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Young women's and men's climate adaptation practices and capacities in Kenya livestock production systems

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Climate change adaptation strategies must be identified and tailored to diverse locations and livestock production systems to be effective. Social factors such as gender, wealth, age and education levels generate differentiated abilities and capacities to cope with climate shocks. In this study we draw upon 48 sex disaggregated focus group discussions with youth to understand young people's engagement in the livestock sector and their livestock adaptation strategies. We first explore whether gender and locational differences exist in young women's and men's engagement in the livestock sector, specifically which livestock species young women and men rear. Next, we describe young women's and men's livestock adaptation strategies in mixed crop and livestock and agropastoral systems. Lastly, we share insights about relationships that shape young women's and men's engagement in livestock during their transitions to adulthood. Youth rear certain species more than others, such as chickens and dairy cows. Livestock adaptation practices are generally low. Gendered practices during transitions to adulthood differ for young women and men and household relationships mediate young women's and men's livestock production engagement. Intergenerational transfers are gendered, however, are changing in all locations. Women's opportunities to inherit or acquire land, for instance, have expanded. Transitions into new households, however, often reinforce gendered access to resources and women's labor. Recommendations on how to better develop inclusive and sustainable policies that provide support to youth in livestock and strengthen their adaptation capacities are provided.

KEYWORDS

youth, gender, livestock, adaptation, Kenya

Introduction

Climate change has risen in Kenya's policy agenda over the last decade. Frequent and increasing severity of drought threaten agricultural livelihoods, especially those who depend on livestock in arid and semi-arid lands (Njeru, 2017; Marty et al., 2022). Climate change adaptation strategies specific to the livestock sector must be identified and tailored to diverse locations and livestock production systems to be effective (Thornton and Herrero, 2014; Rojas-Downing et al., 2017). Climate impacts upon livestock include decreased availability of water and forage and subsequent lower production and losses associated with increased incidence of disease (Rojas-Downing et al., 2017). Adaptation practices include production and management system modifications, such as changes in breeding practices and choices of breeds that are tolerant to

heat stress and disease; intensification in production, livelihood diversification and shifting out of livestock production altogether (Bennett et al., 2014).

Multiple policies specific to climate and youth exist, however the integration of youth specific issues and their abilities to implement adaptation practices in livestock production is not clearly elaborated. Kenya has prioritized mainstreaming climate adaptation in national and county level development planning (Kenya NAP, 2015–2030) and demonstrates consistent policy focus on strengthening climate adaptation (Ashley, 2019). The Climate Change Act of 2016 is the main legislation guiding Kenya's climate response and informed the *National Climate Change Action Plan (NCCAP) 2018–2022* in which agriculture features as a priority sector. The *Kenya Climate Smart Agriculture Strategy (KCSAS) 2017–2026,* includes a strategic goal to empower women, youth, and vulnerable groups through improved participation in CSA activities, including some that are specific to livestock.

Concerns about the significantly large, and mostly unemployed youth population in Sub-Saharan Africa have raised the visibility of youth in international and national level policy discourse (Sumberg et al., 2019). The potential of the agricultural sector to support youth, defined by the Kenya Constitution as those between 18 and 34, is recognized (see Kenya Youth Development Policy, 2019; National Policy on Gender and Development, 2019). However, such policies seldom identify the linkages between youth and livestock (e.g., National Agricultural Policy, 2019). While the National Livestock Policy (2019) highlights the sector's vulnerability to climate change, youth specific approaches or the identification of youth specific climate adaptation strategies are largely absent.

Social dynamics in livestock and adaptation

Inequalities based on gender, race, class, ethnicity, and other axes of power interact and shape social dynamics, such as who may own specific types of livestock, how livestock are managed, whose labor is used and how labor is distributed in livestock production. This study spans three counties and diverse ethnic groups therein, the Kalenjin in Nakuru, Kikuyu in Kiambu, and the Maasai in Kajiado. Gender roles and practices within these cultural groups, to varying extents, influence social dynamics in livestock production and, consequently, livestock adaptation practices. Gender roles, however, are dynamic and changing under the pressures of emerging economic and climatic circumstances (Doss, 1999) and, in some cases, creating opportunities for women to exercise agency in ways that counter conservative and restrictive norms about what women should and should not do (see Petesch et al., 2018; Bullock and Tegbaru, 2019). Studying social change in communities and households during these times of rapid change provides a lens on societal shifts in norms and practices in agricultural systems more generally.

In East Africa, livestock species often are culturally valued, which tends to underpin gendered practices in livestock systems that are well documented, but more recently may be in flux under current economic and climate pressures, for instance. Women often own livestock species of lower economic value relative to men. Men typically own larger livestock, such as cattle, while women own chickens and goats (Njuki and Mburu, 2013; Tavenner and Crane, 2019; Odhiambo, 2020; Garsow et al., 2022). Kalenjin men's legitimacy as men, for example, is in part shaped by ownership of cows (Tavenner and Crane, 2019). Cows are imbued with gendered meaning and Kalenjin masculinity is embedded in localized practices, especially between husbands and wives (Tavenner and Crane, 2019, p. 706). While women may acquire livestock through purchase, gifts, and inheritance, they may not have the decision-making power over livestock or access to resources like land for the livestock (Njuki and Mburu, 2013; Mutua et al., 2017). Purchasing livestock may require permission from the household head and young women may not inherit livestock due to cultural practices (Mutua et al., 2017). In pastoral settings cultural customs may also restrict women's rights to own livestock assets (Omolo et al., 2017) and though women receive livestock through marriage, their rights of access and control may be limited (Rao, 2019).

The division of labor is often gendered in livestock production. Women often carry out most of the daily labor tasks in intensive and semi-intensive dairy production (Tavenner and Crane, 2019) and small ruminant production (Ogolla et al., 2022) such as feeding, watering, and cleaning housing structures. In agropastoral and pastoral systems mobility in animal husbandry is gendered. Men and boys migrate with livestock and leave women and girls at home with weaker or lactating animals, in some cases requiring women to assume more control in management and decision-making over livestock in the homestead (Bullock et al., 2021). Gender dynamics in livestock systems underpin socially differentiated adaptation capacities and capabilities.

Social factors such as gender, wealth, age and education levels generate differentiated abilities and capacities to cope with climate shocks (Omolo and Mafongoya, 2019; Ng'ang'a and Crane, 2020). Among the Maasai gender intersects with age, education, and wealth to shape socially differentiated adaptation pathways and diversification outcomes (Marty et al., 2022). Adaptation practices are shaped by, and themselves shape, beliefs, values, norms, practices, and livelihoods in communities confronted by uncertainty and contextually specific climatic events (Adger et al., 2009; Fazey et al., 2016; Marks et al., 2022), that necessitates the development of "highly situated climate adaptation strategies" (Neef et al., 2018). Adaptation actions influence social relations, and the distribution of resources in any given population or place (Eriksen et al., 2015). For example, in semi-arid northern Kenya, differential adaptation in pastoral and agro-pastoral contexts affect gender and generational relations, with implications for changing household structures (Rao, 2019).

In this study we draw upon sex disaggregated focus group discussions with youth to understand young people's engagement in the livestock sector and their livestock adaptation strategies. We first explore whether gender and locational differences exist in young women's and men's engagement in the livestock sector, specifically which livestock species young women and men rear. Next, we go on to describe young women's and men's climate livestock adaptation strategies in mixed crop and livestock and agropastoral systems. Lastly, we share insights about specific relationships in different household arrangements that shape young women's and men's engagement in livestock during their transitions to adulthood.

Materials and methods

Site description

Kenya spans multiple and diverse agro-climatic zones and livestock production systems are similarly diverse. Commonly owned

livestock in Kenya include cattle, goats, and poultry (Njarui et al., 2016; Odhiambo, 2020). Regions with high mean annual rainfall and fertile soils support mixed crop and livestock systems in which crops and livestock are integrated on the same farm. Production in such systems may be intensified through commercialization practices such as high rates of productivity and inputs, often in smaller spaces when compared to livestock practices in arid and semi-arid lands (ASALs), that occupy a substantial land area in Kenya and where extensive practices are more common, e.g., grazing and mobile husbandry (Kogo et al., 2021). Mixed crop and livestock and pastoral based systems are vulnerable to the effects of climate change, manifested through increasing frequency and intensity of extreme events. Drought has been particularly severe in ASALs in Kenya in recent years (Kalele et al., 2021).

Data collection

Qualitative data was collected in Kiambu, Nakuru, and Kajiado counties (Figure 1). Site selection was based on diversity sampling. The counties differ in terms of ethnic composition and livestock production systems. Ethnic groups differ across the 3 counties. The majority group in Kiambu are the Kikuyu, Kalenjin in Nakuru and Maasai in Kajiado. Dairying is especially common in Kiambu and Nakuru. In the livestock sector dairying is the leading enterprise, with nearly 70% of households keeping an average of 2–3 cows in intensive zero-grazing systems (Kiambu County Integrated Development Plan, 2018). Livestock trade and livestock products in Kajiado include beef, milk, and hides and are a main source of livelihood to most households in the county (Kajiado County Integrated Development Plan, 2018).

The field team consisted of 4 enumerators composed of 2 men and 2 women who underwent a 2-day training. The principal author led the training that entailed a review of the Focus Group Discussion (FGD) guide, translation of the instruments from English to Swahili, and practicing interviews. Data collection was carried out in May 2021 and a total of 48 sex disaggregated FGDs were conducted (Table 1).

Participant selection criteria included age (8–34 years), engagement in agricultural and livestock production and residence in the location for at least 5 years to ensure participants had adequate familiarity with local contexts. Each FGD comprised 5–6 participants and took approximately 2 h. Topics discussed included youth engagement in agriculture, experiences of climate impacts and adaptive capacities and strategies.

Ethical approval was obtained through the ethics board of the International Livestock Research Institute (ILRI-IREC2020-25). Informed consent was read to participants prior to starting the group discussion and signatures were obtained. FGDs were conducted by a facilitator with a note-taker of the same sex. All discussions were recorded, and notes were taken during the sessions. Transcription was carried out by the facilitators in coordination with notetakers, who worked remotely and separately due to COVID. Transcription teams worked jointly in online shared files that were crosschecked by both teams to ensure inter-transcriber reliability, e.g., listening to the audios and checking the transcripts.

Transcripts were translated from Swahili to English and imported into NVivo, a qualitative data analysis software (NVivo 13) (Lumivero, 2022). Iterative deductive and inductive approaches were used (Figure 2). Deductive coding refers to a provisional list of codes that was determined beforehand to explore the study's research questions while inductive approaches refer to identification of emergent, data driven coding (Saldaña, 2021; Bingham, 2023). Coding was conducted by the authors and intercoder consistency was supported through frequent discussions until agreement was reached (O'Connor and Joffe, 2020). Through this process multiple rounds and revisions of the codebook were made. Cross tab coding queries were run to identify gender and location-based trends that were reported in graphs in the Results section.

Results

This section is composed of three sub-sections. First, we describe the livestock species young women and men produce. Then we provide more details about the main species-specific adaptation practices those young women and men implement for chickens, dairy cows and cattle. We report overall trends and gender-specific trends within each location. Percentages of the FGDs, disaggregated by sex per location, were generated to describe key trends. The final sub-section focuses on relationships and the ways that key relations, namely parents and spouses influence youth in livestock production.

Youth engagement in livestock production

Youth rear chickens, dairy cows, small ruminants and pigs and often rear multiple combinations of species (Figure 3). Livestock diversification was described as a strategy to offset fluctuations and irregular income from livestock products.

> "A lot of youths in the area are involved in chicken farming, rabbit and pig farming since you find that if you depend on crop farming too much sometimes the harvests are insufficient. So with keeping those animals you are able to sell eggs, rabbits and pigs for meat." (Men's Group, Nakuru)

Livestock production functions as both a primary and secondary source of income, more commonly referred to as a "side hustle," or a part time enterprise. Dairy, cattle, and small ruminants were reported common primary activities that require more labor than species that were reported to be secondary sources of income: pigs, chickens, and rabbits. Youth engagement in livestock production, and the role of livestock as either primary or secondary sources of emerging income, often changes over the course of the year and depends upon emerging opportunities, such as finding a job or other activities such as attending school.

Poultry production, specifically chicken, is the most common livestock activity and is practiced in both mixed and agropastoral systems (92% of all FGDs). Chicken rearing requires relatively low capital, labor and space requirements. However, this is irregular over the course of the year. Chicken and egg production is flexible, and, should another opportunity arise, like a salaried job, a young person may opt out of livestock activities.

> 'Mine is part time since if I get something else to do, I don't know if I will continue. After school, I have not gotten anything to do that is permanent, so, I have been doing this but it has been part

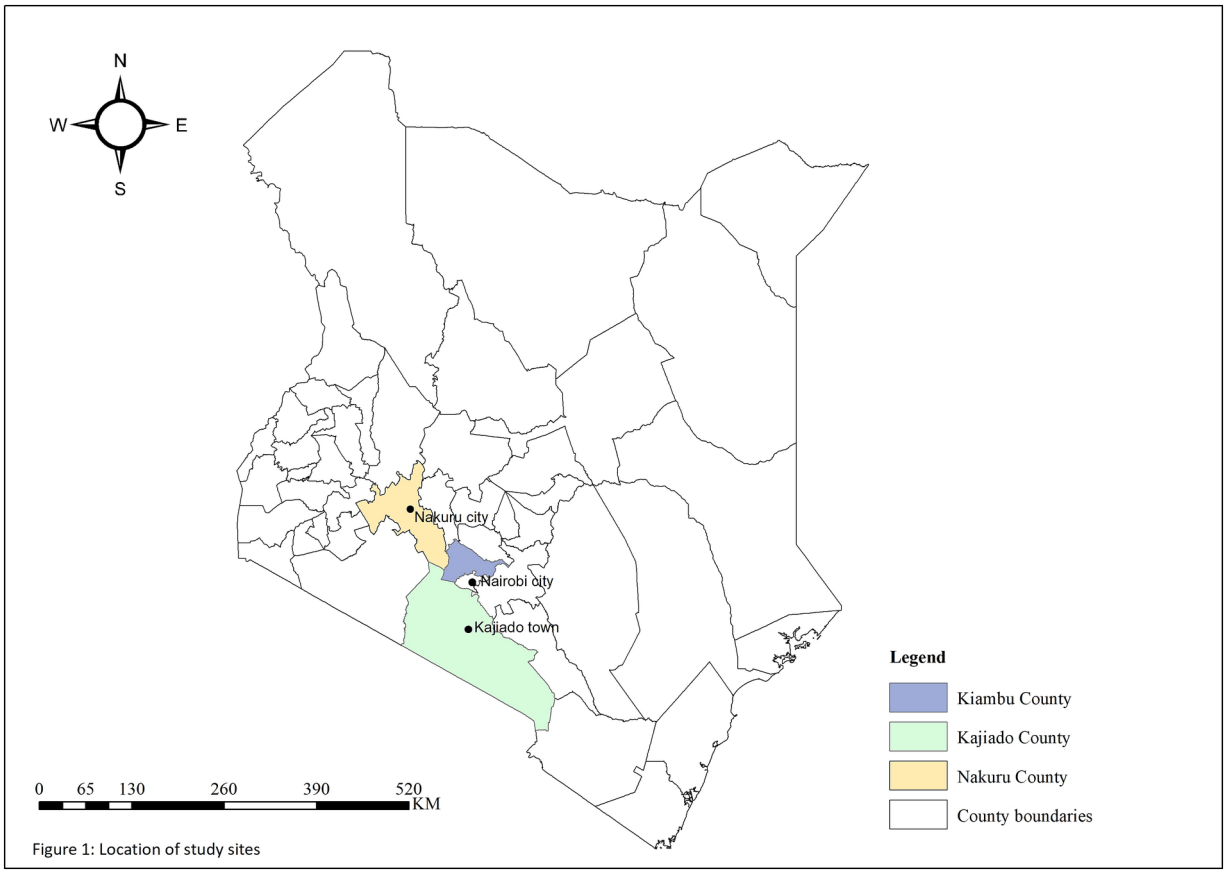

FIGURE 1
Map of study sites.

TABLE 1 Summary of FGDs.

	Women	Men	Sublocation totals	County totals
Kiambu				16
Gatundu North	4	4	8	
Uthiru	2	2	4	
Gitaru	2	2	4	
Nakuru				16
Bahati	4	4	8	
Keringet	4		4	
Kuresoi South		4	4	
Kajiado				16
Bisil	4	4	8	
Matasia	4	4	8	
Total				48

> time … the eggs, they are not sold daily because the chicken reduced in number. So, the eggs are not that many you can find that in a week you sell 2 crates twice or 4 crates at most.' (Women's group, Kajiado)

Dairy cow production (75%), that was reported more often as a full-time activity, is valued for generating daily income and supporting household nutrition needs. It also requires substantially more labor when practicing intensive zero grazing.

> "Personally, I do it full time because since I graduated I have never been employed and I have to farm for a living, so I plant potatoes, peas and keep dairy cows in order to sell milk. These activities keep me occupied full time." (Men's group, Nakuru)

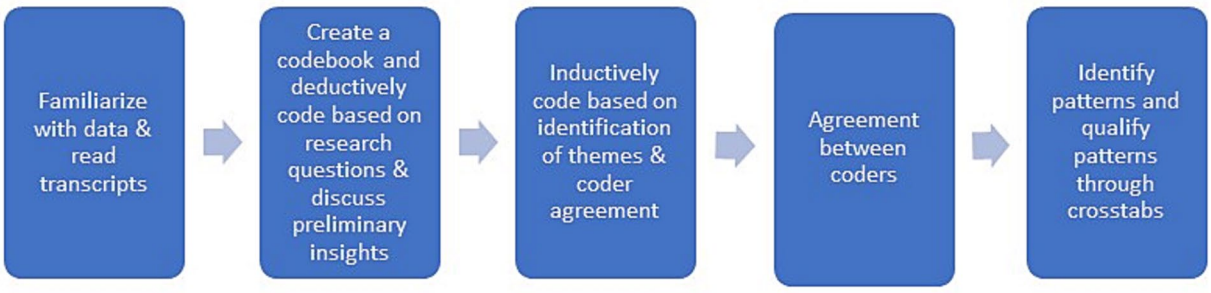

FIGURE 2
Methodological process.

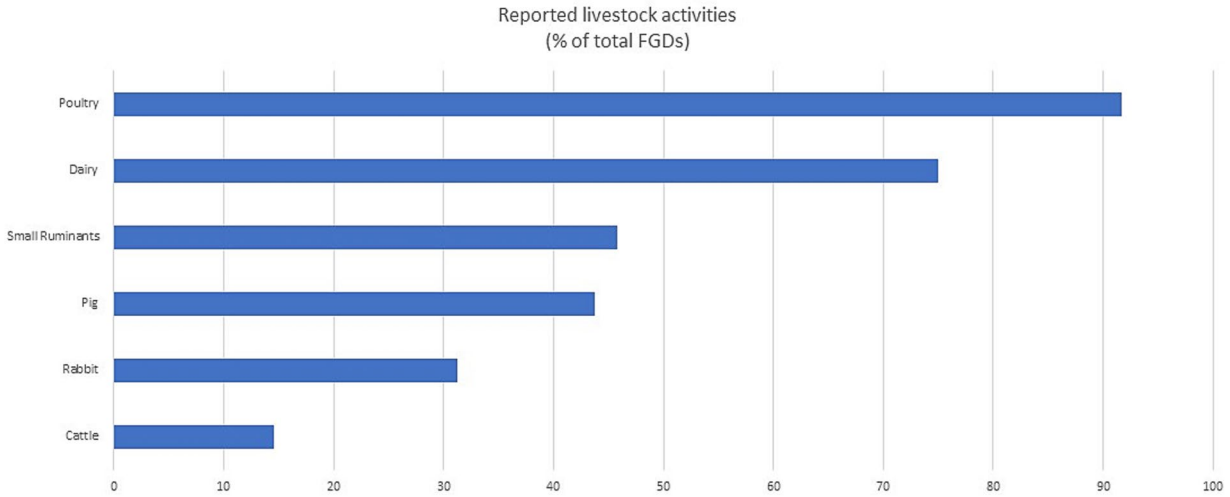

FIGURE 3
Livestock activities based on FGD reporting.

Women and men often reported rearing similar types of livestock but at different rates (Figure 4). More men report livestock production activities than women. An exceptional and location specific trend was found in Kiambu where women and men report similar levels of production in chicken, pigs, and rabbits. Women and men's groups reiterated that raising pigs is done by both women and men. In Kajiado, women and men reported similar rates of rabbit production. Men in Kajiado reported higher levels of cattle production relative to other groups in other locations. Fifty percent of men's FGDs reported engaging in cattle production, compared to only 13% of women's groups.

Climate impacts and adaptation practices

Reported climate events included drought, variable and unpredictable rainfall, flooding, and cold spells. Costs associated with climate include decreased production and availability of resources that sustain livestock, such as feed and water. Reported livestock specific practices were generally low: less than half of the focus groups reported livestock specific adaptation practices. Men reported more practices than women. Across the dataset adaptation for chicken was the highest reported set of practices (45% of the groups), followed by cattle (40%) and dairy practices (25%) (Figure 5).

In mixed livestock systems, the primary adaptation practices are related to chicken and dairy. In Nakuru, men report more practices than women and at higher rates than women in most cases. Women did not report any dairy adaptation practices. In Kiambu, men also report more adaptation practices across livestock species compared to women. Women's reporting of chicken-related adaptation practices is lower than men. In Kajiado, the agropastoral system, cattle—specific practice are reported by women and men at similar rates (75%). Chicken follows and men report at higher rates than women. Women and men reported small ruminant practices at similar rates (Figure 6).

In the following two sub-sections we provide more details about common livestock specific practices, namely chicken, dairy and cattle.

Chicken practices

Climate stressors that affect chicken production include cold and frost that lead to increased mortality and incidence of disease and a decrease in egg production. Practices reported include heating enclosures, treating diseases, destocking or selling off chickens, and

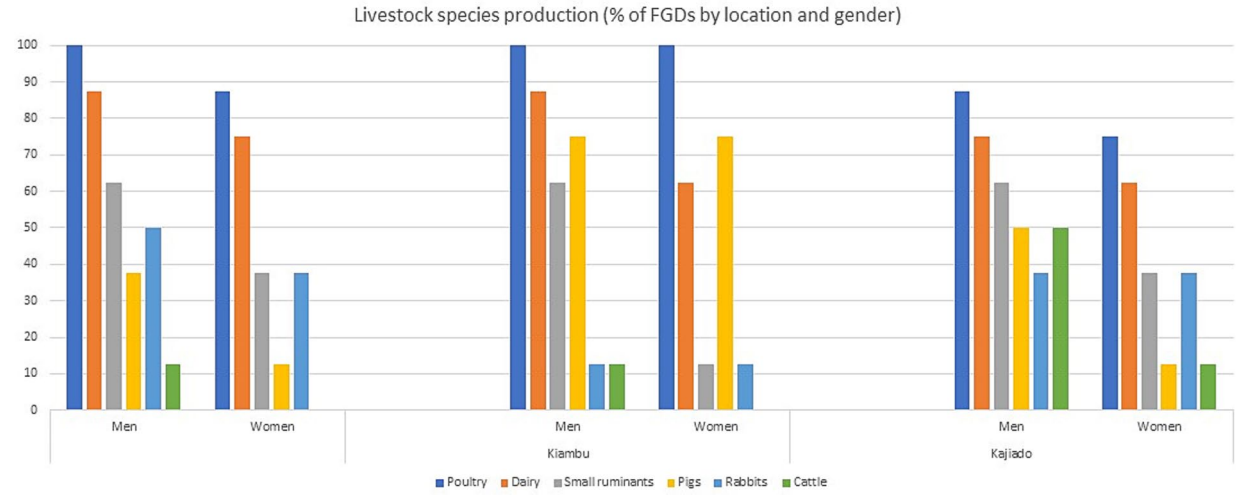

FIGURE 4
Livestock species production (% of FGDs by location and gender).

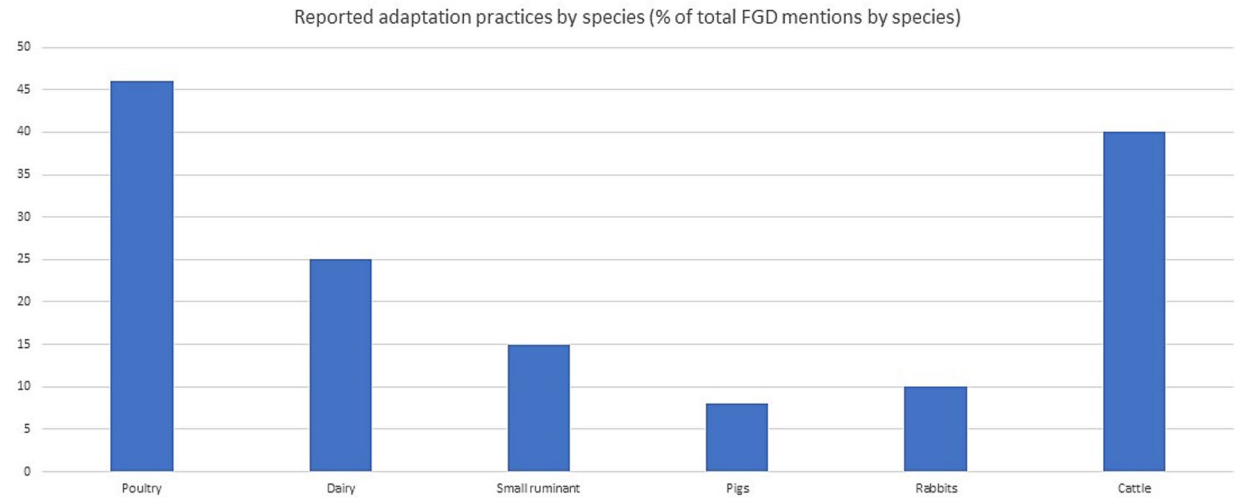

FIGURE 5
Reported adaptation practices by species (% of total mentions by species).

managing reproduction. Women and men often employ multiple practices. Heating techniques and sources for heating include spreading sawdust, sacks, and dry grass in enclosures, using charcoal and braziers, and placing chicken coops and rabbit hutches in areas protected by the wind. Electrical devices like heating bulbs and lamps, which are more expensive, are used and more common in commercial enterprises (Figure 7).

Men utilize more diverse practices than women, however the reporting rates of women's and men's practices differ. Women reported treatment such as vaccines at higher rates than men in Nakuru and Kajiado.

> "I vaccinate my chicken from diseases. Also when I know that there is an outbreak that may kill my chicken, I sell all of them before it gets to them and use the money to restock once the outbreak is over." (Women's group, Nakuru)

Women also reported using heating implements in Nakuru, while men did not. In Kiambu, women reported heating elements in shelters more often than men while men reported more practices than women, including destocking and managing reproduction. Women only reported using heating and at a higher rate than men.

In Kajiado, men reported more practices than women and heat was the most common practice used. Men reported higher rates of destocking or selling than women.

> 'In the past I could let the chicken raise their chicks until they had become established but these days I have to brood the chicks and warm their coops for them to survive.' (Men's group, Kajiado)

Women did not report managing breeding, or reproduction. Women and men report similar rates of using heating implements in the hutches. Women reported higher rates of treatment than men.

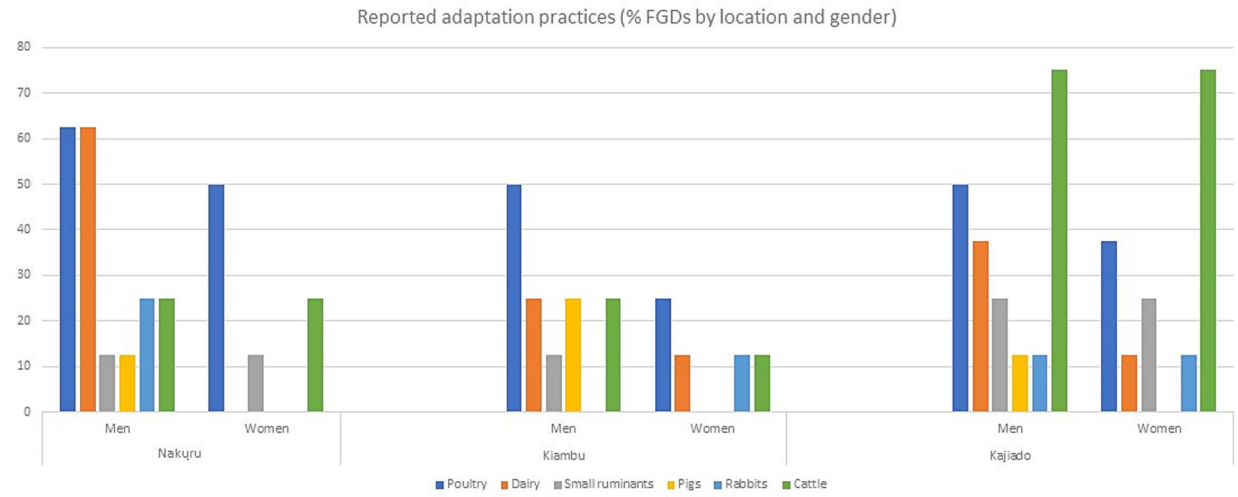

FIGURE 6
Reported adaptation practices by species (% FGDs mentions by location and gender).

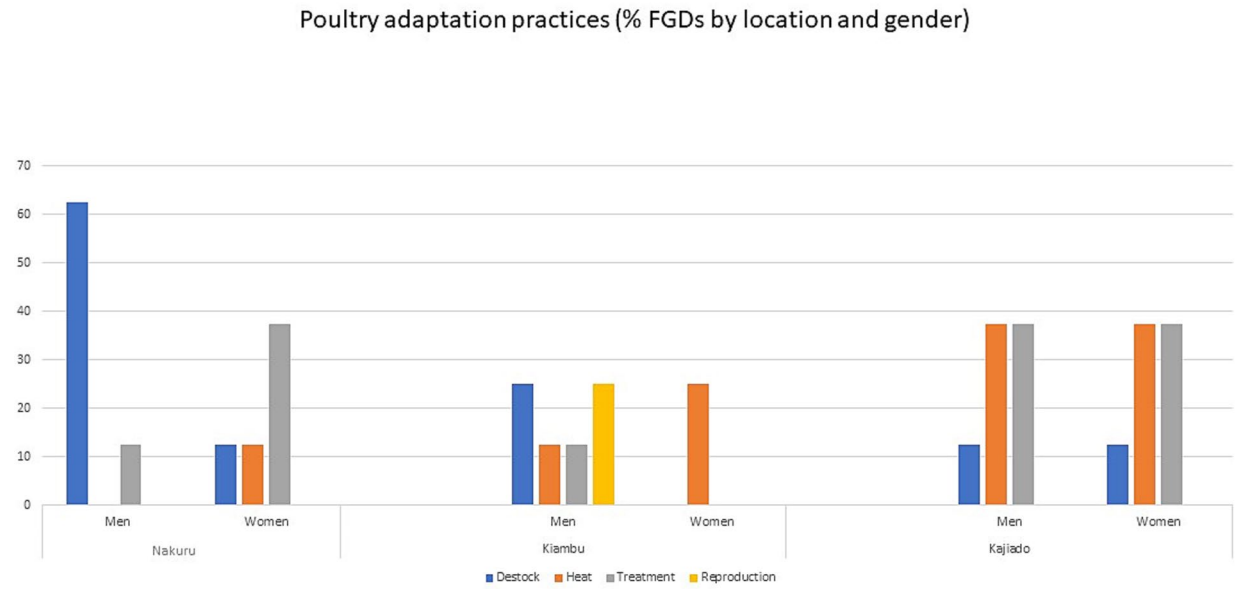

FIGURE 7
Poultry adaptation practices (%FGDs by location and gender).

Cattle and dairy cow practices

Reported dairy cow and cattle specific adaptation practices were combined and analyzed together. Dairy cows and cattle are the same livestock species, but are often different breeds and managed differently. Dairy cattle are bred to produce milk while cattle are bred for beef. Climate stressors to cattle and dairy cows include drought, and consequent impacts include water and feed shortages. Adaptation practices are similar and include feed and fodder practices, destocking and harvesting water. Feed and fodder practices were reported by all groups and the highest reporting was by women and men in Kajiado, followed by men in Nakuru. Destocking and managing reproduction is a risk management strategy and motivated by interests to offset costs in feeding and animal losses due to inadequate feed availability (Figure 8).

In Nakuru, men and women report different practices and men report feeding practices at higher rates than women. Women report medical treatments such as use of vaccines while men do not. In Kiambu, men report more practices than women and overall reporting of feeding practices was lower for Kiambu than other locations. In Kajiado, both women and men report the same number of practices and report feeding at the same rate. Men destock at higher rates than women, women reported higher rates of vaccines treatment than men.

Feed practices

Feed and fodder practices include purchasing feed, paddocking, utilizing and processing crop residues. In mixed crop and livestock systems, purchasing feeds and silage preparation is more common while in agropastoral areas like Kajiado, mobile systems of livestock

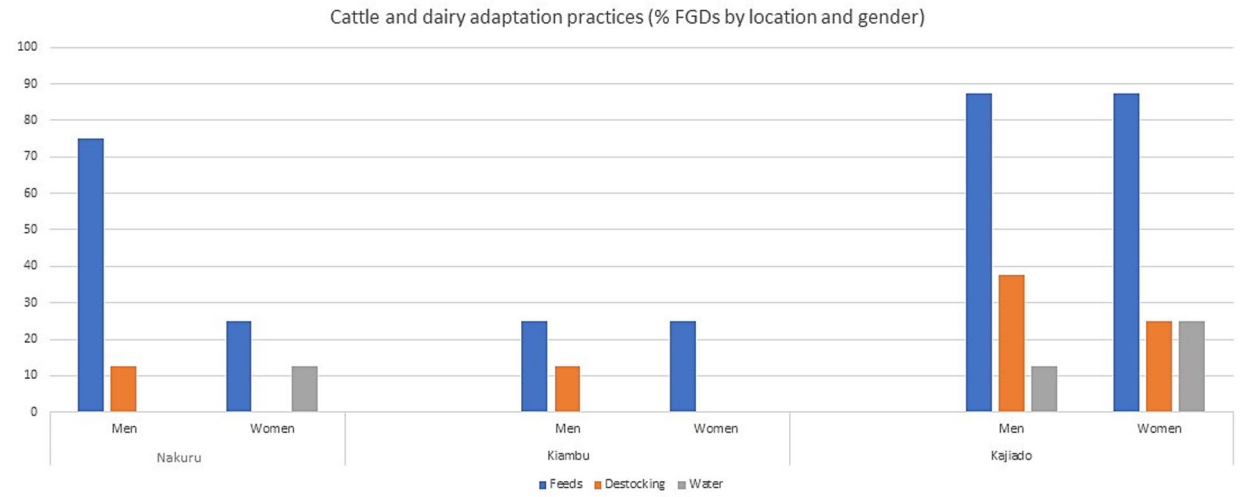

FIGURE 8
Cattle and dairy adaptation practices (% FGDs by location and gender).

husbandry, such as pastoral migration are common adaptation practices. However, pressures to change these practices exist and include limited land and drought-induced fodder scarcity.

> "Sometimes moving to a better area helps your animals get grass to eat but that was in the past when you could take your cows up to Loitoktok. What happens these days is you keep your cows in one place and go and buy grass and bring it to them although this needs money to be able to do. This can cost you anything from 70,000/= to 100,000/= for a small patch of grass, maybe a few acres." (Men's group, Kajiado)

Purchasing feed was reported more often by women. Young women as part of collectives and groups save money from milk sales to then use during drought. In Kajiado, collective community support was explained.

> "If you know that there will be drought next month, anybody with goats or cattle will come as a community and make sure that there is enough … Let's say I have a borehole … they should be given so that those cattle don't lack water. They also buy grass (hay) and store to feed them." (Women's group, Kajiado)

Women and men both described using fencing and paddocking in both mixed and agropastoral systems. Subdividing and fencing the land for paddocking is most common in Kajiado, as reported by both women's and men's groups, so that "cattle can have food to eat to for a short while" (Men's group, Kajiado). Paddocking and planting grass is less common in Kiambu, where land constraints exist.

> 'Mostly due to small land sizes the youths cannot practice in tea and coffee farming since big land parcels still belong to the older generation hence the youths rely mostly on dairy and poultry farming that require small land.' (Men's group, Kiambu)

In Nakuru only men reported making silage, while both women and men reported making silage in other locations. Crop residues are also sourced as feed for livestock. Planting maize and grasses such as Napier and selling fodder is a source of income in Nakuru and Kiambu. Collecting maize cobs and stalks in anticipation of droughts and selling of crop harvests as fodder are reported more often by men in Nakuru than by women, who spoke at generally lower rates than men about feeds.

> 'For my livestock which I value very much, I stock up on silage if I know that year there is a drought expected by going to farmers and collecting maize cobs and stalks and grind these up and store as silage. I stock up on silage enough for even up to one and a half years depending on how the drought comes. This is what I do to prevent my animals from going hungry.' (Men's group, Nakuru)

Certain practices are specific to Kajiado, such as mobile husbandry. Young men migrate with herds, often cattle, goats and sheep, in search of water and pasture, mainly in anticipation of approaching drought, "while the animals still have strength to move" (Men's group Kajiado). Migrating with weak and hungry cows is challenging because weak animal's immunity is lower, and they are more likely to contract diseases and die.

> 'We move cattle to areas with more grass. We move as a group during drought to areas that received more rainfall and still have adequate grass that the cattle can graze on. We move as a group to keep the cattle safe too.' (Men's group, Kajiado)

Resorting to extreme measures like cutting and feeding drought-tolerant cacti to the cows is practiced occasionally.

Herd management: destocking

Destocking or selling off is primarily motivated by resource constraints, namely feed and water. After feed and fodder practices destocking practices were reported as a way to avoid losses. Destocking rates were highest in Kajiado.

> 'Most cattle owners sell. Moving is hard because the family is left alone and the cost of the land for fodder is never cheap. The land is also getting smaller to move anyhow. To leave the family behind might mean more suffering.' (Men's group, Kajiado)

Men sell cows based on rainfall predictions because, "If the drought finds you with too many animals automatically some will die" (Men's group, Kajiado). Men also sell some cattle to then buy hay for remaining animals.

Women in Kajiado described practices to manage breeding, specifically preventing conception to avoid risks associated with livestock pregnancy and birth during drought, when milk supply may be low due to feed shortages. Managing reproduction is also a mechanism to support overall herd health.

> 'When dry season is about to come, you won't let the cows out to prevent mating with a bull. When it is dry, the cow won't get a lot of grass and it won't have a lot of energy to carry the calf so there is high chance of this cow and calf inside dying. So, it is better to prevent this bull from mingling with the cow so that the cow gets its own energy until when it rains.' (Women's group, Kajiado)

Different roles of relationships in mediating adaptation

Young people navigate multiple transitions and uncertainties through the age period of 18–35. For many in our sample, livestock production features as an important source of income during those times in which there may be increased uncertainty over income. Livestock production is practiced by youth who are living with their parents, those who are starting families in separate households and, in some cases, living alone or independently. Gendered practices in these life stages may differ for young women and men because household relationships mediate young women's and men's livestock production engagement and capacities to adapt. In the following sub-section we describe primary relationships in our dataset: parents and spouses. Intergenerational support from parents can provide youth with more opportunities to adapt, namely through resources such as land, capital, and knowledge. Livestock production in married households tends to reproduce gender-based norms and practices and has important implications upon women's labor and mobility.

Intergenerational transfers of resources

Parents provide multiple resources that enable youth to engage, or limit, their activities in livestock production while living at home. Parents provide resources, such as land, knowledge, and labor for instance. Youth often learn about livestock keeping in their parents' home or while they are growing up.

> 'Growing up seeing our parents doing those jobs as part time therefore, you develop passion and you start doing whatever they are doing maybe in another way. My mum is doing dairy farming and I do poultry because I love it.' (Women's group, Kiambu)

Land is frequently passed from parents to sons based on culture and customary practices and women may be urged to marry to gain access to land through their husbands. However, women in all locations reported that they can get land from parents. In Kiambu, women reported that they may ask for and receive land. 'Because we have resources such as enough land, parents give us land to do agriculture when we ask them' (Women's group, Kiambu). The possibility for women, does however, depend upon family dynamics and the presence of sons in the family.

> 'Most of them here have sold their land, the more you keep more cattle and while you don't have land enough for the cattle, you will have to reduce the amount of cattle. Many men have land while many women don't own land and this one really affects them in going to agriculture. Women are not given land; nowadays it depends with your parent. Let's say in your home there are 2 men and you are the only girl, your dad can decide to give you land but if there are 3 men and 3 women, women may not be given.' (Women's group, Kajiado)

Parents and children may also engage in livestock production as a joint and mutually supportive enterprise, in which case they may share space, labor and profits. Parents may also offer space in backyards, and in more intensive management, such as keeping dairy cows, not much space may be needed. Frequent reference to small space requirements for keeping chickens and pigs was mentioned in all locations. In Nakuru, one young woman explained how her cow is kept by her mother, where space is adequate.

> 'There are women keeping goats and even doing dairy farming. You go work, buy a cow and leave it to your mother to manage it for you. That is what I have done, I have a cow and I sell 7 litres every morning at 40 shillings. The cow is mine but I leave it to my mother to manage since I can go to Nairobi and other places and I won't move around with it and while I haven't constructed my own house. I have a group where I take the money to and I also give my mother something small.' (Women's group, Nakuru)

This arrangement frees up her time and enables her to search for work in urban locations and save up to build her own household. Livestock, specifically income from milk, functions as a regular source of income.

Young women and men in married households

Setting up one's own household and starting a new family is a new and often challenging transition. The provision of livestock as a gift in newly married households is a cultural tradition in all study locations. However, men are often given livestock, not women. Women, who may not own the livestock, may assume responsibility of caring for the livestock. This is in part, because labor in households and, by extension in some case livestock production, is gendered.

Furthermore, when starting a new home, women's new responsibilities of assuming more domestic roles and especially childcare responsibilities, often increase. Frequent references were made, by women and men across

the dataset, about women's roles in home-based livestock production activities. Specific characteristics of livestock, such as keeping chicken in backyards are 'convenient' for women because they are home. On one hand, production may be an opportunity, however, additional livestock and home-based responsibilities may also limit women's mobility and create additional labor.

Women's roles in households, that include carrying out household chores and caring for children, often are coupled with 'backyard businesses' that oftentimes include chicken production. Meanwhile, men are looking for source of income to support the household. Gender roles in marriage thus influence women's mobility, labor and potential to control income from livestock sales.

> 'Women are more fulltime farmers since they are left at home dealing with the domestic chores and cannot be expected to do these and go out and do jobs like construction work. So, if there are chickens in the homestead these become her fulltime work where she might get money from eggs while the husband is out working. Women have the time and patience to do agriculture unlike us men. Men are out doing fulltime jobs and providing another source of money that allows women to do their farming activities.' (Men's group, Kiambu)

While both women and men reported chicken production, data across locations frequently described why chicken production is especially important for young married women. Chicken, relative to other livestock species, require lower labor inputs, and are easy for women to maintain along with other activities, because women are at home.

> "Women do it mostly because it is easy to maintain, once you feed them in the morning, you can leave do other things and then feed them again in the evening." (Women's group, Kiambu)

> "Poultry farming is done by mostly women since they mostly stay at home and they like rearing them; they are more concerned about them." (Women's group, Nakuru)

Young women's time spent in supporting and maintaining mixed crop and livestock systems is substantial. As explained by a young woman in Kajiado:

> 'Full time since when you have chicken, they should be fed every day, check the water, when manure increases, you remove so that they don't feel cold and you pour saw dust, if there is any that wants to sit on the eggs, you have to make a place for them; you know when it is time for them to sit on the eggs, they do it at once and you find like 4 of them want to sit on the eggs so that they increase in number. So, let's say it is full time. I also have a farm and after visiting the chicken, instead of being idle, I go to the farm; I have vegetables there. The manure I collect from the chicken house I go pour in the farm and there are ducks which have a lot of work; you have to place a pool of water for them to swim, you have to trim their wings so that they don't fly and get lost. So you see there is no day you will lack work to do.' (Women's group, Kajiado)

Spouses also manage different species together. For instance, as reported by a focus group participant from Nakuru:

> 'As a youth from this area I focus on goat and chicken farming. These are the activities most youths are involved in because they say it brings in more income than crop farming. This is also because if you have a family, you can have your wife tend to the chicken while you tend to the goats and if an urgent need for cash arises you can take some eggs or one animal and sell to get cash.' (Men's group)

Diversification of livestock species can buffer from climate shocks. The prospect of additional and quick income can also foster cooperative relations within households. However, the question of *who* in the household decides *when* to sell *which* animal, while relevant, was not systematically explored in data collection.

Discussion

Empirical insights

In this paper we set out to understand how youth in Kenya engage in livestock production and how their adaptive practices and capacities differ by gender, location, and livestock species. Livestock production is attractive to youth as an alternative to crop production for multiple reasons, that include greater resilience to climate change, lower capital investments, and the potential for quick returns and flexibility. Clear and consistent gender trends are not evident when comparing mixed crop and livestock and pastoral systems.

Youth rear certain species more than others, such as chickens and dairy cows. Chicken production is the most common livestock activity in both mixed and agropastoral systems. Women and men often reported rearing similar types of livestock but at different rates. More men report livestock production activities than women except in Kiambu where women and men report similar levels of production in chicken, pigs, and rabbits.

Major climate events that affect livestock include drought and cold spells. Livestock adaptation is generally low, less than half of the focus groups reported livestock specific adaptation practices. Men reported more practices than women. Chicken was the highest reported set of practices, followed by cattle and dairy. Men utilize more diverse practices than women, however the reporting rates of women's and men's practices differ. Women reported treatment such as vaccines at higher rates than men in Nakuru and Kajiado. Women also reported using heating implements in Nakuru and Kiambu more than men. In Kajiado, men reported more practices than women and heat was the most common practice used. Men reported higher rates of destocking or selling than women. Feed and fodder practices were reported by all groups and the highest reporting was by women and men in Kajiado, followed by men in Nakuru. Specific practices such as purchasing feed and making silage were gender specific. Mobile husbandry was specific to Kajiado.

Gendered practices during transitions to adulthood also differ for young women and men and household relationships mediate young women's and men's livestock production engagement. Data suggest that intergenerational transfers are gendered, however, are changing in all locations. Women's opportunities to inherit or acquire land, for instance, have expanded. Transitions into new households, however, often reinforce gendered access to resources and women's labor. In summary gender differences in livestock production and adaptation practices exist. While young men often try more diverse practices and

at higher rates than young women, occasionally women report practices different and at higher rates than men, such as using vaccines.

Our empirical insights inform recommendations on how to better develop inclusive and sustainable policies that provide support to youth in livestock and strengthen their adaptation capacities.

Recommendations

Young people engage in livestock and are finding ways to adapt to climate change, often while navigating complex life transitions. Climate change undermines the ways that livestock support youth transitions, especially income generation from regular sales of livestock products. Halting production through destocking and selling off is not optimal. Efforts to sustain youth engagement in livestock production through policy support in adaptation could improve the sector's potential to ease uncertainty in young women's and men's transitions. Policy investments that enable young people to sustain their activities through climate events and shocks are recommended to maintain their participation in the sector and ensure equitable income and nutrition benefits.

The *Kenya Climate Smart Agriculture Strategy (KCSAS) 2017–2026* focus on the livestock sub-sector and emphasis upon equity and inclusion of women, youth, and vulnerable groups provides a valuable entry point youth inclusive and to generate tailored, practical, context-specific approaches that are youth inclusive and co-developed with local communities. Further efforts include:

1 Engage young women and men in policy creation through forums in which they share their experiences, constraints, and capacities by location, and specific to livestock systems.
2 Tailor interventions to mixed and pastoral systems and consider gendered differences and equitable approaches to support both women and men.
3 Develop socio technical bundling to offset potential social and economic tradeoffs associated with certain livestock and livestock practices.
4 Identify crop and livestock synergies in mixed and agropastoral contexts, e.g., crop residues as livestock feed.

Conclusion

Adaptive actions are shaped through the interaction of physical events with social, political, and cultural systems. Social differences shape livelihoods and climate adaptation (Djoudi et al., 2016; Carr, 2020). Our empirical study similarly confirms that age and gender interact and influence livestock engagement and adaptation in ways that vary across contexts and systems. Activities, technologies and practices are influenced by relationships, depending upon where young people are in transitions, e.g., living at home or starting their own independent households.

Evidence should inform new initiatives supporting climate change adaptation, e.g., National and County Climate Change Funds. That being said, more evidence about socially differentiated practices and capacities, many of which are species or livestock system specific, is needed. Putting evidence to work and finding out what works for whom will enable more targeted and relevant efforts to scale existing practices. Additional support in building skills and capacity is recommended to improve upon what people are doing and support more diverse opportunities. Tailored approaches that recognize the unique position of youth in transitions are recommended. Livestock function in important ways, namely by providing steady income or quick sales covering unplanned emergencies. Livestock support youth transitions, that are often dynamic, by generating income and potentially reducing uncertainty associated with income volatility to some extent, however climate change threatens and undermines this potential livestock.

Youth engagement in the livestock sector is diverse and often gendered. National policies and donor supported programs and interventions may inadvertently reinforce inequitable power relations that exacerbate climate related vulnerabilities of certain groups of livestock keepers. Awareness and sensitivity to the ways in which adaptive practices may influence gender relations, specifically young women's labor, mobility, and control over income and livestock products, will be critical to develop sustainable and socially inclusive pathways for livestock systems in the face of climatic change.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by ILRI Institutional Review Board (ILRI-IREC 2020-25). The studies were conducted in accordance with the local legislation and institutional requirements, e.g., NACOSTI. The participants provided their written informed consent to participate in this study.

Author contributions

RB developed the proposal, research design, and methodologies, supervised data collection activities and guided analysis, and led in the organization of the manuscript and final edits. PM and TD carried out analysis and supported write up of the manuscript including literature review. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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