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A gendered approach to the goat value chain analysis: A case study of Mbire District, Zimbabwe

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ABSTRACT
This study evaluated the functionality of the goat value chain from a gender perspective in a rural district of Zimbabwe prone to crop failure due to droughts and flooding in some parts. Using KII and a semi-structured questionnaire, data were collected from a random sample of 112 farmers in five wards of Mbire district and analyzed for three gender categories: males in male-headed households (MHH), females in male-headed households (Female - MHH) and females in female-headed households (Female - FHH). Results showed that women played a significant role in goat feeding, disease detection and treatment, and were the major owners of goats. However, they rarely had control over income from goat sales despite owning the majority of the goats. Goat production was profitable and economically viable, but gender dynamics influenced decision-making and income control. Therefore, development projects promoting gender transformative strategies should conduct an analysis of gender relations that impact control of income from goats by women within households and communities, to develop context-specific and relevant strategies for impactful transformative changes. The integration of gender-sensitive amenities at the institutional level is also recommended.

Keywords: Gender dynamics, goat production, smallholder farmers, value chain, Zimbabwe

RÉSUMÉ
Cette étude a évalué la fonctionnalité de la chaîne de valeur caprine du point de vue du genre dans un district rural du Zimbabwe exposé aux échecs des cultures dus à la sécheresse et aux inondations dans certaines parties. En utilisant des entretiens individuels approfondis (KII) et un questionnaire semi-structuré, des données ont été collectées auprès d'un échantillon aléatoire de 112 agriculteurs dans cinq secteurs du district de Mbire et analysées pour trois catégories de genre : les hommes dans les ménages dirigés par des hommes (MHH), les femmes dans les ménages dirigés par des hommes (Femme - MHH) et les femmes dans les ménages dirigés par des femmes (Femme - FHH). Les résultats ont montré que les femmes jouaient un rôle significatif dans l'alimentation des chèvres, la détection et le traitement des maladies, et étaient les principales propriétaires des chèvres. Cependant, elles avaient rarement le contrôle sur les revenus de la vente des chèvres malgré la propriété de la majorité des chèvres. La production caprine était rentable et économiquement viable, mais les dynamiques de genre influençaient la prise de décision et le contrôle des revenus. Par conséquent, les projets de développement promouvant des stratégies de transformation du genre devraient effectuer une analyse des relations de genre qui impactent le contrôle des revenus provenant des chèvres par les femmes au sein des ménages et des communautés, afin de développer des stratégies contextuelles spécifiques et pertinentes pour des changements transformateurs impactants. L'intégration d'équipements sensibles au genre au niveau institutionnel est également recommandée.

Mots-clés: Dynamiques de genre, production caprine, petits agriculteurs, chaîne de valeur, Zimbabwe

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INTRODUCTION

Goat meat consumption has seen an increase due to its high nutritional value (Malekian *et al*., 2014). This demand has led to efforts in the goat industry to meet the market's needs. However, the contribution of the goat sector to Zimbabwe's agricultural GDP is only 19%, whereas developed countries have seen it increase to as much as 45% (Matandare, 2017; Ministry of Lands, Agriculture, Water and Rural Resettlement, 2018).

Improving local genetic resources has become increasingly important for sustainable livestock production in Zimbabwe (Duguma, 2010; Haile *et al*., 2019; Abebe, 2020; Kaumbata *et al*., 2020). However, gender dynamics also need to be considered because they are strong determinants of pastoral livestock management practices and are rarely integrated into livestock improvement programs (Kariuki *et al*., 2022). Women are responsible for the care of small ruminants and poultry, while men take care of larger animals. But both genders have complex rights and responsibilities across livestock species, which affect supply of fodder and water, health inspection, mating arrangements, veterinary care, and marketing of animal products (Kristjanson *et al*., 2017).

Various organizations are empowering women in Zimbabwe to improve agricultural and development outcomes through targeted interventions (Kristjanson *et al*., 2017; Dugarova, 2018). However, initiatives that only empower individuals inside homes without addressing gender-power dynamics among household members are prone to failure. Gender relations are important determinants of economic growth, poverty reduction, and wellbeing (Njuki *et al*., 2013). Thus, gender-responsive monitoring and assessment along the goat value chain are necessary to identify unintended impacts and address gender roles, responsibilities, and rights.
Mbire district in Mashonaland Central, in Zimbabwe has the fourth-largest goat population but has not made a substantial contribution to the district's growth and development, with up to 57% of the population being vulnerable (ZAGP, 2019). Reports show that initiatives solely targeted towards women have led to unanticipated negative consequences, including gender-based violence and insecurity, which hinder development progress. Thus, the integration of gender relations as an essential variable in livestock systems, such as the goat value chain, is proposed to address the persisting issues of inequality and insecurity (Kristjanson *et al*., 2017).

MATERIALS AND METHODS

Study area. The study was conducted in Mbire district, which is situated in the Mashonaland Central Province of Zimbabwe (Figure 1). This area is located in the northern part of Zimbabwe, with coordinates between 30.60 and 31.2 East and 15.6 and 16.4 South. The district consists of 17 wards, covering a land area of 4,715 km^2, with a population of 83,724 people, living in 22,000 households scattered across 632 villages (Zimstats, 2022). Mbire district is in Zimbabwe's agro-ecological region IV, characterized by floodplains of the Zambezi River Basin. The district experiences hot temperatures, with maximum temperatures surpassing 40°C during October and November, while June and July – the coldest months - experience temperatures around 20°C (Mugambiwa and Makhubele, 2021). The region receives annual rainfall ranging from 450 to 650 mm, with the rainy season starting around December and ending in February. Mbire district has a variety of soils, including eutricleptosols, tropically leached iron-rich soils, sandy loamy soils, and calcic luvisoils, with sodic calcic solonetz soils covering a significant portion of the area (FAO, 1996; Nyamapfene, 1991). Flood inundations deposit nutrient-rich soil suitable for plant development in the floodplains. Soil moisture increases towards the Angwa and Manyame River tributaries, and approximately 22,800 ha of Mbire has appropriate to somewhat acceptable flood recessions farming area, which is used by communities to grow crops such as vegetables, tomatoes, and onions (Munodawafa *et al*., 2013).

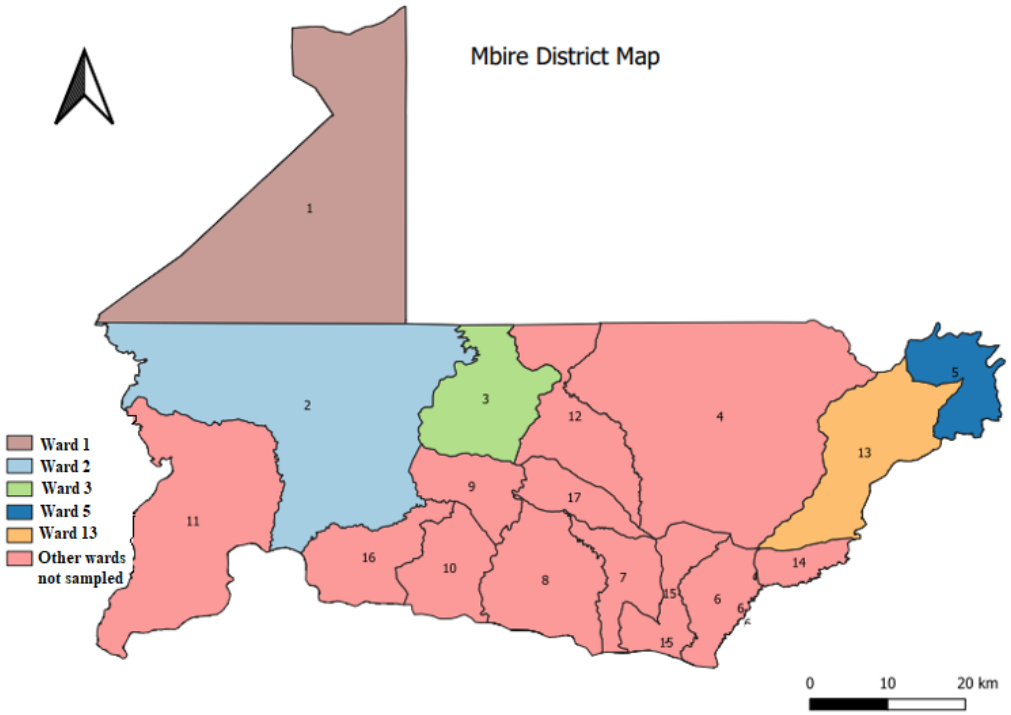

Figure 1. Map of Mbire district in Mashonaland Central Province Zimbabwe

Sampling procedure. The study was conducted under the ERRIC (Enhancing Recovery and Resilience in Communities) project, which is financed by United States Agency for International Development (USAID) through Adventist Development and Relief Agency International (ADRA I).The ERRIC project operates in selected wards of Mbire district, including wards 1, 2, 3, 5, and 13. A purposive sampling approach was used to select a sample of 112 farmers who met the inclusion criteria of keeping goats and being beneficiaries of the goat value chain development interven-tion, either presently or in the past. To ensure a comprehensive understanding of the value chain, key informants from various organizations such as Agricultural Technical and Extension Services (AGRITEX), the Veterinary Services Department, Rural District Council, and the Ministry of Women Affairs, Community, Small and Medium Enterprises Development (MWACSMED) were also purposively selected. In addition, other value chain actors, such as traders, processors, transport operators, suppliers, retailers, and credit providers were surveyed using an android-based semi-structured questionnaire. Market assessments and field observations were also conducted to supplement the survey data.

Data collection procedure. To collect data for this study, a mixed-method approach was used. The researchers administered a pre-tested semi-structured questionnaire to 112 goat farmers to capture socio-economic and demographic characteristics, gender-based constraints, and gender dynamics. The questionnaire was translated into Shona, the local language, to ensure accuracy of responses. Additionally, identification was conducted to understand the different actors in the Mbire goat value chain and a function matrix adapted from USAID (2009) was used to map their linkages. To gain in-sight into market dynamics, the researchers also conducted field

observations and interacted with buyers, sellers, and traders during goat sales. Finally, a review of academic, policy, and development literature was conducted to complement the primary data sources.

Statistical analyses. The data collected in this study were first organized and reviewed for accuracy in Microsoft Excel. Afterward, the data were analyzed using IBM SPSS Statistics version 25. Descriptive statistics and standard measures of dispersion were calculated to summarize the data. Additionally, binary logistic regression analysis was used to test for any possible associations between sales and geographic location of the farmer, gender, level of education, and experience in goat farming. We also conducted the Chi-Square test to identify any possible relationships between the sex of the participant and gender roles in the goat value chain, as well as other relevant parameters.

To determine the benefits of goat production, we employed enterprise budgeting and cost-return analysis. These methods allowed us to evaluate both tangible and intangible benefits of goat farming, such as monetary gains and social advantages.

RESULTS

Functionality of the Mbire goat value chain. The Mbire district goat population has grown exponentially over the past decade (Figure 2). Substantial growth was recorded between 2015 and 2016. The Mbire district goat value chain has a total of five key actors namely input suppliers, producers, traders, retailers and consumers. These are shown in a functions-mix matrix for Mbire district as presented in Table 1. Boxes are shaded to match function with actors. Figure 3 shows the value chain map.

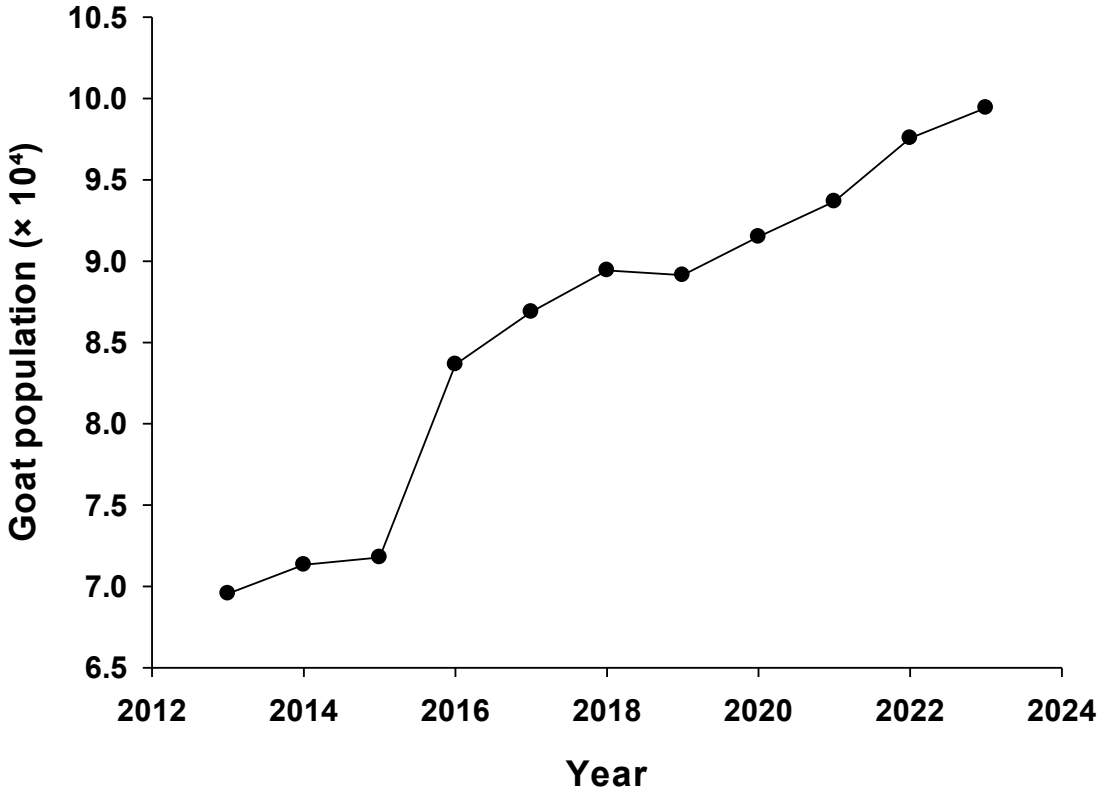

Figure 2. Goat population in Mbire district from 2013 to 2023

Table 1. Goat production - functions matrix (shaded area matches specific function to actor)

Functions	Support services					
	Input suppliers	Growers or producers	Traders	Retailers	Consumer	Village savings and loan associations (VSLA), Non-governmental organizations, Agricultural extension officers
Input supply	■					
Production		■		■	■	
Transporting		■	■	■		
Marketing		■	■	■		
Buying			■	■	■	

The Mbire district goat value chain involves five key actors, namely input suppliers, producers, traders, retailers, and consumers, with limited application of inputs in goat production. The NGOs support production by introducing bucks for breeding practices and feed formulation, while community animal health workers encourage farmers to use traditional remedies. Farmers obtain technical support from government livestock officers, with training done at feedlots or community centers, where farmers learn how to grow fodder crops for feed, as well as feed formulation techniques.

Goat herd sizes among communal farmers in Mbire district range from 0 – 30, with flock sizes ranging from 0 to 130, averaging 12 goats per household. Free-range grazing and crop residues are the primary sources of feed, with 41% of farmers trained in making hay bales and feed formulation using fodder crops such as velvet bean and lab lab. Male offspring are sold, while females are retained, with market choices limited for communal farmers. Live goat sales range from USD$9.00 to US$60.00, depending on the size of the goat, with an average of US$18.72 per goat. Income from sales is primarily used for food, school fees, medical expenses, clothes/uniforms, and kitchen utensils. Vaccination of goats in the district is not common, with 72.8% of farmers not vaccinating their goats.

The Mbire district goat value chain has only live animal transporters who double as traders, scouting with community-based agents to find goats to purchase and pay low prices for them. Specialist animal movers/traders usually transport large numbers of goats in medium or big trucks, On average, seven trucks per week, carrying either goats or cattle leave the district when there are no restrictions to animal movements, with the destination for these trucks being Harare abattoirs or individual farmers who need these goat.

Respondents indicated that they do not pay any taxes for keeping goats. Taxes are only required directly from farmers for cattle and payments are done during dipping sessions at ward-based dip tanks. The Mbire Rural District Council (RDC), however, reported that taxes for goats are only paid by traders and transporters when they ferry goats out of the district. A checkpoint was established along the highway in Mahuhwe and US$1 is required for each goat that passes through. According to the Department of Veterinary Services, 21000 goats pass through the boom gate/checkpoint per year. Provided there are no animal movement restrictions, this translates to US$21000.

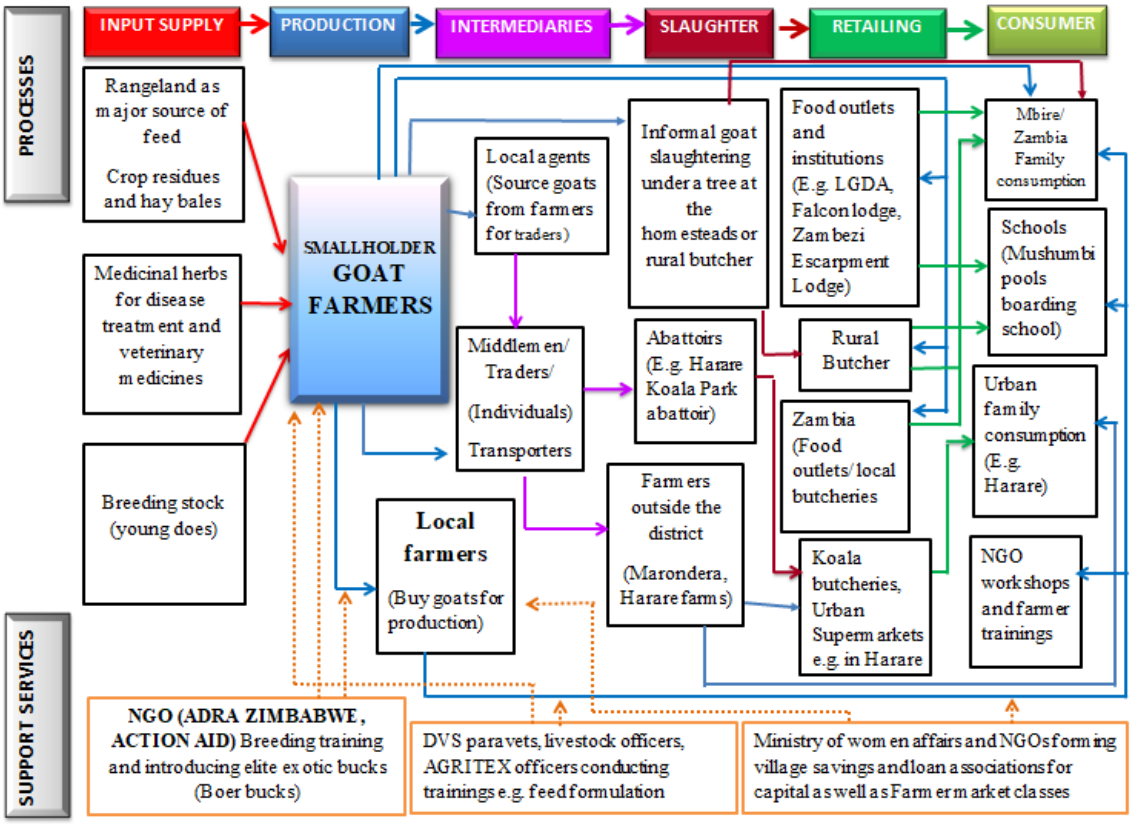

Figure 3. Mbire goat value chain map

Processing of goat meat takes place in two stages, the first of which involves slaughtering, inspection, and grading by meat inspectors, usually carried out at the abattoir. In Mbire district, there are no abattoirs for goats, and the carcasses are not graded for quality. The second stage involves converting chevon into high-value foods such as sausages, pies, and polony, but there are no private or governmental entities that perform this task in the district. Slaughter is, therefore, done under a tree by rural butchery owners and farmer/ producers who slaughter.

Main products and their status in the Mbire goat value chain. Tables 2 and 3 summarize the current status and main products of the Mbire goat value chain. Goat value chain, like any other livestock value chain, is complex because products are diverse at different stages of the value chain and numerous choices can be made. The results showed that there is no strictly commercial goat operation in the district.

The findings presented in Tables 1, 2 and 3 suggest that in some way, a dysfunctional goat value chain. The main technical and organizational challenges are related to slaughter and meat processing. Absence of grading means there is no benchmark for quality hence farmers continue to fail to enter mainstream markets where profits will likely increase. Another dysfunction is price. Pricing is also affected yet price transparency is an important element of a functional market. Farmers have limited choice of markets. There is high retention of goats as a means of secure savings and a hedge against future economic shocks in a hyperinflationary volatile economy of Zimbabwe. Disease management is also difficult and during the study, Mbire district was battling an FMD outbreak. Livestock graze and thus interface with wild animals. Lastly, gender incorporation in support services is limited. According to the

DVS, there are 11 Veterinary Extension Workers with 82% of these being male. This means limited or no resources will be dedicated to assessing and promoting gender-sensitive amenities.

SWOT analysis of the Mbire goat value chain

The SWOT analysis of the goat value chain (Table 4) highlights the strengths, weaknesses, opportunities and threats to the Mbire goat value chain.

Table 2. Current status of Mbire goat value chain and goat products

Item	Status	Product	Current status in Mbire district
Veterinary drugs	Informal/ Unregulated	Veterinary drugs and vaccines	No formal veterinary outlets. Farmers rely on traditional remedies. Those in need of professional assistance can get help at a fee (US$0.50 - US$2.00). Veterinary officers purchase their own set of veterinary medicines from outside the district e.g. Guruve, Mvurwi, Harare
Animal feed	Informal/ unregulated	No commercial feeds, only homemade	No commercial goat feeds in the district. All farmers rely on the rangeland and supplement with crop residues or formulate their own feed from fodder crops
Breeding stock	Formal	Bucks from breeds of superior genes	Organized breeding programs by non-Governmental organizations
	Informal/ unregulated	Local bucks	Goats randomly mate when they go for grazing. Farmers can also either sell bucks or gift one another
Meat and meat products	Formal/ regulated	Live goats	Passes through a range of actors (producer to trader/transporter) regulated by the police and veterinary department
	Informal/ unregulated	Live goats	Sales between farmers or to institutions such as schools for food or events. Sales to food outlets
		Meat cuts and offal	Sales to food outlets, to different households and own consumption.
		Blood/bone	Not used for human consumption. Dogs usually eat these
		Hides	Thrown out or used to make instruments such as drums or material to sit on.
Cooked foods	Informal/ unregulated	Sadza/rice and goat meat	Food outlets sell plates of food which is mostly goat meat cuts or offal.
Milk	Informal/ unregulated	Raw milk	No sales. Farmers believe that the milk is for the goat kids.
Manure	Informal/ unregulated	Organic fertilizer	Important for gardening

Table 3. Land owned, production system, goat breeds and constraints

Parameter	Fully/Partial Communal farmers	Percentage
% of households with land	92.9±0.259	
Mean land holdings (ha/ household)	3.00±3.400	
Mean goat keeping experience (years)	8.82±8.480	
Mean goat flock size/ household	12.14 ± 15.110	
Characteristic of production system	Mixed farming (livestock/small grains)	74.4%
	Mixed farming (livestock/ staple food)	19.2%
	Livestock production only	4.0%
	Crop production only	2.4%
Main functions of goats	Cash sale, manure, meat	
Goat breeds kept by farmers	Mashona	65.6%
	Mashona and Boer goats	9.6%
	Mashona and indescript	6.4%
	Other	18.4%
Feeding system	Free range grazing and crop residues	
Major constraints to production	Lack of water, predation, diseases, stock theft	
Main strengths	Easy to see in cases of emergency	

Table 4. SWOT analysis of the goat value chain in Mbire, Zimbabwe

Strengths	Weaknesses
- Farmers organized in farmer groups - Extension services (farmers work well with their extension officers from AGRITEX, Veterinary and Woman affairs - Village Savings and Loan associations (farmers well trained on savings groups therefore they have access to loans to start up or promote their businesses - Variety of plant species that can formulate bush meals - Availability of large goat numbers - Goats have twinning abilities (there is need to test if its related to genes or the environment in which the goats are reared)	- Unavailability of abattoirs as well as facilities to make processed meat products such as sausages - Limited market options - Mashona goat is the dominant breed in the district. It is genetically inferior. The carcass weight is usually very low compared to other local goat breeds eg Matebele - Network (both roads and communication) – some parts of the district have poor network making it difficult for farmers to coordinate sales. The roads are also very inaccessible such that even traders are not willing to travel that distance to source for goats for abattoirs outside the district
Opportunities - Increase in demand for goat meat - Increase in knowledge on fodder crop production for feed	Threats - Constant outbreaks of FMD which stops all livestock movements, farmers cannot make any

- The district has enough access to light for solar power which can make it possible for construction and running of solar powered abattoirs and butcheries.
- There is a chance for meat processing with availability of solar power; households that cannot afford to slaughter goat for consumption can have a variety of products from goat processing.
- Livestock improvement through breeding programs

sales within that period as their major market source is traders
- Predation from wildlife (Ward 1 has the least number of farmers engaging in goat rearing as they lose many to lions and other predators
- Stock theft
- Floods usually at the beginning of the year
- Crop pests and diseases affecting crops including fodder crops, reducing availability of even crop residues as feed.
- Unavailability of water due to excessive heat (April – November)
- Gid and Orf diseases
- Gender based violence
- Veld fires which destroy the rangeland therefore reducing feed resource base for livestock

Suggestions for improving goat productivity in Mbire. A few options could be explored in order to increase goat productivity in the Mbire district. For instance, to prevent the loss of herds to diseases and predators, grazing ground for livestock should be maintained separate from locations where wildlife graze. Prevalent veld fires and deforestation not only cause climate change but also cause animals to graze farther into wildlife habitat, which results in predation. Further training sessions on the development of fodder crops and feed formulation will be very helpful for farmers to rely less on the rangeland, as would installation of water troughs near boreholes so that animals drink water from there instead of naturally occurring water bodies where they can encounter crocodiles. In order to prevent disease outbreaks disease surveillance for early identification of disease should also be strengthened. Major roads should be constructed to make remote places accessible to potential buyers, and the establishment of abattoirs will help the region establish standards for the quality of the meat and provide farmers leverage in pricing negotiations.

Social analysis of the Mbire goat value chain. A total of 87% of the households were headed by males. However, sex disaggregated data are often only disaggregated by gender of the household head, leaving women in male-headed households invisible. Cognizant of that, this paper considers three gender categories namely Male-MHH, Female-MHH and Female-FHH. Table 5 shows ages of household heads among the respondents disaggregated by gender. Majority fell in the Female-MHH (43.75%) Male-MHH (42.86%), and Female-FHH (13.39%) categories.

The mean household size was 5.57±2.15 persons composed of 2.69 males and 2.74 females. About 5% of the households had at least one disabled family member between 11 to 63 years of age. Eighty-seven percent of the respondents had formal education where 43.8% had primary school education, 42% high school and 0.9% with diplomas. There was no association ($p>0.05$) between highest level of education and gender category. The majority (90.2%) of the respondents were unemployed. The employed, who constituted the minority worked as school teachers, security guards, or at local clinics and retail shops. Crop and livestock production were cited as the major sources of income by 55.4% and 23% of the respondents, respectively (Figure 4). Other sources of income were buying and selling (6.3%), piece jobs (3.6), brick making (1.8%), building (1.8%), gardening (1.8%) and formal employment (12.4%). Average annual household income varied widely but averaging $222.

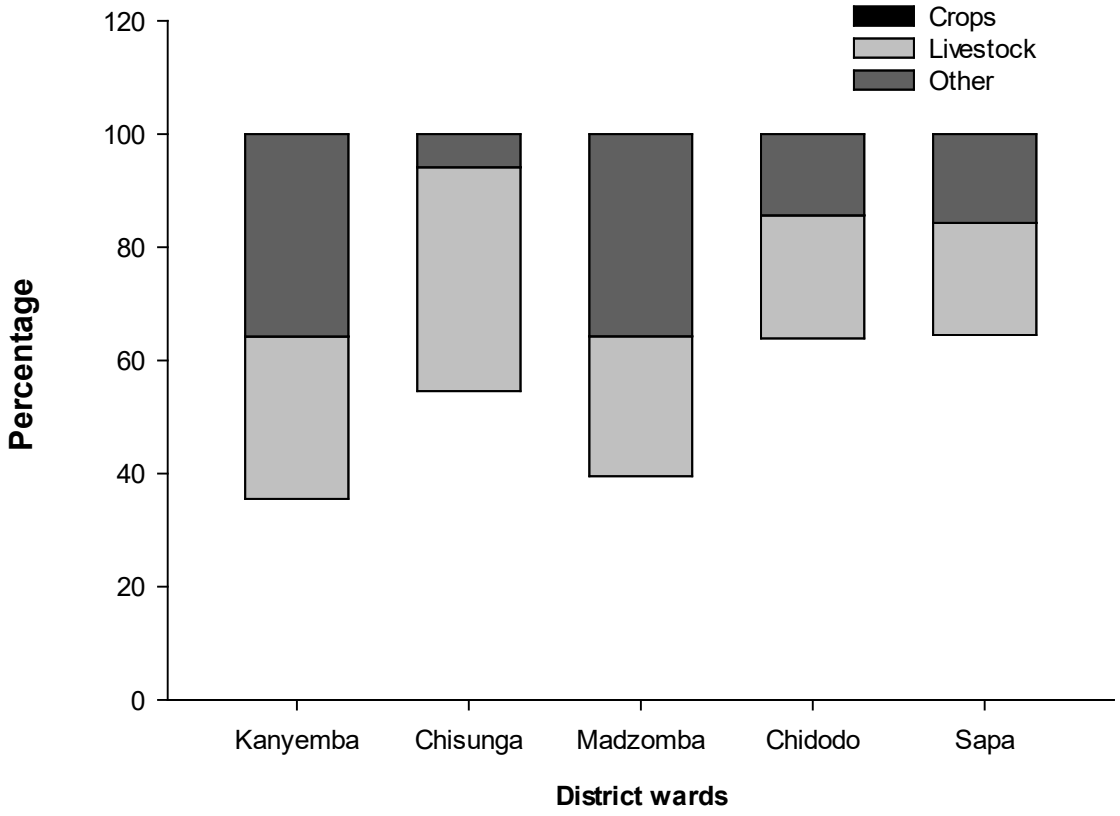

Figure 4. Contribution of agricultural and non-agricultural enterprises to annual household income

Table 5. Ownership of livestock species by women

Animal species	Households with species		Animals owned by females (%)	Total holdings	Number		
					Owned by women	Mean	Std dev
	n	%					
Cattle	74	66.1	25.7	610	192	5.45	10.76
Goats	112	100	66.6	1 360	959	12.1	15.1
Sheep	17	15.2	52.9	154	81	1.4	4.5
Indigenous birds	99	88.4	62.6	1 660	1058	14.8	13.7
Ginea fowl	34	30.4	61.8	329	161	2.9	6.3
Pigs	12	10.7	25.0	88	27	0.8	3.2
Ducks	3	2.7	66.7	79	11	0.7	2.6
Fish	1	0.9	100	150	150	1.3	14.2

Livestock ownership. Common livestock species in the district included cattle, goats, sheep, indigenous birds (road runner), pigs, ducks, fish and guinea fowl with ownership varying across species. The proportion of households where women owned livestock were as follows 25.7% cattle, 66.1% goats, 52.9% sheep, 62.6% indigenous birds, 61.8% guinea fowl, 25% pigs, ducks 66.7% and fish 100% (Table 5).

Table 6 shows, among other details, the different classes and ownership patterns for livestock present in the district. Gender category did not significantly influence goat ownership. Qualitative results show that it was not very clear what joint ownership represented. The term translated to either of the two: 1) women being the owner of some goats and the men the other half; 2) goats were entirely owned by the household head, mainly the male (husband).On average, respondents had kept goats for about 9 years. There was a significant association between years of goat rearing and gender categories ($p = 0.041$). Male-MHH had the highest mean number of years in goat rearing activities (10.01±8.124) followed by Female-MHH (7.96±9.146 years). Female-FHH had kept goats for a shorter duration (7.8±7.331 years). Females who headed households were either divorced women or the older siblings in a family where parents were deceased.

On average, a household kept 12.14 goats. There was a significant association between herd size and different variables such as land size ($p = 0.003$), feeding system ($p = 0.015$), cattle herd size ($p = 0.000$). This means that the bigger the cattle herd size, the smaller the goat flock size. In terms of goat feeding system and hectares of land the household owns, feed was the limiting factor to goat herd size.

Women's access to agricultural extension services and resources. Female-MHH (34.7%) indicated that they had missed out on various agricultural training courses. Women's lack of confidence in leading farmer groups and their perception that males should hold leadership positions were some of the reasons why they choose not to participate. This explains why the husband's name was written down during registration for development projects. The fact that women are in charge of managing the homestead and are expected to be at home when the kids get home from school so they can prepare food for them is another factor in the lack of engagement. Some of the community development initiatives needed lead farmers to travel distances organize their groups. Women cannot go further from the homestead since doing so would expose them to rape in the evening and danger from wildlife. Because their spouses did not relay information that they should be passing on to their wives, women were unable to participate in training courses because information was never conveyed to them. Lastly, it was deemed inappropriate for women to assume positions in society that require them to travel to various homesteads.

Production costs and average prices. The average price for a live goat in Mbire was US$18.72 at the time of the study and it was fairly consistent throughout the year. Goat prices did not vary much between the dry season (March – October) and the rainy season (November – February). Variable costs per goat are presented in Table 8. Animals purchased for stock replacement accounted for the highest proportion of total variable costs.

Tangible and intangible benefits. The traditional evaluation of the advantages that goat development initiatives bring to farmers in smallholder production systems where milk, meat, and money are the only products is quite inadequate. Advantages should be divided into two categories, tangible and intangible, taking production costs into account. The tangible benefits that farmers obtained from the Mbire goat value chain were income, manure, meat and milk in decreasing order of importance. Farmers kept goats mainly as a source of income for emergencies. Income obtained was used to pay school fees and medical fees, purchase clothing, and food items. Farmers rarely slaughtered goats for their home consumption. At most, one goat was

slaughtered annually. Goat milk consumption was uncommon and only 6.08% of the respondents reported drinking goat milk. The reasons for not drinking milk included low yields reserved for the newborn kids (17.4%); not knowing that goat milk could be consumed (45.6%) and that it was against their tradition, and it would be taboo (37%).

For the intangible benefits, goat rearing acted as a low cost and inflation proof alternative source (credit buffer) and as insurance. Goat sales, though random, were mostly done during the dry season (March to November). Fewer sales were done during the rainy season due to flooding that occurs in the district around December to February making the area inaccessible because of bad roads. On average, a household sold 6.40±0.287 goats in the dry season and 1.93±0.920 in the rainy season. Goats were sold to traders, food outlets, local farmers and rural butcheries. About 90% of the total revenue from goat sales was generated from the live goat sales. Manure and milk had no market value. The remainder (10%) accrued to the value of goats either slaughtered for household consumption by the household or given out as gifts. Table 6 also shows the average annual net profit, gross margin per flock and per goat. Incorporating the intangible benefits increased the net profit obtained from goats. Mean flock size and number of animals sold are the main factors influencing the size of the benefit of insurance and financing, respectively.

Table 6. Goat revenue, gross margins, net profit and return on capital per flock per year

Parameter	Cost (US$)	Total
Average capital	50.00	
Tangible benefits		
Live sales (Cost per goat 18.72 and mean sales per year is 5)	93.60	
Slaughters (own consumption/gifting) (Once a year)	18.72	
Subtotal		112.32
Intangible benefits		
Benefit of financing (*BF*= $b_f Y$; BF = (0.1x18.72)	9.36	
Benefit of insurance (*BI*= $b_i X$; BI = 0.1 x (12 goats x 18.72)	22.46	
Subtotal		31.82
Production costs		
Total variable costs (e.g. veterinary medicine/vaccine at $0.50/$1, replacement)	30.60	
Annual housing cost	15.00	
Interest on capital (8%)	1.20	
Gross Margin = GR –VC		
Per flock		81.72
Gross Margin with intangible benefits (GMI = GRI –VC)		
Per flock		113.54
Net profit (NP = GR – (VC + AHC + OCC)		
Per flock	44.26	
Return on capital (%)	88.52	
Net profit with intangible benefits (NPI = GRI - (VC +HC + OCC)		
Per flock		84.52

GR- gross revenue, VC- variable costs, GMI - gross margins with intangible benefits, GRI – gross revenue with intangible benefits, BF – Benefit of Financing, BI – Benefit of Financing, HC – housing costs, AHC – annual housing costs, NPI – net profit with intangible benefits, OCC -opportunity cost of capital

Roles and responsibilities for men and women. Women and men have different roles and responsibilities in goat production. Table 7 shows the different family members in charge of goat rearing activities.

Goat breeding in Mbire smallholder goat production is not controlled. The majority (87%) of the households did not put in place any measures to control breeding unless the households were part of NGO driven breeding programs. Castration and removal of bucks from the herd through slaughter or sales were the only activities that inadvertently constituted control of breeding. Even then, a very small proportion practiced castration. Out of the 1 384 goats assessed, only 1.4% were castrates. This, coupled with the removal of five goats through slaughter and sales per year was not enough to control breeding. Breeding practices were done mostly by men as shown in Table 7.

The goat flocks in the district relied on the natural rangelands for feed. Goat herding was not a very common practice. Goats were released to graze in the morning and they would make their way back to the homestead at dawn.

Though both sexes participated in goat flock health assessments, they played different roles in several disease management activities. Some of the signs of disease described were, loss of appetite, goats going round in circles or presence of wounds on the mouth. Men, however, made little contact with the animals making women more important at detecting flock health issues. Disease problems were reported to the males who then purchased the veterinary drugs and conducted treatment. Parasite infestations were mostly handled by males.

Though all respondents ate goat meat, this practice was infrequent, with goat meat being eaten at most twice a year. Chevon and milk were ranked as the least important benefits for rearing goats. The respondents could not afford to slaughter goats for household consumption. They preferred selling goats for money to offset costs of basic necessities.

Goat sales were random and, on average, 5.37 goats were sold per year. In female headed households, the females (86.7%) or their male children (13.3%) made the sales. There was a significant association between ward and frequency of goat sales ($p = 0.024$). Ward 1, which is the furthest from Harare, did not trade with middlemen from that city. This is because ward 1 is the furthest and the roads are inaccessible. Ward 3 on the other hand got to interact with more traders as it is easily accessible. Education status ($p = 0.030$), years of goat keeping ($p = 0.004$), herd size, main functions of keeping goats (0.000), women's leadership position in society ($p = 0.041$) and power to influence local government and policy ($p = 0.021$) also showed significant associations with frequency of goat sales. Sex and age, however, did not influence decisions to sell goat.

Market participation was greatly influenced by marital status ($p = 0.002$). There was shortage of labour in female headed households which made it difficult for them to actively participate in goat marketing. The sales made by farmers were a result of traders moving from one homestead to the next in search of goats. Female-MHH had their husbands actively participating in goat sales while they handled the household chores.

Gender-related determinants of gains from goat production

Income control. Goat ownership had no significant association with income control. However, marital status showed a significant association with income control ($p=0.045$), where Females-FHH had 67% control of income.

Table 7. Family members in charge of goat rearing activities

Practices	Gender category											
	Male-MHH (%)				Female-MHH (%)				Female-FHH (%)			
	♂	♀	Joint	CHN	♂	♀	Joint	CHN	♂	♀	Joint	CHN
Breeding	58.3	14.6	20.8	6.3	57.1	24.5	18.3	0	0	66.7	0	33.3
Feeding	35.4	12.5	31.3	20.9	32.8	30.6	22.4	14.2	0	40.0	0	59.9
Disease con-trol	60.4	8.3	29.2	2.1	59.2	22.4	18.4	0	20.0	66.7	0	13.3
Sales	41.7	12.5	43.8	2.1	40.8	24.5	34.7	0	0	86.7	0	13.3
Slaughter	31.3	27.1	35.4	6.3	30.6	36.7	26.5	6.2	0	86.7	0	13.3

CHN- children

Table 8. Income control by different gender at household level

Gender Category	♂only		♀only		Jointly		*N*	Std. Dev.
	n	%	*n*	%	*n*	%		
Male-MHH	20	41.7	6	12.5	21	43.8	48	0.976
Female-MHH	20	40.8	12	24.5	17	34.6	49	0.876
Female-FHH	2	13.3	10	66.7	3	20	15	0.884
Total	41	36.6	28	25.0	41	36.6	112	0.915

DISCUSSION

The finding that most homes are headed by men is comparable to that made by Chinogaramombe *et al*. (2008), who found that 80% of communal households were headed by men. In this study, the average age of the household head and size of family was likewise comparable to Kaumbata *et al*. (2020) which was 46.5 years and 5.6 persons respectively. Literature shows that 77% of household heads in communal areas have formal education obtained up to primary level. The findings from this study deviates from this observation where that 87% had access to primary and secondary education. While some studies indicate that people in community areas lack official employment and completely rely on agricultural and livestock production for their livelihoods (Boogard *et al*., 2015), a portion of the communal farmers in Mbire are formally employed by schools, clinics, or retail establishments.

Goats and indigenous birds were the most common livestock species kept; other species of livestock farmers kept included cattle, sheep, pigs, guinea fowl, ducks and fish. This observation differs from those of some other studies. The most common species reared by communal farmers are goats and cattle in some regions of Malawi (Kaumbata *et al*., 2020). However, in both cases, goats still remain the most reared livestock species. Goats constitute an important livestock resource, as seen by the district's huge and still growing goat population in the area studied (Fig 2). While the number of larger livestock, notably cattle, in the Southern African Development Community

(SADC) has not changed much over the past two decades (Miller *et al*., 2012), goat populations have steadily increased during the same period. This is partly because goats are easier and cheaper to feed and do not require large tracts of land (Kosgey and Okeyo, 2007). They are also adapted to extreme weather conditions and possess low value feed acceptance and have high production (Monteiro *et al*., 2018).

Ownership of the livestock species varied across the households. Men usually own cattle and other larger animals, while women own smaller animals, such as goats and poultry (Deere *et al*., 2012; Yisehak, 2008). In accordance with ownership trends documented for women in Kenya and the Inhassoro district of Mozambique, women owned 38.7% of the goats (Boogaard *et al*., 2015; Njuki and Sanginga, 2013). Joint ownership was an exception in Tanzania, where males typically owned goats (Saghir *et al*., 2012). When joint ownership is taken into account, the proportion of women who owned goats rose to 66.6%. It should be noted, however, that goat ownership did not imply ownership rights, or control of income obtained from the goat enterprise. Despite being the primary owners of the livestock species, female-MHH had very little influence over the resource, and its outputs, prompting the view that perhaps the ownership is rather ceremonial. The limited influence over which roles and responsibilities to play appears to disagree with the current epistemological claim which states that in most cases, women mainly have decision-making power over livestock management alone (Njuki *et al*., 2013; Waithanji *et al*., 2015).

Literature shows that all members of the household play a role in the goat rearing activities (Machina and Lubungu, 2019), however, men are particularly in charge of roles that are considered risky and take them far away from home while females carry out milking and looking after sick animals. This has also been observed in Ethiopia and Uganda (Rota *et al*., 2010). However, this study deviates from these findings as women did not milk goats and their role in disease management was merely identification of sick animals. It concurs with the findings in Zambia where diseases treatment is mainly a responsibility of men.

This study shows that women also have little or no control over household income which concurs with literature reports on unequal livestock rights between men and women in developing countries (Kristjanson *et al*., 2010; Walugembe *et al*., 2016; Dumas *et al*., 2018; Yurco, 2018). The findings of this study contrast with the statement that women manage most of the income from live goat sales (Njuki *et al*., 2013) and milk (Waithunji *et al*., 2015).

According to a study in Ethiopia, goat farmers benefit most from income from goat sales (Woldu *et al*., 2016). In a separate study, the sale of goat kids, highly valued in the southern Mediterranean region, was the main reason for goat rearing (Monteiro *et al*., 2018). The finding that revenue was the primary advantage of raising goats in this study is consistent with these and other studies. The benefits of rearing goats as stated in literature are tangible and intangible benefits (Kaumbata *et al*., 2020). From a wide range of tangible benefits, money, meat milk and manure, communal farmers in Mbire have not placed any kind of value on goat milk. Yet it is reported in literature that Female-headed households derive more income from milk sales than goat sales (Waithanji *et al*., 2015). Other studies also show that manure has value in Malawi (Kaumbata *et al*., 2020) which costs 15,588 Kwacha (US$ 19.4169). The study's average price of live goats fell within the range reported for Beitbridge in Zimbabwe (Dube *et al*., 2017). Sales of goats were made in response to the urgent need for money to deal with emergencies.

The average cost of live goats in the study area was within the range reported in Beitbridge, Zimbabwe (Dube *et al*., 2017). In order to raise the money necessary to handle emergencies, goats were sold. Often, goats are sold at a young age (Woldu *et al*., 2016; Monteiro *et al*., 2018). In their

study, Woldu *et al*. (2016) found that 54% of goats sold were under one year old. Overall, the benefit of financing and insurance (intangible benefits) increased the overall net profit which is what was also observed by Kaumbata *et al*. (2020). Overall, the study findings indicate that raising goats is a rewarding and profitable agricultural activity. This is consistent with earlier research conducted in other underdeveloped countries (Miller *et al*., 2012; Woldu *et al*., 2016).

This study findings show that women were unable to participate in agricultural training courses due to lack of confidence, perception of male leadership, inability to travel and failure to obtain information. This contradicts the findings by Waithanji *et al*. (2015) who stated that women had access to information through informal exchanges with other farmers and formal training activities. The present study findings indicated that men had access to more information sources than women. A widely held view was observed that married women should limit their interaction with men and this limited their engagement in ward-based activities that would keep them on the road, e.g., joining farmer groupings. This view introduces bias on the provision of agricultural service provision towards women. Additionally, the observation that the Mbire veterinary and AGRITEX departments had only two females out of 11 Veterinary Officers reinforces the gender disparity in representation. This results in the failure of any attempts to transform service provision by mainstreaming gender into programming due to limited representation of women (Tsige *et al*., 2020).

Consitent with the literature (Adeyemi, 2010; O'Brien *et al*., 2016), household income in the Mbire goat value chain was primarily used to buy food items. Women who are the primary caretakers are said to have a propensity to spend money on foodstuff (O'Brien *et al*., 2016). It would seem that excluding women from developmental interventions involving livestock would worsen the gender gap and make it more difficult to improve household food security.

CONCLUSION

In the study area, goats were raised to generate cash needed to sustain the household. Goat production was economically viable to the farmers but ownership and the right to goats differed among the different gender categories. Women owned most goats but that did not translate to control over responsibilities and income obtained from sales. It is not just the asset base that is gendered, the decisions taken within households on livelihoods strategies and the impact pathways towards livelihoods outcomes were also gendered. Development projects wanting to introduce goat production as a gender transformative strategy to women empowerment should also conduct an analysis of the gender relations that impact on decision making processes over control of income from goats by women within households and communities. This better understanding could lead to the development of context-specific and relevant strategies for impactful transformative changes in these processes.

STATEMENT OF NO-CONFLICT OF INTEREST

The authors declare that there is no cobflict of interest in this paper.

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