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Backyard Sheep Fattening: Constraints, and Economic Implications in Bule District, Gedeo Zone, Ethiopia

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Abstract

The study was conducted in the Bule district of the Gedeo Zone to assess backyard sheep fattening practices, limitations, opportunities, and economic viability. Six out of 18 Kebeles were purposively selected based on sheep resources, farmer experience, and accessibility. A total of 126 households were randomly chosen for the survey. Sheep fattening was prevalent in the area, with 94.4% of households utilizing tethering and free-grazing systems. Traditional fattening methods were dominant, with an average of 1.97 ± 0.08 sheep fattened over periods of 2 to 6 months, and 1.59 ± 0.059 rounds per year. Rams were the preferred type for fattening (72.2%), followed by both rams and ewes (17.5%), and ewes alone (10.3%). The Easter season (27.78%) was the most common time for fattening, and 40.48% of fatteners engaged in this practice primarily for income generation. Separate housing for sheep was common, although often poorly managed; 35.7% of households housed sheep separately within other livestock shelters. Key challenges included feed shortages, diseases, rising veterinary drug prices, decreasing grazing land, low sheep productivity, and issues with predators and theft. Conversely, opportunities included favorable agro-ecological conditions, abundant fresh grass, experienced farmers, a large sheep population, increasing market demand, rising sheep prices, higher literacy rates, and larger household sizes, all of which could enhance fattening practices. Despite these opportunities, sheep fattening remained unprofitable under current management systems. To improve profitability, the study recommends targeted training, ongoing support, collaboration among stakeholders, improved forage development, and consistent monitoring and evaluation.

Keywords/Phrases: Backyard, Bule, Easter, Fattening, Profitability, Ram

1 Introduction

Ethiopia has one of the largest livestock populations in Africa, with approximately 70.3 million cattle, 42.9 million sheep, 52.5 million goats, 8.2 million camels, 2 million horses, 9 million donkeys, 0.38 million mules, and 49 million chickens (CSA, 2021). For many rural communities, livelihoods are deeply intertwined with livestock production, complementing traditional agricultural practices (Estefanos *et al*., 2014). Sheep, in particular, play a vital role in Ethiopian livestock, being extensively reared across the country (Tadesse *et al*., 2015; Abera and Elias, 2019). As a result, sheep fattening has emerged as a crucial economic activity that enhances food security and supports vulnerable groups, including women and disadvantaged members of society (Teketel *et al*., 2021).

Despite the significance of sheep in the local economy, productivity faces numerous challenges (Tariku & Etefa, 2022). While previous studies have attempted to address these issues, most have focused on specific feeding systems within controlled environments (Skunmun *et al*., 2012; Wude, 2017; Gebrekidan, 2018; Sime, 2019; Kokeb *et al*., 2021;

Alemu, 2023). This focus highlights a critical gap in research regarding farmers using diverse feeding systems that utilize local feed resources.

Bule District in the Gedeo Zone is recognized as a potential hub for sheep production, benefiting from a favorable climate and a rich tradition of backyard sheep fattening. The district features a robust livestock market and hosts a diverse sheep population, including various breeds from the Oromia and Sidama regions. However, modern sheep fattening practices remain largely absent, and economic growth among sheep fatteners has been sluggish. There is a notable lack of cooperative associations, investors, or initiatives aimed at developing sheep fattening into a viable business. Many farmers treat sheep fattening as a traditional activity rather than a reliable income source, leading to inconsistent practices and a reliance on basic grazing without additional management strategies.

Furthermore, a comprehensive investigation of backyard sheep fattening, including constraints, opportunities, and profitability in this area, has not yet been conducted. Current evidence suggests that inadequate research and limited technological skills in fattening practices prevent households from capitalizing on potential economic benefits throughout the sheep value chain (Wamatu *et al*., 2022). Therefore, this study aims to assess backyard sheep fattening practices, identify existing limitations, explore potential opportunities, and evaluate the economic profitability of sheep fattening in Bule District.

2 Materials and methods

2.1 Description of the study area

The study area is situated in the Gedeo Zone of the South Ethiopia Regional State, approximately 386 km from Addis Ababa. It spans 27,300 hectares and has an altitude range of 2,001 to 3,000 meters above sea level. The average annual rainfall in the region is estimated at 1,600 mm, with temperatures ranging from 12.6^{o}C to 20^{o}C. The predominant farming system is a mixed crop-livestock production system. Major crops include barley, beans, peas, maize, and wheat, along with perennial plants such as enset and coffee. The area borders the Oromiya region to the south, east, and west, and the Sidama Zone to the north (Bule Woreda BOPE, 2022, unpublished).

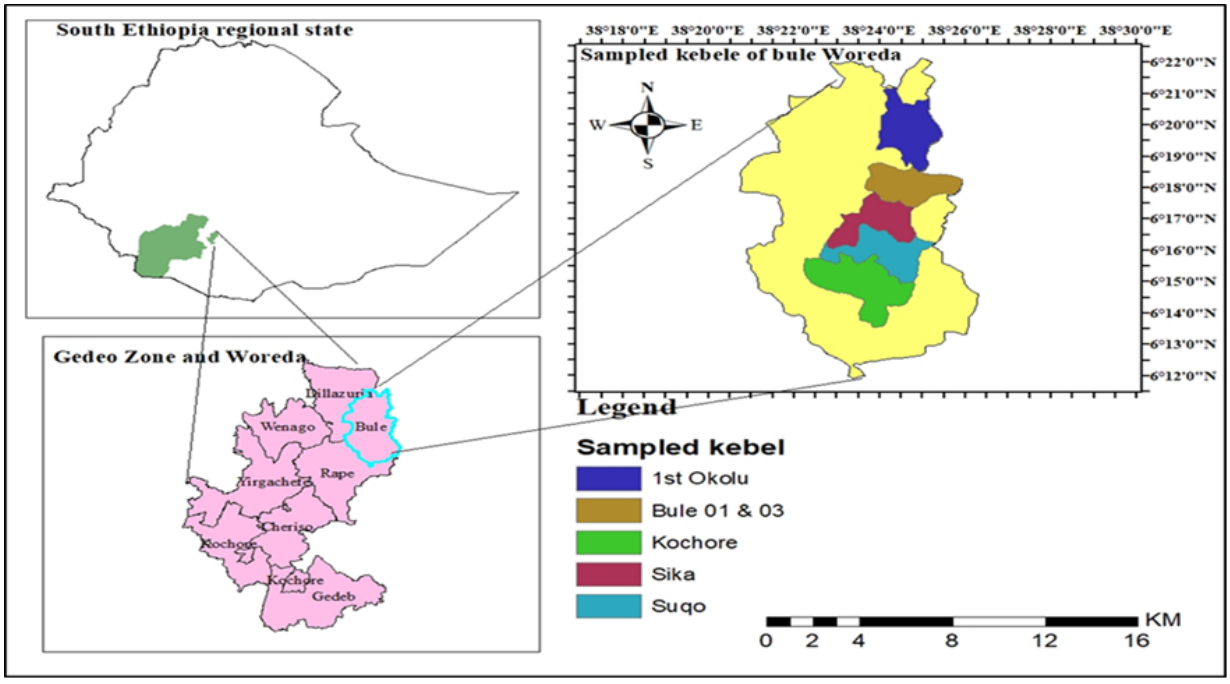

Figure 1. Study area map

2.2 Sampling method and sample size determination

The study employed a multistage sampling method. Initially, six out of 18 kebeles (Bule 01, Bule 03, Sika, Kochor, Suqo, and Igna Okolu) were purposively selected based on sheep resources, farmer experience in sheep production, and accessibility. These selected kebeles represent 33.3% of the district's total kebeles.

To begin the selection process, all household heads involved in sheep production were listed to create the sampling frame. Representative households were then randomly selected using simple or systematic random sampling methods, ensuring representation of key criteria relevant to sheep fattening practices.

The study targeted sheep-fattening farmers in the selected kebeles, identified from a population of 328 households according to district livestock data. A sample size of 126 households was determined using Yamane's formula (1973) with a standard error of 0.07 and a 95% confidence level. This resulted in the allocation of 21 households from each of the six kebeles, which were randomly selected for interviews and data collection.

2.3 Method of data collection

Data were collected by using semi-structured questionnaire, field observation, key informant interview and focus group discussions.

2.3.1. Questionnaire survey

Data was collected using pre-tested, semi-structured questionnaires administered by trained enumerators to 126 randomly selected households. The survey gathered information on fattening practices (cycle, season, sources, and feed conservation) as well as household demographics (age, sex, family size, education, marital status, landholding, and income sources), fattening constraints, and economic profitability.

2.3.2. Field observation

During the administration of the questionnaire, the husbandry methods for fattened sheep—including management, feeding, and housing conditions—were observed. Additionally, preferred morphological characteristics of the fattening sheep, such as coat color, body length and height, horn shape, tail type, health status, and age determined by dentition, were important components considered during field observations (Kostera, 2007; Ciesielska & Jemielniak, 2018).

2.3.3. Key informant interview

Key informant interviews will be conducted with individuals who possess in-depth knowledge and experience related to backyard sheep fattening. This may include agricultural extension workers, livestock experts, community leaders, cooperative heads, and experienced sheep farmers. The aim is to gather qualitative insights on local practices, challenges, and support systems associated with sheep fattening.

2.3.4. Focus group discussions

Six focus groups were conducted across the selected kebeles, comprising diverse participants, including women and elders. Discussions explored feeding systems, fattening challenges, animal husbandry practices, and potential opportunities for sheep fattening in the region. The insights gathered provided valuable qualitative data to complement the quantitative findings of the study.

2.4 Partial budget analysis

Sheep fattening costs and returns have been estimated using budgeting procedures. Specifically, the budgeting method will make use of gross margin analysis, which is exactly how model's net income was calculated (Rahman & Lawal, 2003).

$$Gross\ margin = Gross\ income - Total\ variable\ cost \quad (1)$$

$$Net\ farm\ income = Gross\ margin - Total\ fixed\ cost \quad (2)$$

2.5 Statistical data analysis

Survey data were analyzed using SPSS version 20. Descriptive statistics (mean, percentage, standard deviation) were used to summarize the findings. According to a formula of index employed by Musa

et al., 2006), indexes were obtained to provide a ranking of the specifically favorable fattening season, mostly preferred type of ram and ewe, fattening sheep selection criteria. Therefore, the index was calculated as,

Index = Sum of [(r_n*C_1+r_{n-1}*C_2.... r_1*C_n)] raised for an individual season, preference, and criteria divided by the sum of [(r_n*C_1+ r_{n-1}*C_2....r_1)]) for the overall season, preference and criteria.

Where,
r_n = Value for the least ranked level (for example if the least rank is 5^{th} rank, then r_{n-5}, r_{n-1} = 4, and... r_1 = 1); C_n = Counts of the least ranked level (in the above example, the count of the 5^{th} rank = C_n, and the counts of the 1^{st} rank = C_1.

3 Results and Discussions

3.1 Demographic characteristics of households

In the study area, respondents had an average family size exceeding the national rural average of 4.9 members per household (Ayele & Gebretsadik, 2024). This increase can be attributed to cultural influences that view family members as valuable resources for labor in agricultural activities and social status, as well as the prevalence of polygamous marriages, often pursued to acquire additional farmland (see Table 1).

The average age of sheep fatteners in the study area was 41.38 years, ranging from 19 to 83 years old. This finding aligns with Zemene & Tolemariam's (2016) report of 41.9 years for households in the Jimma Zone. However, it is lower than the average ages reported by Teklay (2008) and Endale (2015), who found averages of 48.1 and 49.14 years, respectively. The age range is comparable to Yeshitila's (2008) study in Alaba, which reported an average of 42.82 years. This age distribution suggests that an active and potentially interested population is engaged in sheep fattening and broader agricultural activities within the study area.

Households in the study area had an average total landholding of 0.76 hectares, significantly less than the 1.93 hectares reported in the South Gondar Zone (Tilahun, 2021). Fortunately, literacy rates are promising, with 76.3% of sheep fatteners having at least some formal education, which could facilitate the adoption of improved farming techniques.

Group discussions revealed a local tradition that dictates livestock ownership in the area belongs to the husband, even if the wife has her own fattening sheep. This finding is consistent with Gebru *et al*. (2017), who reported that, similar to other African nations, household resource leaders are primarily men.

3.2 Occupation of the households

In the study area, pure agriculture dominated household occupations, accounting for 87.3% of fatteners. This was followed by agriculture combined with small trade (6.3%), agriculture with labor work (2.4%), and agriculture combined with civil service (4%). The dominance of pure farming, which typically involves mixed crop cultivation and livestock rearing, can likely be attributed to favorable agro-ecological conditions that support both agricultural and livestock activities. This observation aligns with findings from West Hararghe, Oromia, where mixed crop-livestock farming serves as the primary livelihood and income source (Abdi *et al*., 2013).

Table 1. Fatteners socio-economic data in study area

Variables		Kebeles						Total N=126	p-value
		Bule 01 n=21	Bule 03 n=21	Sika n=21	Suqo n=21	Kochore n=21	1gna okolu n=21		
FS	Mean ±SE	5.62 ± .71^{b}	5.10 ± .46c	5.43 ± .50b	5.14±.46c	7.14±.43a	7.43±.62a	5.98±.23	0.004
	Mi	1	3	2	2	4	3	1	
	Ma	14	10	12	10	10	13	14	
Age	Mean ±SE	36.24 ± 2.81^{c}	37.33 ± 1.6^{c}	45.90 ± 3.26a	40.05 ± 1.64b	42.00±1.8b	46.76±2.6a	41.38±1.01	0.007
	Mi	19	24	26	25	28	29	19	
	Ma	72	46	83	56	56	81	83	
TLH(ha)	Mean ±SE	0.70 ± .071^{b}	.69 ± .058^{c}	0.67 ± .053c	0.851 ± .087a	0.76±.098b	0.90±.06a	0.76±.035	0.094
	Mi	0.23	0.25	0.25	0.25	0.25	0.35	.023	
	Ma	1.65	1	1.03	1.70	1.25	1.67	1.70	
MS	Married%	14.3	16.7	14.3	15.9	15.9	15.9	92.9	0.610
	Single%	0.8	0.0	1.6	0.0	0.0	0.0	2.4	
	Widowed%	1.8	0.0	0.8	0.8	0.8	0.8	4.8	

		Sex of Respondents (%)				
		Male (n=108)	Female (n=18)	Total	χ^2	p-value
Education level of HHs	Illiterate	25.9	77.8	33.3	18.051	0.001
	1-4	34.3	5.6	30.2		
	5-8	29.6	11.1	27.0		
	9-10	5.6	0.0	4.8		
	Diploma	2.8	5.6	3.2		
	Degree	1.9	0.0	1.6		

Occupation of fattener/sources of income	Frequency (N=126)	%
Agriculture (crop and livestock production)	110	87.3
Agriculture and petty-trade	8	6.3
Agriculture and labour work	3	2.4
Agriculture and civil servant	5	4.0

SE=standard error Ma = maximum; Mi = minimum; FS = family size; TLH = total land hold; MS = marital status; HH = households; N = number of respondents.
The above table adopted from Tsegaye and Wondewsen (2024) which was published on Online Journal of Animal and Feed Research

3.3 Number, Duration and fattening cycle

On average, fatteners in the study area completed 1.50±0.050 sheep fattening cycles per year, ranging from 1 to 3 rounds, with no significant differences across kebeles. The findings of the current study differ from those of Shewangzaw *et al*. (2018) in the Amhara region, where the average number of fattened sheep per fattening period was higher at 2.86. However, these findings are consistent with those of Assefa & Ayza (2020) in the Hadiya Zone of Southern Ethiopia, where farmers typically practice fattening 2 to 3 times a year.

In contrast, Nurlign (2020) reported predominantly 2 cycles, while Getachew *et al*. (2017) noted only one cycle in the Fogera District. Samuel (2016) found similar results of 1.625±0.05 rounds per year in the Amhara region. The study suggests that improving feed and nutritional status, as well as management practices, may be key to increasing both the number of fattened sheep per cycle and the total number of fattening cycles per year. The variation in the number of fattening cycles across study kebeles may be attributed to differences in resources, agro-ecological conditions, and seasonal variations in fattening (see Table 2).

Table 2. Number, duration and cycle of fattening sheep in study area

Variables		Kebeles						Overall	p-value
		Bule 01	Bule03	sika	suqo	kochore	1gna okolu	N=126	
NFS	Mean±SE	1.6±.14^{c}	1.4±.13^{c}	2.05±.18^{a}	2.2±.22^{a}	2.1±.24^{a}	2.1±.22^{a}	1.9±.08^{b}	0.02
	Mi	1	1	1	1	1	1	1	
	Ma	3	3	4	4	5	4	5	
FD	Means	4.1±.96^{a}	4±.13^{a}	3.9±.19^{b}	3.8±.19^{b}	3.6±.16^{c}	3.6±.16	3.8±.07^{c}	0.2
	Mi	2	3	2	2	2	2	2	
	Ma	6	5	5	5	5	5	6	
FC	Mean±SE	1.8±.159^{a}	1.3±.126^{c}	1.4±.11^{c}	1.7±.15^{a}	1.5±.14^{b}	1.5±.14^{b}	1.5±.05	0.09
	Mi	1	1	1	1	1	1	1	
	Ma	3	3	2	3	3	3	3	

NFS = Number of fattening sheep FD = Fattening duration; FC = Fattening cycle; N = total sampled respondents; Mi = Minimum; Ma Maximum; SE = standard error

3.4 Fatteners ranking criteria for selection of sheep fattening

In the study area, sheep fatteners employed specific selection criteria, prioritizing conformation (height, length, and appearance) through visual assessment (see Table 3). This criterion was ranked as the most important factor (Index = 0.22), followed closely by physical characteristics such as color, horn shape, and tail type (Index = 0.21). Age and health status were equally important, ranking third (Index = 0.17), while adaptability and price were considered less crucial.

These findings align with previous research (ESGPIP, 2012; Assefa & Ayza, 2020; Diriba *et al*., 2021; Getahun, 2022), which emphasizes factors like body condition, frame, age, and health. Fatteners primarily relied on visual cues, such as body frame, hair appearance, and the presence of diarrhea, to assess sheep suitability. While most respondents (65.1%) considered age important, they relied on visual estimation rather than dentition; however, a significant portion (34.9%) deemed age less critical for fattening purposes.

Table 3. Fattening Sheep Selection Criteria

No	Selection Criteria	Frequency of rank given fatteners						Total	Index	Rank
		1^{st}	2^{nd}	3^{rd}	4^{th}	5^{th}	6^{th}			
1	Body conformation (height, length and appearance)	55	9	34	16	13	3	130	0.22	1
2	Physical characteristics	11	64	23	18	5	2	123	0.21	2
3	Age	46	11	3	1	26	42	129	0.17	3
4	Health	9	23	32	32	27	6	129	0.17	3
5	Price	4	2	13	11	33	61	124	0.09	6
6	Adaptability	1	17	21	48	22	12	121	0.14	5
	Mostly preferred physical characteristics									
1	Color	22	39	21	20	-	-	102	0.27	2
2	Horn	15	24	37	33	-	-	109	0.24	3
3	Tail	5	16	33	39	-	-	93	0.17	4
4	Body length and height	58	21	9	8	-	-	96	0.32	1

	Respondent %						Total	χ^2	p-value
Consideration of age of fattening sheep	Bule 01	Bule03	Sika	Suqo	Kochore	1gna okolu		22.071	0.001
Yes (%)	6.3	10.3	14.3	15.9	10.3	7.9	65.1		
No (%)	10.3	6.3	2.4	0.8	6.3	8.7	34.9		

Index = [(6 × number of responses for 1^{st} rank + 5 × number of responses for 2^{nd} rank + 4 × number of responses for 3^{rd} rank + 3 × number of responses for 4^{th} rank +2 × number of responses for 5^{th} rank+1 × number of responses for 6^{th} rank)] divided by (6 × total responses for 1^{st} rank + 5 × total responses for 2^{nd} rank + 4 × total responses for 3^{rd} rank + 3× total responses for 4^{th} rank + 2×total responses for 5^{th} rank+1 × number of responses for 6^{th} rank).

3.5 Preferences of fatteners for sheep fattening

The study revealed that the majority (72.2%) of respondents preferred fattening rams due to market demand, feed efficiency, potential profit, and superior weight gain, consistent with findings in the Genji district (Diriba *et al*., 2021). Mature rams were ranked highest (index value 0.37) because of their rapid growth, high market demand, and favorable pricing, followed by young rams (0.31) and old rams (0.30). Fatteners prioritized mature rams for their quicker attainment of market weight (47.9%), strong market demand (39.6%), and higher selling prices (12.5%), as indicated in Table 4.

In the study area, barren ewes were preferred for fattening due to their marketability, associated with good body condition and non-reproductive use (Index = 0.40). Old ewes were also favored for their low purchase price and suitability for culling (50%) and high demand from local butchers (37.5%). Gimmer ewes were preferred due to market demand and usage by local butchers (Mamo, 2020; Getahun, 2022). This aligns with findings in other regions, where unproductive female sheep or aged animals are commonly fattened due to market factors (Diriba *et al*., 2021; Samuel, 2016) (see Table 5).

Table 4. Condition of castration practices, preferred fattening sheep type

Variable		Frequency (n)	Percent (%)
Castration practices	Yes	0	0.0
	No	126	100.0
Type of sheep for fattening	Ram	91	72.2
	Ewe	13	10.3
	Both	22	17.5
Total		126	100.0

Table 5. Community preference of fatten sheep in the study area

Mostly preferred type of ram	1st ranked F	2nd ranked F	3rd ranked F	Total	Index	Rank
old ram	23	50	40	113	0.30	3
matured ram	48	47	18	113	0.37	1
young ram	42	16	55	113	0.31	2
Mostly preferred type of Ewe						
Old ewe	8	14	13	35	0.29	2
Barren/infertile ewe	21	13	1	35	0.40	1
Gimmer ewe	6	8	21	35	0.25	3

Index = [(3× number of responses for 1st rank + 2 × number of responses for 2nd rank + 1 × number of responses for 3rd rank)] divided by (3 × total responses for 1st rank + 2 × total responses for 2nd rank + 1 × total responses for 3rd rank); F=frequency.

3.6 Sheep fattening occasions

Sheep fattening in the study area is a seasonal practice, with 27.78% of farmers targeting the Easter season (see Figure 2). This finding aligns with research by Wude (2017) in the Debre-Berhan area and Assefa & Ayza (2020), who also noted peak fattening periods around Easter, Christmas, and the Ethiopian New Year.

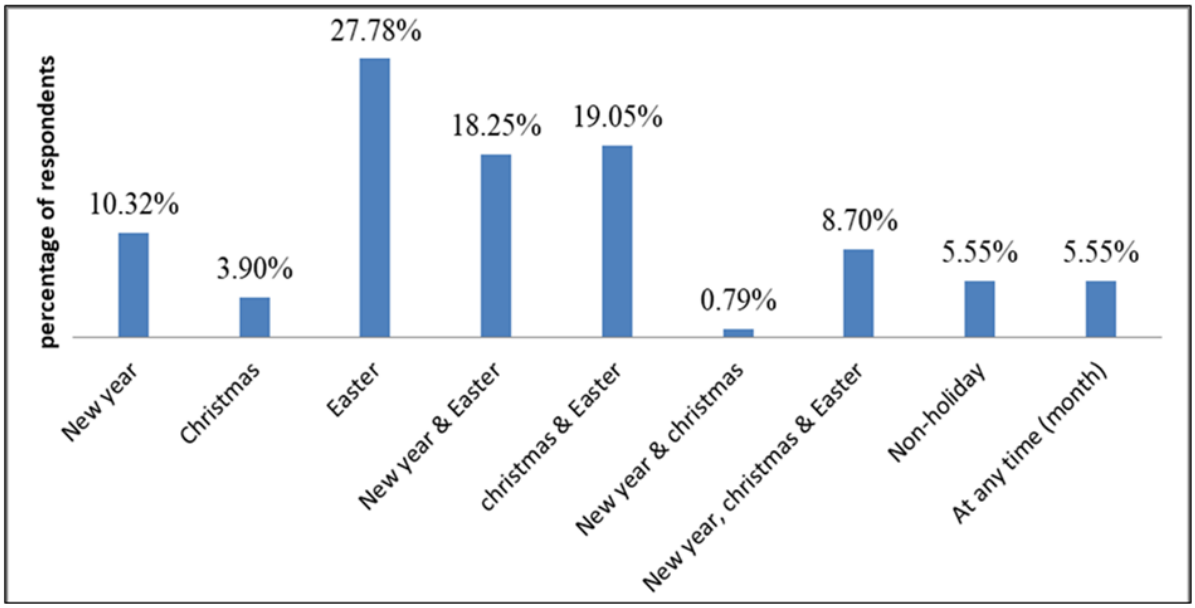

Figure 2. Seasons of sheep fattening in study area

3.7 Reasons for fattening sheep

Sheep fattening in the study area is primarily driven by income generation (40.48%), with additional motivations including saving, purchasing more sheep, and fulfilling socio-cultural functions. This finding aligns with the research of Fikru & Gebeyew (2015) in the Degehabur Zone and Samuel (2016) in the Amhara Region, both of which also reported income generation as the main purpose of sheep fattening (see Figure 3).

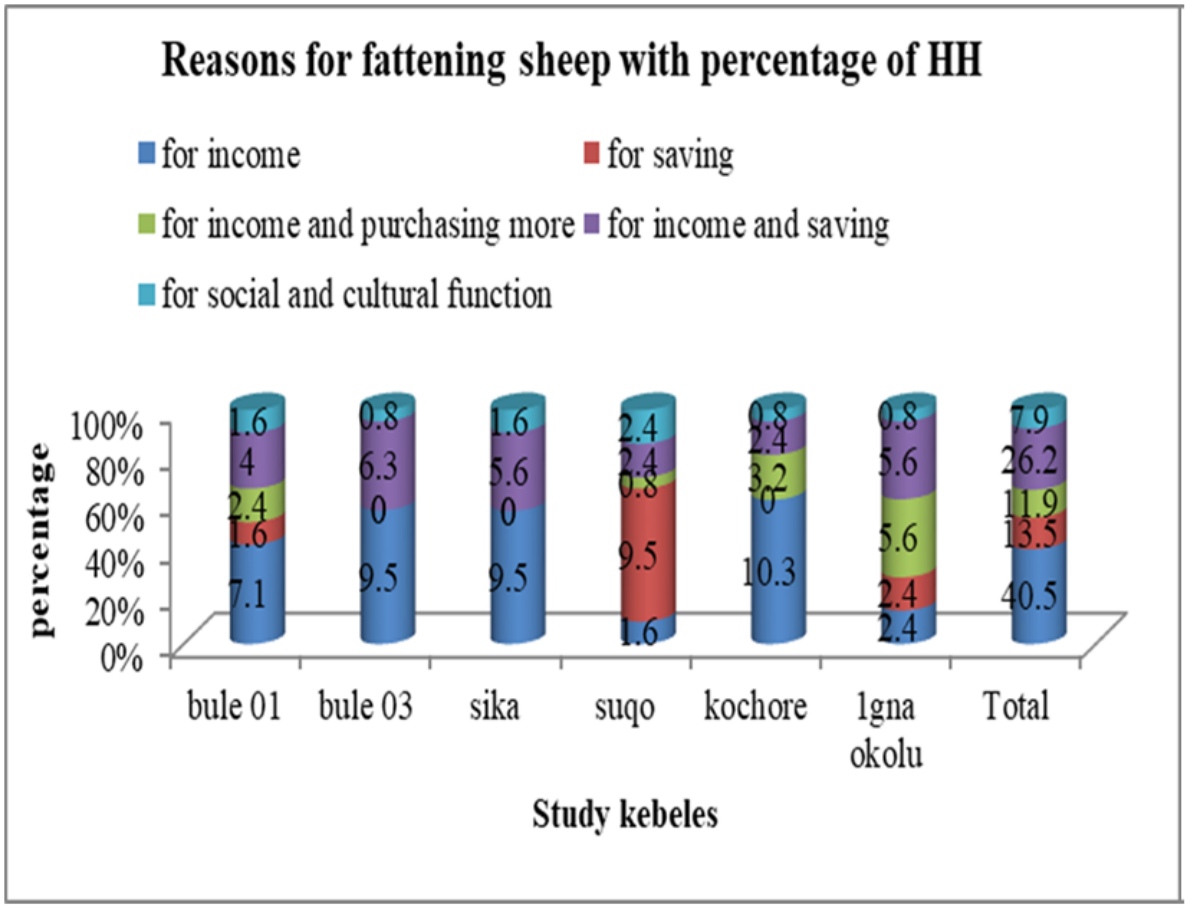

Figure 3. Main purpose of involving in sheep fattening activities

3.8 Fattening sheep, feeding system and supplementary feed types

The commonly provided feed and feeding systems for fattening sheep in the study area are presented in Table 6. The predominant feeding systems include tethering with stall feeding (68.3%), semi-grazing with stall feeding (20.6%), and free grazing with a cut-and-carry system (11.1%). This result aligns with Getachew *et al.* (2017), who reported that stall feeding (56.1%), free grazing (18.1%), mixed systems (11.1%), and tethering (7.4%) were common among respondents in the upper land of Fogera District. The current findings also agree with Esatu *et al.* (2019), who noted that tethering, cutting, and carrying were practiced feeding systems for sheep in Arba Minch Zuria District.

Table 6. Provided feed and feeding/fattening system in study area

Description		Sheep fattening/Feeding system (%)			Total	χ^2	p-value
		FGCC	TSFS	SGSFS			
Feed for sheep during stall-feeding	B.L & HL	2.4	20.6	6.3	29.4		
	GFG	4.8	23.8	6.3	34.9	7.779	0.4
	CF	4.0	10.3	2.4	16.7		
	Enset	0.0	10.3	3.2	13.5		
	CRB	0.0	3.2	2.4	5.6		
Total		11.1	68.3	20.6	100.0		

B.L & HL = Bamboo leaf & home leftover; GFG = Green fresh grass; CF = Cultivated forage; CRB = crop residues with bole; FGCC = Free grazing with cut and carry system; TSFS = Tethering with stall feeding system; SGSFS = semi-grazing with stall feeding system.

Backyard sheep fatteners in the Bule district commonly tether sheep on nearby pastures, supplementing their diet with fresh grass, bamboo leaves, and enset. Tethering with stall feeding is practiced, with fresh grass (23.8%), bamboo leaves (20.6%), and cultivated forage (10.3%) being the primary feeds. This observation aligns with findings from Salo *et al*. (2017) in Anelemo Woreda, where farmers also tether animals and provide pasture grown between enset.

Tethering is a common sheep fattening practice in the study area, promoting weight gain through grazing, reducing aggression, and preventing breeding (Getachew *et al*., 2017). This method optimizes feed utilization, reduces labor, and minimizes unnecessary movement, ultimately leading to faster attainment of market weight. Households utilized three main feeding systems: semi-grazing with stall feeding, tethering with stall feeding, and free grazing with cut-and-carry. Semi-grazing with stall feeding involves allowing sheep to graze freely before confining them to a fenced pasture for stall feeding (Esatu *et al*., 2019). Free grazing with cut-and-carry was also common, where sheep grazed freely for 11 hours a day and were provided with additional supplements (Abebe *et al*., 2021).

The study found no significant difference ($p > 0.05$) in the types of feed provided to fattening sheep across different feeding systems in the study area. Fresh green grass (34.9%) was the primary feed, supplemented with bamboo leaves and home leftovers, with variations based on kebele and availability. The similarity in feed types across systems and the unknown daily amounts given may explain this finding, with basal feed resources used as supplements during grazing. This aligns with Machen (2019), who also reported variations in supplementary feed types across locations due to factors such as land availability (see Table 6).

3.9 Utilization and type of available supplementary feed

As indicated in Figure 4, supplementary feeds for sheep fattening in the Bule district primarily included salt, kitchen leftovers (such as cereal screenings and coffee residues), and enset (18.3%). Combinations of salt, bole, and home leftovers (15.1%) as well as enset with salt (11.1%) were also common. Coffee residues served as a readily available daily supplement due to household production. This study aligns with Nurlign (2020), who reported the use of food leftovers and cereal screenings in Ethiopian sheep fattening.

Within the study area, some farmers utilized crop residues treated with salt or bole soaking, and 9.5% believed that using crop residues could help mitigate feed shortages. Abshir (2018) similarly emphasized the importance of crop residues in addressing acute feed resource shortages. According to Tolera *et al*. (2012), crop residues account for approximately 50% of the total feed supplied in Ethiopia. Nonetheless, the use of these techniques by fatteners in the current area remains minimal due to factors like low palatability, labor intensity, and time constraints. Respondents indicated that chopping crop residues requires additional labor and time, further complicating their use.

Moreover, Alemu *et al*. (1991) highlighted that the feeding value of crop residues is limited by poor voluntary intake, low digestibility, and deficiencies in nitrogen, energy, minerals, and vitamins. Fatteners noted that population growth and intensified crop cultivation have resulted in insufficient grazing land, compelling them to restrict livestock access to pastures until grass is established for grazing during designated seasons.

To improve the intake and nutritional status of available feeds, fatteners could enhance utilization efficiency by employing techniques such as chopping, salting, and mixing bole (mineral soil) into feed materials. Among these practices, salting was noted as particularly common; it often followed the chopping of feed into manageable sizes to enhance intake. Sampled households affirmed that employing these techniques significantly alleviated some consequences arising from feed shortages. Supporting evidence from the central highlands of Ethiopia suggests that feed processing methods like chopping, wetting, grinding, boiling, and roasting could significantly contribute to resolving feed-related issues (Ahmed *et al*., 2010).

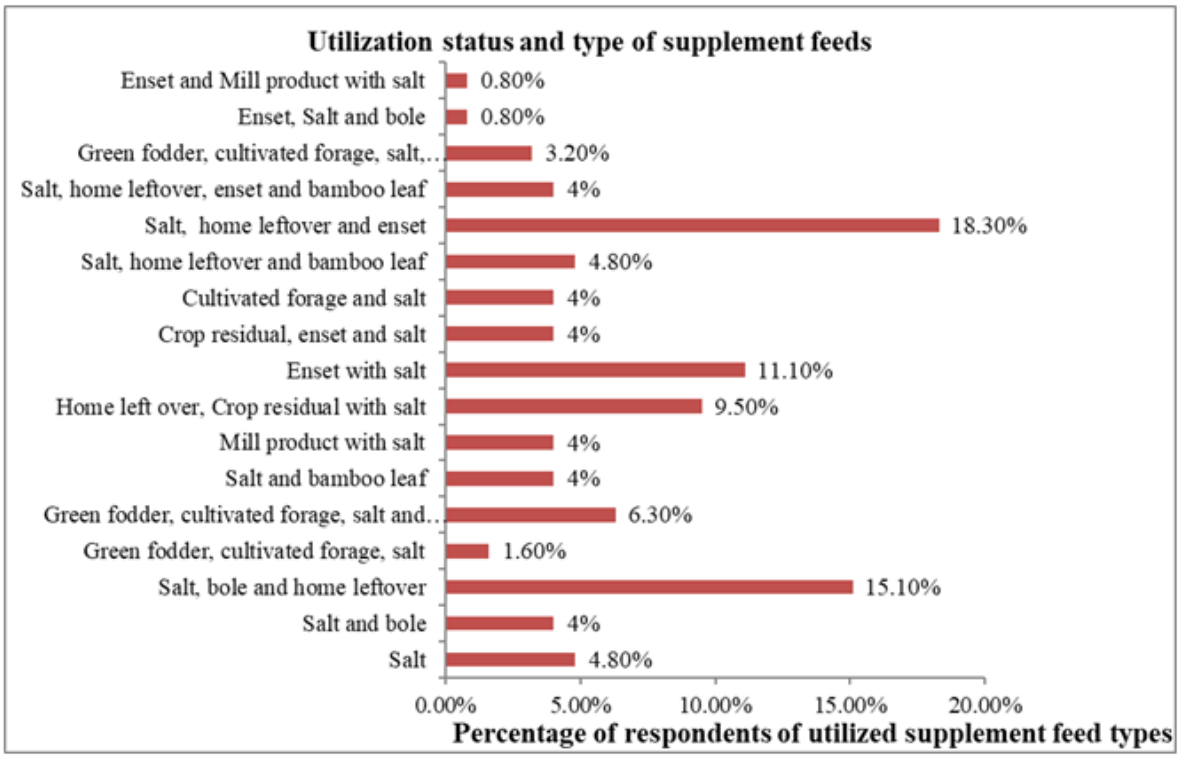

Figure 4. Percentage HHs supplementary feeds used

3.10 Economic analysis of sheep fattening

Budgeting analysis of sheep fattening in the Bule district revealed that while farmers achieved a gross margin of 517.3 ETB per sheep after 2 to 6 months of fattening, the practice was ultimately unprofitable. Costs were categorized into fixed expenses (such as equipment depreciation and land rent) and variable costs (including feed and healthcare), with sheep procurement accounting for 61% of total expenses. Feed represented the largest cost component, averaging 694.7 ETB, while variable feeding costs constituted 86.4% of total feed expenditure.

The average cost of purchasing sheep was 2,554.07 ETB, with a selling price of 4,122.23 ETB. The resulting benefit-cost ratio of 0.98 indicates that for every 1 ETB invested, the return was only 0.98 ETB, confirming economic unprofitability under current management practices, as a profitable business typically has a benefit-cost ratio greater than one (Sarma *et al*., 2014).

This loss is exacerbated by a lack of awareness among farmers regarding the tracking of variable costs, leading them to primarily focus on the purchase-sale price differential while neglecting other significant input costs. To improve profitability, it is crucial for fatteners to meticulously record all costs associated with sheep fattening, enabling a more comprehensive understanding of the true economic benefits and potential for optimization.

4 Conclusion and recommendation

4.1 Conclusion

The study identifies challenges in backyard sheep fattening, including inadequate housing, poor feed management, and disease outbreaks. Opportunities exist to improve productivity but require coordinated efforts.

4.2 Recommendations

- Enhance farmer's capacity through training related to proper management practices, including record-keeping and disease control.
- Improve feed access- Develop strategies to improve feed quality and availability, including supplementary feeding and nutrient-rich basal feeds.
- Support from authorities- Provide government

support through subsidies, grants, or low-interest loans, and expand training in modern techniques and disease control.

- Encourage best practices - Foster collaboration among stakeholders to implement best practices and raise awareness among farmers about efficient management.
- Promote long-term profitability- Encourage better practices through education and demonstration of long-term profitability.

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Data availability

Data will be made available on request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this manuscript.

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