M.K. Matiko, E.K. Batamuzi, R.M. Wambura, E.D. Karimuribo, D.G. Mpanduji, L.B. Massawe, R.S. Silayo, E. Kimbita, and H. Kiwia. 2014. Pastoral indigenous breeding practices and their impact on cattle reproduction performance: The case of Kilosa and Gairo Districts. *Livestock Research for Rural Development* 26: 76 Retrieved June 3, 2020. http://www.lrrd.org/lrrd26/4/mgon26076.htm.

Mwanyumba, P.M., R.W. Wahome, L. MacOpiyo, and P. Kanyari. 2015. Livestock herd structures and dynamics in Garissa County, Kenya. *Pastoralism* 5 (1): 26. https://doi.org/10.1186/s13570-015-0045-6.

Ngowi, E. E., S. W. Chenyambuga and P. S. Gwakisa. 2008. Socio-economic values and traditional management practices of Tarime zebu cattle in Tanzania. *Livestock Research for Rural Development* 20 (6): 2008.

Nyariki, D.M., and D.A. Amwata. 2019. The value of pastoralism in Kenya: Application of total economic value approach. *Pastoralism* 9 (1): 9. https://doi.org/10.1186/s13570-019-0144-x.

Ocaido, M., C.P. Omit, N.M. Okuna, J. Erume, C. Ssekitto, R.Z.O. Wafula, D. Kakaire, J. Walubengo, and J. Monrad. 2005. Socio-economic and livestock disease survey of agro-pastoral communities in Serere County, Soroti District, Uganda. *Livestock Research for Rural Development* 17: 93. Retrieved June 10, 2020. http://www.lrrd.org/lrrd17/8/ocai17093.htm.

Pankhurst, Alula, and François Piguet. 2009. Displacement, migration and relocation. In *Moving people in Ethiopia. Development, Displacement and the State*, ed. Alula Pankhurst and François Piguet, 246–264. New York: James Currey.

Reddy, G., E. Smyth, and M. Steyn. 2017. *Land access and resettlement: A guide to best practice*. London: Routledge.

Stanley, J. 2004. *Development-induced displacement and resettlement*. Forced Migration Online. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.621.9202&rep=rep1&type=pdf.

Tadesse, Y., M. Urge, P. Kesari, Y.M. Kurtu, K. Kebede, and S. Abegaz. 2015. Socioeconomic profile and gender characteristics in relation to camel management practices in the pastoral communities of Ethiopia. *Journal of Economics and Sustainable Development* 6 (1): ISSN: 2222.

Tashi, G., and M. Foggin. 2012. Resettlement as development and progress? Eight years on: Review of emerging social and development impacts of an ecological resettlement project in Tibet Autonomous Region, China. *Nomadic Peoples* 16 (1): 134–151.

Terminski, B. 2013. Development-induced displacement and resettlement: Theoretical frameworks and current challenges. *Development* 10: 101.

Terminski, B. 2015. *Development-induced displacement and resettlement: Causes, consequences, and socio-legal context*. Stuttgart: Ibidem Press.

Vanclay, F. 2017. Project-induced displacement and resettlement: From impoverishment risks to an opportunity for development? *Impact Assessment and Project Appraisal* 35 (1): 3–21.

Wilmsen, B. 2016. After the deluge: A longitudinal study of resettlement at the Three Gorges Dam, China. *World Development* 84: 41–54.

Yonas, B., F. Beyene, L. Negatu, and A. Angassa. 2013. Influence of resettlement on pastoral land use and local livelihoods in southwest Ethiopia. *Tropical and Subtropical Agroecosystems* 16 (1): 103–117.

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