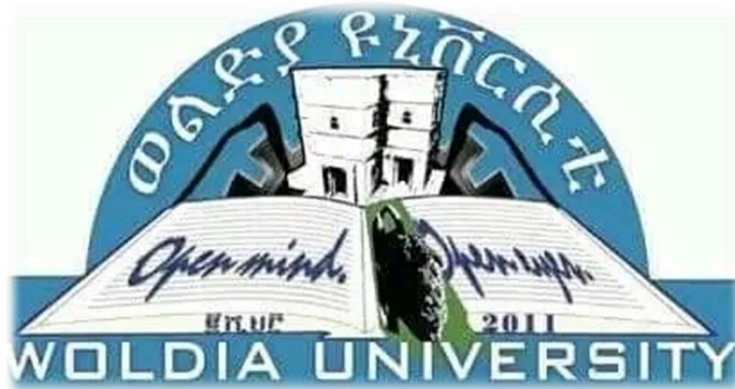




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THESIS ON
ASSESSING THE ROLE OF GOAT PRODUCTION IN SUPPORTING
RURAL HOUSEHOLD'S IN DROUGHT-PRONE AREAS OF ABERGELE
DISTRICT, AMHARA REGION ETHIOPIA

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SEPTEMBER, 2024
WOLDIA, ETHIOPIA

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COLLEGE OF SOCIAL SCIENCES AND HUMANITIES
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THESIS ON
ANALYZING THE ROLE OF GOAT PRODUCTION IN SUPPORTING
RURAL HOUSEHOLD'S IN DROUGHT-PRONE AREAS OF WAGHIMRA
ADMINISTRATIVE ZONE

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**A THESIS SUBMITTED TO SCHOOL OF GRADUATE STUDIES
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Declaration

This is to certify that the thesis entitled “Analyzing the Role of Goat Production in Supporting Rural household’s in Drought-Prone Areas of Waghimra Administrative Zone submitted in partial fulfillment of the requirements for the degree of Master of Art in Geography and Environmental Studies Department of Food security and development, Woldia University, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

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ADVISOR APPROVAL SHEET

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APPROVAL OF THESIS FOR DEFENSE RESULT

As a member of the board of examiners, we examined this thesis entitled” thesis on Analyzing the Role of Goat Production in Supporting Rural Livelihoods in Drought-Prone Areas of Waghimra Administrative Zone " prepared by Mebratu Getahun Embaye. We hereby certify that the thesis is accepted for fulfilling the requirements for award of degree of “Master of Art in Geography and Environmental Studies Department of Food Security and Development.

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Abstract

In all agro-ecological parts of Ethiopia, goat production practices are potential opportunities to sustain subsistence rural livelihoods. This study therefore examined the role of goat production in supporting rural livelihoods in drought-prone areas of Waghimira administrative zone, northeast Amhara, Ethiopia.

This study employed a cross-sectional research design and was based on both qualitative and quantitative research approaches. The survey data were collected from both primary and secondary sources. In this study, a multistage sampling procedure was used to select sample households. The researcher selected Abergele district in the purposive sampling method due to goat production potential, and three kebele, such as Marnet, Seria, and Wirkadibnu, were selected based on the agroecology zone of the study area. The quantitative data were collected from 257 randomly selected goat owner households, while the qualitative data were collected from purposefully chosen FGD and KI participants. To address the objective, the researcher used both descriptive and inferential statistics. Inferential statistics such as chi square and Pearson correlation Independent sample t tests were used.

This study has found that generally goat husbandry is an integral part of subsistence households, contributing to diversifying livelihood income and providing milk and meat for home consumption. The findings of the study show that constraints such as diseases, feed shortages, drought, and limited access to veterinary services were major barriers affecting goat production practices. Spatially, diseases were the major constraint across all kebeles, with farmers in Seria and Wirkadibnu ranking them as the most critical issue (indexed 0.5), as well as Marnet ranked the third (indexed 0.17). Feed shortages, particularly during dry seasons, present another substantial challenge in the Marnet and Wirkadibnu indexes of 0.40 and 0.32, respectively. Drought (indexed 0.43) was found to be a to be a major constraint, and Marnet ranked as the first limiting barrier. This study recommends that enhancing goat production through targeted interventions can contribute significantly to sustainable rural livelihoods in the scenario of changing climate.

Key words: Abergele, Drought-Prone Areas, goat production, Rural Livelihood, independent sample t test

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LIST of Abbreviations and Acronyms

ACSI	Amhara Credit and Saving Institution
AWOA	Abergelie Woreda Office of Agricultur
CBBP	Community Based Breeding Program
CSA	Central Statistics Agency
DFID	Department For International Development
ETB	Ethiopian Birr
FAO-	Food and Agricultural Organizations
FGD	Focus Group Discussions
KII	Key Informant Interview
MASL	Meter Above Sea Level
MMR	Mixed Method Research
NGO	Non-Governmental Organization
PSNP	Productive Safety Net Program
SI	Sustainable Livelihoods
SLF	Sustainable Livelihood Frame Work
SSA	Sub-Saharan Africa
TLU	Tropical Livestock Unit
UK	United-kingdom
UKDID	United kingdom's Department for International Development
WBG	World Bank Group
WCED	World Commission on Environment and Development
WSTP	Wag Himra Social Transformation Programmer

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CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

Since the evolution of human civilization to the production of milk, meat, and fiber, the roles of goats in the world are numerous, relevant, and important (Lu, 2023). In addition, goat farming has the potential to significantly contribute to the growth, development, and fulfillment of food security (Akintobi & Achu, 2021) and lifting the community out of poverty towards prosperity in developing countries (Peacock, 2005).

Goats eat everything but stones (Lähde, 2021). Hence, thus rearing goats might be an effective way to lessen the impact of climate change on the sub-Saharan African rural economy (Assan, 2021). The many reasons for this are based on the fact that the socioeconomic role of goat husbandry has increased during the last decades, especially in less developed countries that are routinely exposed to adverse environmental conditions (Darcan & Silanikove, 2018). Goats are an integral part of livestock keeping in Sub-Saharan Africa that are mainly kept for immediate cash sources, milk, meat, wool, manure, and saving or risk distribution and have various social and cultural functions (Gobena, 2016). Goats have a unique ability to adapt and maintain themselves in severe climates or habitats (Kula, 2020). They are also characterized by having distinct but complementary feeding habits, being browsers and highly selective feeders (Lamesegn, 2018). Unlike others, the effects of climate change on goat production vary significantly depending on the weather elements concerned (Ume et al., 2019). Simply, goats are well-suited to harsh environments (Adam Mohammed, 2022). Specially, the genetic potential of indigenous goats makes them the most resistant breeds to drought and diseases under given conditions (Darcan & Silanikove, 2018).

This numerous advantages goat are essential to the food and nutritional security of rural impoverished people, particularly in rain-fed areas where crop production is unstable and where there is an extreme shortage of feed and fodder for raising large ruminants (Kumar et al., 2010). It is a major source of human nutrition and also the means of economic stability for many small and marginal farmers, providing meat and manure as two major sources of income (Kumar & Roy, 2013).

Ethiopia has the largest number of goats on the continent, which serves several functions for the communities (Adam Mohammed, 2022). The country consists of 52.5 million goat population, of which 7,045,305 and 550,710 goat population are from Amhara region in general and Waghimra zone in particular, respectively (CSA, 2021). In the nation, goat production represents 16.8% of the total meat and 16.7% of milk consumption (Adam & Mohammed, 2022). They contribute significantly to national export earnings and the livelihoods of producers, especially poor rural households (Solomon. et al., 2014). Thus, goats are vital to smallholder mixed, agro-pastoral, and pastoral production systems because of their low initial capital requirements, capacity to produce a variety of goods (meat, milk, skin, manure, etc.) at low input costs, high rates of reproduction (many births are not unusual), and rapid maturity that leads to high turnover rates (Solomon. et al., 2014).

In all agro-climatic situations, goats have always been an important part of the farming systems of Ethiopia (Seid, 2017). Goats are highly adapted to a broad range of climatic and geographic conditions and are more widely distributed than any other mammalian livestock (Lamesegn, 2018). They are owned by the majority of smallholder rural farmers, for whom this resource is critical for nutrition and income and important as a secure form of investment (Asefa et al., 2015). Goats contribute as a source of income, saving account, providing food, improving crop production and soil fertility, fuel, social functions, and employment (Birara & Ayalew, 2016). They are used as a source of risk mitigation during agricultural failures, property security, and financial savings (Kula, 2020).

Moreover, in the nation's lowland, smallholder farmers and herdsmen produce goats, one of the most significant types of animals, which are excellent options for a hard climate (Adam Mohammed, 2022). Goats are well suited to small farming systems (Feleke et al., 2016). They contribute to building and reinforcing risk-coping capabilities of agro-pastoral and pastoral communities, known for fragile livelihoods due to frequent droughts (Yitayew et al., 2023). As subsistence goats are a low-cost and inflation-proof alternative to saving, their value provides asset (financing) and security (insurance) benefits at times of difficulty (Ayalew et al., 2001). Beyond their numerical outputs of various products, goats are significant for building capital, diversifying production, generating jobs, raising revenue, improving human nutrition, and lowering risk. (Gobena, (2016)

In the Amhara region, goat production is one of the subsistence agricultural practices widely reared in rural livelihoods. For example, a Western Amhara study by Kebede et al. (2015) indicates that goats were the most predominant species of livestock owned, followed by sheep, cattle, chickens, donkeys, mules, and horses, respectively. As Teklewold, B. (2022) observed in east Amhara (Wereillu, Mojaena Wedera, Merehabete, and Moretena Jiru), among five species of livestock popularly used in the study area, the contribution rank of goats and cattle was better than from other species of livestock along study areas. In Waghimra zone also rural livelihoods are engaged in the agricultural sector, of which small ruminants take the lion share of means of livelihood in the lowland part while cattle are dominant species in the highland part of the area (Wubet et al., 2020). According to Yeshiwas et al. (2020), goats, together with other livestock species, contribute about 75% of the cash income sources of smallholder farmers in the mid- and lowland areas of Waghimira. particularly nearly 88.2% of farmers in Abergele district dominantly engaged in goat rearing, which accounts for 73.4% of the district's livestock (Abeje et al., 2016).

The Abergelle goat breed is one of the best breeds in terms of adaptability to harsh environments (Wubet et al., 2020). They have evolved special adaptations to survive and develop in severely harsh environmental conditions (low feed quality and scarcity of water), which qualify them for use in traditional low-external-input farming systems (Alemayehu, 1993). They are considered important assets, which can be sold at any time when cash is needed. Their products and byproducts, such as meat, milk, and butter, are a valuable source of food (Abebaw et al., 2013). These breeds are characterized in terms of good quality of meat in special tests (Tewodros et al., 2022). Moreover, milk is an important product that all households consume (Yeshiwas et al., 2020). Recently, in the course of repetitive and prolonged dry spells in the past decade, an increasing number of Waghimra households have incorporated goat production into their subsistence systems to sustain their livelihoods. This study aims at understanding the motivation behind the potential of goat production to create a sustainable livelihood system over other production strategies and to provide a better understanding of goat production as a drought adaptation measure for changing climates.

1.2. Statement of the Problem

The current levels of contributions of the livestock subsector in Ethiopia, at either the macro or micro level, are below potential (Berhanu et al., 2007). Like all other livestock species, the roles of goats at the household and national level, the productivity, and the contribution of goats to the national economy are far below the potential. Adam Mohammed, (2022); Gobena, (2016); & Solomon, (2014). The major reason could be that in Ethiopia there is no policy that exclusively focuses on small ruminants (Mulema. et al., 2015). Ethiopian goats are raised in overall, traditional systems with little to no technology or inputs, resulting in their very poor production. Commercial or market-oriented production is basically nonexistent (Solomon et al. 2010). The goat in Ethiopia is among neglected farm animals in agricultural research and development programs (Alemu, 2015). Research on the Abergelle goat breed has also been scarce, despite its importance regarding milk, meat, cash flow, and skin production (Belay, 2008).

A previous study in Ethiopia noted that goat production was largely affected by food shortages, diseases and parasites, market depressions, low genetic production, and severe water shortages. Tade & Melesse, (2023); Adam Mohammed, (2022); & Kula, (2020). Diseases and parasite infestations hurt a negative impact on goat production, resulting in high mortality rates in both adult and young goats (Gebeyehu et al., 2013). Another difficulty was found in the lack of improved technologies and inputs to transform traditional subsistence goat farming into market-oriented production and the inefficiency of institutional support for goat production (Friat & Haben, 2020). Interventions directed at constraints in goat production in semi-arid areas are required to improve the level of goat production (Solomon et al., 2014).

Moreover, catastrophic fluctuations in household income are an abiding threat to the welfare of rural families in Ethiopia (Behnke & Metaferia, 2013). In the dry land areas of Ethiopia, climate change and associated drought problems are leading to poor harvests of both food and animal feed (Giorgis & Assefa, 2018). Spatially, farmers' income from agricultural and livestock resources is significantly reduced during drought years, and even their cattle (Menghistu et al., 2018). Recent studies by Mera (2018) &FAO (2016) also point out that drought in Ethiopia seriously damaged the resilience of household livelihoods and harmed the country's food production systems, environmental resources, and various sources of income. These impacts of climate change on yields are first-order effects that trigger direct and indirect economic impacts, such as reductions in income, employment, savings, and investments (Nigussie & Demies, 2015). Like that, Waghimra

being one of the most drought-prone areas (Kidane & Dagnachew, 2022). Especially, the Kolla (dry hot) low-altitude agro-ecology is frequently affected by drought (Alemu. et al., 2023).

As Giorgis & Assefa argue, ‘In the past, in Ethiopia, there was no specific extension approach or compatible system designed for dry lands, which are characterized by limited access to infrastructure and public service centers, a challenging climate, household food insecurity, frequent drought occurrences, moisture stress, and other problems (Giorgis & Assefa, 2018). The mainstay for the livelihoods of the people in Abergele woreda was found highly dependent on goat production (Tewodros et al., 2022). While crop production usually fails due to low soil fertility and moisture stress almost every year (Alemu, 2015). The area is characterized by erratic rainfall, and the soil has too low fertility to grow enough amounts of food crops even for home consumption (Tewodros et al., 2022). On top of the spatial and temporal variations in temperature and rainfall, subsistence farming, high poverty, low income and resources, and a greater dependency ratio make the district enormously vulnerable to climate change (Belete, 2016). The district has faced brutal natural resource decline, agricultural yield reduction, and water shortage (Ademe. et al., 2021). More so, currently the populations in Abergele district are living with diverse effects of recurrent drought while they were recovering from the socioeconomic crises of the northern Ethiopian war. The war had a significant negative impact on forage and livestock products and marketing of forage and livestock products (Yared Alemayehu & Sale Abate, 2022).

Therefore, to use the potential of the goat resource optimally and promote targeted interventions in this climate-resilient ideal animal, it is important to assess the unlocked potential of goat production in the study area. Pervious empirical studies such as Belete, (2016), Alubel, A. (2015), Abebaw et al. (2013), and Tewodros et al. (2022) give important development initiatives and target interventions in either the socioeconomic or production practices of goats in the district. Furthermore, in order to ensure the long-term sustainability of any goat intervention, it must be clear over time what roles will be played by goat keepers, farmer organizations, the government, and the private sector (Peacock, 2005). As well, the suitability of an area for either animal or crop production and the type of animal or crop to be produced in the area depends on the agro-ecological conditions of the area (Tolera & Abebe, 2007). However, previous empirical evidence in Abegale woreda lacks to explore the role and its constraint of goat production, with a specific gap in addressing aspects related to agro-ecology. Policymakers and administration tend to overlook their contributions to the economy and vulnerability reduction while they are most drought-adaptive

(Wubet et al., 2020; Alemu, 2015) and are reared by most rural households in the district (Abebaw et al., 2013).

Hence, understanding the role of goat keeping under farmers 'management, production characteristics, identifying constraints, and designing workable production strategies are required in order to improve goat productivity and the market success of producers. Therefore, to address this knowledge gap, this study assesses how goat production in the local subsistence pattern has affected the household's livelihood security in Abergele woreda.

1.3. Objectives of the Study

1.3.1. General Objective of the Study

The overall objective of the study was assessing the role of Goat Production in Supporting Rural household's in Drought-Prone Areas of Abergele district, Amhara region, Ethiopia.

1.3.2. Specific objectives of the Study

The specific objectives of the study are:

1. To assess the goat feeding and management practices in the study area
2. To investigate the contribution of goat rearing on household income in the study area,
3. To identify the challenges of goat production practices in the study area
4. To evaluate how existed institutions support goat production in the study area

1.4. Research Questions of the Study

1. What are the goat feeding and management practices in the study area?
2. How has the involvement goat production affected the livelihood income in the study area?
3. What challenges are there for goat production practices in the study area?
4. How do existed institutions support goat production in the study area?

1.5. Scope of the Study

Geographically, this study was conducted in Abergelle district, a goat production zone located in the drought-prone area of Waghimra zone, Amhara region, Ethiopia.

It is conceptually scoped, analyzing the role of goat production in the livelihood security of subsistence farmers and constraints of the production system. The household was the unit of

analysis, specifically focusing on goat-farming households. The study is limited to analyzing livelihood assets, considering goat production as one of the many assets and activities farmers use to sustain their livelihoods in drought-prone areas.

1.6. Significant of the Study

Abergele, a district in the northeast part of the Amhara region, is among the most remote and marginalized areas in the region, with widespread poverty and food insecurity. In this district, livestock production serves as the primary income-generating activity, crucial for improving the livelihoods and quality of life for its inhabitants. Assessing the livelihood of drought-affected populations is an essential step for advancing development (Frankenberger et al., 2015). Hence this study aims to contribute to the development of knowledge surrounding goat rearing and the development of production methods.

The findings of this study are helpful for goat farmers to understand further goat as the preferred livelihood adaptation strategy in this drought-prone area. The findings of this study will identify the feeding and management practices of goat production and their constraint implications for enhancing productivity and improving production systems.

The recommendations of this research will have the potential to influence the regional government to place a greater emphasis on goat rearing as a key livelihood option for all small holding rural households and invest in such drought-prone areas. Furthermore, the study will be used as a base for other researcher studies in the area of small ruminant research.

Overall, the study will have profound importance for the study population, academic community, and researchers. Because increasing livestock's contribution to the livelihoods of developing communities requires an improved understanding of livestock's multiple and complex roles (Swanepoel et al., 2010). Similarly, Acosta et al. (2021) also noted that, thus, a deeper understanding of the complex role of the livestock portfolio to help cope with drought is fundamental to enhancing the design and effectiveness of livestock interventions in prolonged crises.

1.7. Limitation of the Study

In this study, the target sampled population for the survey was ($n = 278$); however, the researcher collected the questionnaire from only 257 respondents. The researcher faced challenges in reaching

all respondents in the remote village of Wirkadibnu Kebele, leading to the inability to record responses from 21 goat farmers.

The other limitation of this study was data acquired, which constituted another constraint. The survey was conducted during a period of severe drought, when the government and other humanitarian organizations were also evaluating food assistance. Thus, the respondents made a connection between their evaluations and this study. Therefore, the assistance or aid anticipated from the humanitarian agencies may have had an impact on the responses. As a result, prolonged time was also needed to have an open discussion with the goat owners.

1.8. Organization of the Thesis

This thesis was organized into five chapters and is supplemented with a list of references. The first chapter presents the general background of the study, the statement of the problem, the objectives of the study, research questions, the significance of the research, and the limitations of the research. Chapter Two presents a review of related literature followed by the theoretical and conceptual framework of the study. In this chapter, concepts and theories related to livelihood approach and empirical studies of goat production practice and its constraints in Ethiopia and its role in binding rural livelihood capital were reviewed. Chapter three describes the study sites, the method of research design, sampling techniques and procedures, research approaches, data sources, data collection tools, data analysis techniques, etc. Chapter four describes the results and findings of the study, and chapter five describes the conclusion and recommendations of the study.

1.9. Operational Definition of Terms and Concepts

Goat production refers to the process of raising goats for various purposes, including meat, milk, fiber, hides or other socio economic benefit.

Drought-prone areas is an area experience prolonged insufficient rainfall or water scarcity and high temperatures, impacted in agriculture, livelihoods, and natural resources.

Livelihood" refers to the means by which individuals or households secure the basic necessities of life, such as food, shelter, and clothing.

Sustainable livelihoods “The ability to maintain and improve livelihoods while maintaining or enhancing the local and global assets and capabilities on which livelihoods depend (Chambers & Conway, 1992).

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1. Livelihood Approach

The livelihoods approach is a way of thinking about the objectives, scope, and priorities for development (DFID, 2000). According to Chambers and Conway (1992), a sustainable livelihood is characterized by effectively responding to various shocks and the way of retrieving and improving capabilities and assets that generate sustainable living opportunities for future generations, etc. It is an assumption that sustainability can only be analyzed with reference to an individual household's livelihood patterns and what constitutes 'a living' under specific environmental and socioeconomic circumstances (Sneddon, 2016)..

2.2. Sustainable Livelihood Frame Work (SLF)

In this study, authors will use and adapt the Sustainable Livelihoods (SL) framework based on the original structure from Chambers & Conway (1992). The Sustainable Livelihood Frame may be used in the form of a livelihood analysis to evaluate how development activities 'fit' with the livelihoods of the impoverished, while the SLF might be of use as a checklist or means of structuring ideas (Kollmair and Gamper, 2002). The livelihoods framework is a tool to improve our understanding of livelihoods, particularly the livelihoods of the poor (DFID, 2000). The idea of sustainable livelihoods first came from the World Commission on Environment and Development (WCED, 1987). WCED's definition of sustainable livelihoods is "maintenance or enhancement of resource productivity on a long-term basis." They go on to say that "a household may be enabled to gain sustainable livelihood security in many ways—through ownership of land, livestock, or trees; rights to grazing, fishing, hunting, or gathering; through stable employment with adequate remuneration, or through varied repertoires of activities." Chambers & Conway (1992) conclude that for sustainable livelihoods there are three main objectives: increasing sustainability, enhancing capability, and improving equity. In this framework, the starting point for all livelihoods (or livelihood analysis) is the vulnerability context, which through a series of permutations yields livelihood outcomes (DFID, 2000).

2.3 Livestock Production and its Challenges in Ethiopia

In Ethiopia, agriculture is the main economic activity, and more than 80% of the Ethiopian population is dependent on agriculture, of which livestock plays a very important role (Birara & Ayalew, 2016). In Ethiopia, the livestock sector has been contributing a considerable portion to the economy of the country and is still promising to rally around the economic development of the country. (CSA, 2021). Thus, the livestock production and management system in Ethiopia is mainly extensive, where indigenous breeds are kept under low input/low output husbandry practices (Tegegne & Feye, 2020). In Ethiopia, the vast majority of rural people, comprising 85% of the total population, depend on animal power for cultivation, weeding, threshing, and transportation. Similarly, livestock products play a significant role in maintaining soil fertility, increasing soil organic matter, and improving soil texture (Birara & Ayalew, 2016). Livestock plays vital roles in generating income for farmers, creating job opportunities, ensuring food security, providing services, contributing to asset, social, cultural, and environmental values, and sustaining livelihoods (Leta & Mesele, 2014). Livestock products are often used for household consumption and/or sold to finance the purchase of basic household consumption commodities (Birara & Ayalew, 2016).

Livestock are integral components of the Ethiopian farming systems and perform multiple functions at different levels of aggregation. At the individual level, livestock production constitutes an important source of food (milk and meat), income, services (transportation), and manure (for soil fertility management and as fuel). Livestock have also social and cultural values among producers, particularly pastoralists (Berhanu et al., 2007).

Nowadays, the pastoralists in the dry lands such as Afar, Somalia, and Borana are decreasing the number of cattle and sheep and increasing the number of camels and goats (because of their remarkable capacity to adapt to severe drought) in their herds as a strategy to improve their livelihoods and adapt to climate change (Cherinet et al., 2022). Because of the dry lands that cannot be utilized for crop farming but which are favorable for small-scale livestock production, such as sheep and goat rearing (Giorgis. et al., 2018).

2.4 Goat Production System in Ethiopia

In Ethiopia, small ruminants are raised in systems of mixed crop-livestock and pastoral/agro-pastoral production, wherein there are more than 42.92 and 52.46 million heads of sheep and goats,

respectively (Mijena & Getiso, 2022). As Kulu looked in 2020, there are two goat production systems in Ethiopia: the mixed and pastoral system and the agro-pastoral system.

The country's highlands and midlands are used for mixed livestock and agricultural cultivation. Some goats with very modest flock sizes are part of the system to produce meat and earn money. The main feed sources in this production system include natural pastures, crop leftovers, industrial byproducts, and tree legumes harvested using a cut-and-carry method. Water is plentiful in this production system, and goats can live with their families or in separate quarters. As the human population increases and land holdings decrease, goats' population and relative importance in these systems increase (Solomon. et al., 2014).

The largest numbers of small ruminants (40 percent of sheep and 40 percent of goats) are located in arid and semi-arid agro-ecological zones, which are home to pastoral and agro-pastoral production systems (Negassa and Jabbar, 2008).

In Ethiopia, goats are distributed in all agro-ecological zones that are well-known for their comprehensive production techniques (Tade & Melesse, 2023). Flock sizes are bigger in the lowland mixed crop-livestock and pastoral and agro-pastoral systems (Solomon et al., 2010). Goats are among the primary livestock species raised in the dry lowlands, where nomadic pastoralism is the norm. Goats are also essential for highland farming methods (Solomon et al., 2014). Aberegelle goat breed is one of the rift valley goat families, and it is extensively found in low-lying places. of Wag-himra and Raya areas in North Wollo and around East Bellessa in Gondar (Walle et al., 2023). The main fodder resources for goats are natural pastures, crop residues, local fodder trees, shrubs, roads and riversides, and others (Tade & Melesse, 2023).

2.4.1 Purpose of Goat Production in Ethiopia

In Ethiopia, compared to larger glowing animals, smallholder farmers choose small ruminants due to their lower investment requirements, shorter production cycles, faster development rates, and increased environmental tolerance. Additionally, they supply their owners a wide range of products and services (Adam Mohammed, 2022).

According to Seid (2017), the majority of goat keepers in the country's dry and semi-arid lowlands kept goats primarily for milk yield, whereas in the country's highlands, they raised goats to generate cash for various uses, such as emergency situations and numerous family needs. As reported by

Desta. et al. (2020), who found that the main motivation of the majority of small ruminant keepers is obtaining additional income through sales that is used to buy basic food and clothing, pay children's school fees, and finance agricultural or subsidiary activities. In addition, their ability to resist drought and disease, generate income quickly, and reproduce quickly ensures sufficient food resources. In addition, their ability to resist drought and disease, generate income quickly, and reproduce fast ensures enough food resources. The study of Wendimu et al. (2018) also revealed that the goat owners kept their goats to generate income as the primary purpose in all sampled districts of the study area.

In east Amhara, income, meat, and saving were ranked as objectives of goat production along all districts of the study areas (Teklewold, B., 2022). In southern Ethiopia, raising small ruminants is primarily accomplished for financial gain, security, and holiday slaughter (Shigute & Anja, 2018). The finding of Tegegn et al. (2016) also stated that goats are kept for a number of purposes, such as income, meat, savings, wealth preservation, and cultural rituals; nevertheless, the main purposes for which they are kept are income, meat, and orderly.

2.5 Role of Goats in Rural Livelihood Security

The economic importance of goat farming has increased in the last decades around the world, predominantly in countries that are routinely exposed to harsh environments (Darcan & Silanikove, 2017). Moreover, numerous research and development initiatives throughout different countries have shown the value of goats in reducing poverty and fostering sustainable livelihoods, particularly in rural areas (Senait, 2012). Goats can also play an important role in supporting the four pillars of food security and enhancing global food supply and human nutrition, therefore improving food and nutrition sustainability (Lu, 2023). Goats have also taken on a more prominent role in storing food in the form of meat and moving across space and through seasons (Nori et al., 2008).

Goats play a vital role in the livelihoods of millions of small farmers and the landless by fostering the expansion of agriculture and livestock assets (Devendra, 2015). Small-scale farmers, especially those in remote areas, and the landless are gradually recognizing the potential of goats as a low-cost solution to their poor resource endowments. Therefore, goats deserve greater attention at both the macro and micro levels (Peacock, 2005). Goat "power" is an animal that is peculiar to an agro-ecological zone, resilient to climate change, and tolerant of high temperatures. It also plays a

multifaceted role in promoting gender equality in this region and helps to ensure food security in rural regions with limited resources by maintaining productivity (Assan, 2021). They also serve as a coping mechanism against shocks and as a store of value in the absence of formal financial institutions and functional markets (Tegegne & Feye, 2020).

In Ethiopia, small ruminants have become increasingly important in the animal production of rural households. This is due to farmers recognizing that small ruminants provide alternative opportunities to increase their incomes (Desta. et al., 2020). It contributes to the country's export earnings and livelihoods of producers, especially poor rural families that provide meat, milk, cash, skins, compost, and protection (insurance), as well as banking services and gifts (Adam & Mohammed, 2022). In Ethiopia, the majority of smallholder farmers and pastoralists raise one or more goats for food (meat, milk), income, dung, wool, and skin production, as well as to serve many roles in their religious and cultural lives (Aynalem et al., 2020). According to Hasen and Tesfaye (2014), goats are valuable in communities with limited resources because they offer a variety of practical advantages, including flesh for domestic use, financial income from animal sales, manure, skins, and fiber. They also provide intangible benefits like insurance, savings, and sociocultural goals (Tadesse et al., 2014). Goats are becoming more and more important in helping Ethiopian rural residents improve their standard of living and income (Kocho et al., 2011).

According to Regasa & Musa (2019) in Karrayu Pastoralists of Ethiopia, the pastoralists, who suffer severe financial constraints as a result of their restricted options for a living, small ruminants like goats and sheep have been found to have greater economic significance. The case study by Peacock (2005) found that in Ethiopia, during the severe drought of 1999–2000, households with livestock to sell were able to buy food grain and hold on to the drought without resorting to food aid handouts. Thus all benefits of goats help to achieve Ethiopia's green economy initiatives, which consider goats as the most important component of the process of building a climate-resilient economy (Yitayew et al., 2023).

Many scholars assured that goats play a significant role in rural livelihood improvement in developing countries. For instance, a study demonstrated by Nedumaran (2023) reports that people and households can improve their nutrition, income, and resistance to economic shocks through judicious management and investment in goat farming. Goat production has the potential to

significantly contribute to household income given the ever-increasing local and regional demands (Byaruhanga et al., 2014).

A study by Adeleye et al. (2016) in Nigeria showed that the perceived effects of goat rearing on the level of living of the women in the study area were positive based on increases in savings, income, household food security, and household assets reported by a large majority of the respondents. As finding of Haque et al. (2023), considering all the parameters related to livelihood, it was clearly found that the socio-economic status of goat farmers was improved through goat rearing. Goat farming has become a profitable business because it requires low investment as well as being an effective instrument for poverty alleviation and also women's empowerment for the rural poor.

According to Acosta et al. (2021), finding the contribution to income of livestock portfolios differs by animal species and income quintile. The income contribution of different animal species (as per the first five coefficients), under quintile one, varies between 5% and 11%, except for cattle, which contributes approximately 2%. The species that contribute the most to the income are goats, followed by poultry, pigs, sheep, and finally cattle.

Because of their flexibility, goats have adapted to virtually every climate on the planet; overall, they appear to withstand drought better than other livestock's and have higher survival rates under drought conditions (Lebbie, 2004). Due to this, the goat population has continued to proliferate in the harshest agro-ecological regions (Assan, 2021).

2.6 Goats Contribution to Livelihood Assets

The role of goats is relevant to food and nutrition sustainability, economic sustainability, and environmental sustainability (Lu, 2023). Goats for many people represent their main, or only, asset and, as such, deserve protection both through good husbandry and veterinary care and, wherever possible, insurance (Peacock, 2005). Due to the progressive goat meat demand and flexible markets, goat is often the most significant source of income and store of wealth in the rural economies where the animal is considered a liquid asset, easily realizable into cash in times of drought or other natural calamities (Kumar et al. 2010). Goat meat is gaining popularity in the world due to a growing demand for lean and nutritious meat. Meat is one of the essential elements of the human food pyramid that provides the necessary nutrients, such as fats, proteins, and some micronutrients (Wyness, 2016).

Beyond its economic possibilities and use to meet the daily nutritional demands, goat's milk has qualities that make it suitable for children, adults, and lactating mothers (Fernández, 2017). Goat milk proteins are unique in their nutritional and functional properties and have become increasingly popular in recent years (Alkaisy et al., 2023). The report of Tiwari et al. (2022) stated that goat's milk is a valuable source of nutrition, especially in regions where cow's milk is not easily accessible or commonly consumed. Increased crop growth rate, yield, ability to tolerate stressful conditions, and product quality in relation to the application of goat manure have been widely reported by Nweke et al. (2013).

2.6.1 Financial Capital

Goat production has overcome most of the financial constraints of small holders, and the animal occupies a multi-functional position in rural livelihoods (Day et al., 2008). According to Singh & Jain (2023), the financial role of goats in India was expressed as the poor man's mobile bank because it gives the money at any time to the farmer, which means marketing facilities are available all over India. In other words, much 'successful' livestock development has relied on the provision of credit to enable poor people to acquire livestock or new breeding stock (Peacock, 2005).

2.6.2 Social Capital

Households with a herd of goats have created a habit of using milk donations to access resources and improve their social status in the community (Lähde, 2021). According to Peacock (2005), goats provide their owners with a broad range of products and socio- economic services and have played an important role in the social life of many African people, being used as gifts, dowry, in religious rituals and heritage. The study of Lebbie (2004) also highlights the social benefits of goats in certain cultures, where they are used for bride price payments, important rituals, and as sacrificial offerings for esteemed visitors.

2.6.3. Human Capital

The main human capital value that goats provide is nutrition (Senait, 2012). Animal products and by-products in the form of milk, meat, honey, cheese, eggs, and butter provide the necessary animal protein to improve the nutrition of the people (Yosef, 2018).

Goat production has a significant role in the income generation and household nutrition of landless, small, and marginal farmers in agro-pastoral subsistence societies (Lähde, 2021). Inversely, access to high-quality skills and efforts is key to transforming the traditional method of animal production

into market production efforts (Adam Mohammed, 2022). It is important to target women and children in goat productivity improvement programs that intend to improve household nutrition and income (Byaruhanga et al., 2015).

2.6.3 Natural Capital

Goats may be able to contribute to sustainable development in an eco-friendly environment all over the world if local initiatives are successful in promoting quality labels and cutting-edge cheese, meat, and fiber products (Singh & Jain, 2023).

Manure and urine from goats are an invaluable source of organic fertilizer for maintaining or improving agricultural production (Lebbie, 2004). The average daily manure production by livestock in Ethiopia (kg DM per TLU/day) is estimated at 3.3 for cattle, 2.48 for sheep and goats, and 2.40 for equine (Tegegne & Feye, 2020). In the mixed crop-livestock system, manure is collected and used as fertilizer in crop fields or dried and stored for use as cooking fuel (Abebe, 2012).

2.7. Role of Institutional in Goat Production

The degree of application of modern technologies and marketing support strategies has a significant impact on the rate of production advancement and farmers' income. According to Berhanu et al., (2007) government policies such as those pertaining to input supply, market conditions, finance availability, and pricing have a significant impact on the appropriation of better developments.. This lack of institutional support has hindered the growth and development of the goat farming industry.

Many scholars indicate that these institutions play a key role in goat production system for example; positive result was recorded in dairy goat production of Kenya (Kikwatha et al., 2021). Providing the farmers with timely access to information on improved technologies, inputs, markets, and credit would be an important step in overcoming different constraints in goat production (Kumar et al., 2010). Moreover, Institutional, policy and regulatory supports are fundamental and the basis for all other strategic interventions (Solomon et al., 2010).

In some cases, the projects ended fruitlessly due to a lack of clear targets aligned with production environments, genotype incompatibility with farmers' breeding objectives, management methods, and an absence of involvement by all stakeholders (Seid, 2017). Institutional support in sheep and

goat production in Ethiopia is largely limited to health services, and there are no private or governmental enterprises or cooperative associations working on livestock marketing and input supply (Solomon et al., 2010). According to Solomon et al. (2014), different institutions in different parts of the country are working to develop goat production and productivity (both governmental and nongovernmental organizations). The intervention primarily aimed to improve growth rate and milk yield by crossing exotic breeds (Giorgis & Assefa, 2018). Efforts are underway to link dry land producers with good marketing outlets to get inputs for livestock production and for their trading products. A deliberate effort must be made to design and carry out an appropriate and sustainable breeding program. Undoubtedly, a community-based breeding program with native breeds that have been adapted will boost and maintain goat productivity in the nation to satisfy the demands of the nation's expanding human population (Seid, 2017). In order to enhance the potential of goat production as a strategy for alleviating poverty in rural communities, relevant efforts should be made by the government and other concerned agencies to raise awareness on goat production through radio and extension advisory services (Adeleye et al., 2016).

2.8. Constraints of Goat Production in Ethiopia

The barriers that hinder livestock development are broadly categorized into environmental, infrastructure, technical, institutional, and policy. Technical constraints in livestock production include poor nutrition, high prevalence of diseases, poor genetic resource improvement and management, and poor market infrastructure (Tegegne & Feye, 2020).

Even though goats have been utilized by humans for thousands of years in a variety of situations and for a wide range of purposes, until recently, public and academic support for goats was lower than that of other animal production sectors (Dubeuf, 2022). In Ethiopia, despite the size of the goat population in the country, the productivity and contribution of this sector to the national economy are low. Gobna, (2016): Zero et al. (2016). Subsistence livestock farmers adopt broad production goals that are motivated more by their immediate subsistence needs instead of the demands of a market (Ayalew et al., 2001).

According to Belete (2016); Alemu (2015); Gatew et al. (2015), finding drought, feed shortage, disease, and a lack of nourishment, these entire impacted goat productivity in different parts of Ethiopia. Lack of feed, sickness, parasites, unstable markets, highly predatory breeds with lower genetic productivity, acute water scarcity, and a severe labor shortage all have a significant impact on goat production (Gobena, 2016).

According to Chiemela et al. (2018) finding, including feed shortages caused by prolonged drought resulting in below-average rainfall, which causes feed and water shortages, causing nutritious vegetation to be quickly eaten up and later animals to eat the rejected residual. Another difficulty is the lack of improved technologies and inputs to transform traditional subsistence goat farming into market-oriented production and the inefficiency of institutional support for goat production (Friat & Haben, 2020). Goat production was largely affected by food shortages, diseases and parasites, market depressions, low genetic production, and severe water shortages (Adam & Mohammed, 2022). The low market participation of pastoral livestock producers is also a challenge to the development of a climate-resilient economy in drought-prone areas (Yitayew et al., 2023). To improve the production system Poor institutional support, weak organization of farmers', incompatible cooperative society proclamation to the CBBP, and shortage of incentives to participant farmers are identified as main challenges of the CBBP (Bruh & Mezgebe, 2020).

2.7 Conceptual Framework

In this study, the SL approach was preferred due to the fact the fact that the approach places priority on the livelihood systems of the poor and the ways in which the poor adapt to maintain their livelihoods under conditions of severe environmental, economic, or political stress (Butler & Mazur, 2007). A sustainable livelihoods framework can be used in both planning new development activities and assessing the contribution to livelihood sustainability made by existing activities (DFID, 2000). In spite of this, the Sustainable livelihood framework is adopted as a conceptual framework to discuss the role of goat production on rural livelihood security. Since the lives of subsistence farmers revolve around goat production, which provides wealth and sustenance. The impact of drought, seasonality, and trends on the vulnerability context in the study area is shown to affect farmers' livelihood activities, such as farmer raising goats.

This study conceptualized both goat keepers' access to livelihood capital and the manner in which goat production functions as a form of livelihood asset. How goat production serves as a livelihood asset involves looking at income generation and other dimensions. Using the above model, the role of goat production is examined as financial, social capital, human, and natural assets. Under financial capital, the researchers examine the monetary benefits derived from goat production. More importantly, the viability of goat-related activities was explored by examining the income earned from goat sales and its product. Though social capital was not easy to measure, the researcher examined social assets by analyzing those formal and informal institution structures that

goat farmers might draw upon in times of severe drought as well as the entire production system improvement. Examine the social interactions and networks fostered by goat production. Investigate the role of goat farming in building social cohesion within the community. Social networks and relationships within the community contribute to the exchange of knowledge and best practices in goat production. Goat's contribution to human capital services such as meat, milk, and skin. The main human capital value that goats provide is food and other basic necessities, which are obtained by selling goats. The nutritional value of animal products to overcome malnutrition has been thoroughly studied.

The other livelihood capital available to farmers determines their ability to invest in goat production. Such human capital, including the skills and knowledge of farmers, plays a crucial role in successful goat production. Farmers with adequate training in animal husbandry, health management, and breeding practices are better equipped to address challenges and optimize productivity.

These conceptual frameworks explore the benefits and challenges of goat production activity associated with improved access to service supply from any institution, such as availability of credit, training, health care, market, and climatic information.

This brought out the role played by the above-mentioned institutions in the livelihood strategies of the goat production system that farmers pursue in order to achieve certain livelihood outcomes, e.g., more income, increased wellbeing, reduced vulnerability, or coping with climate change.

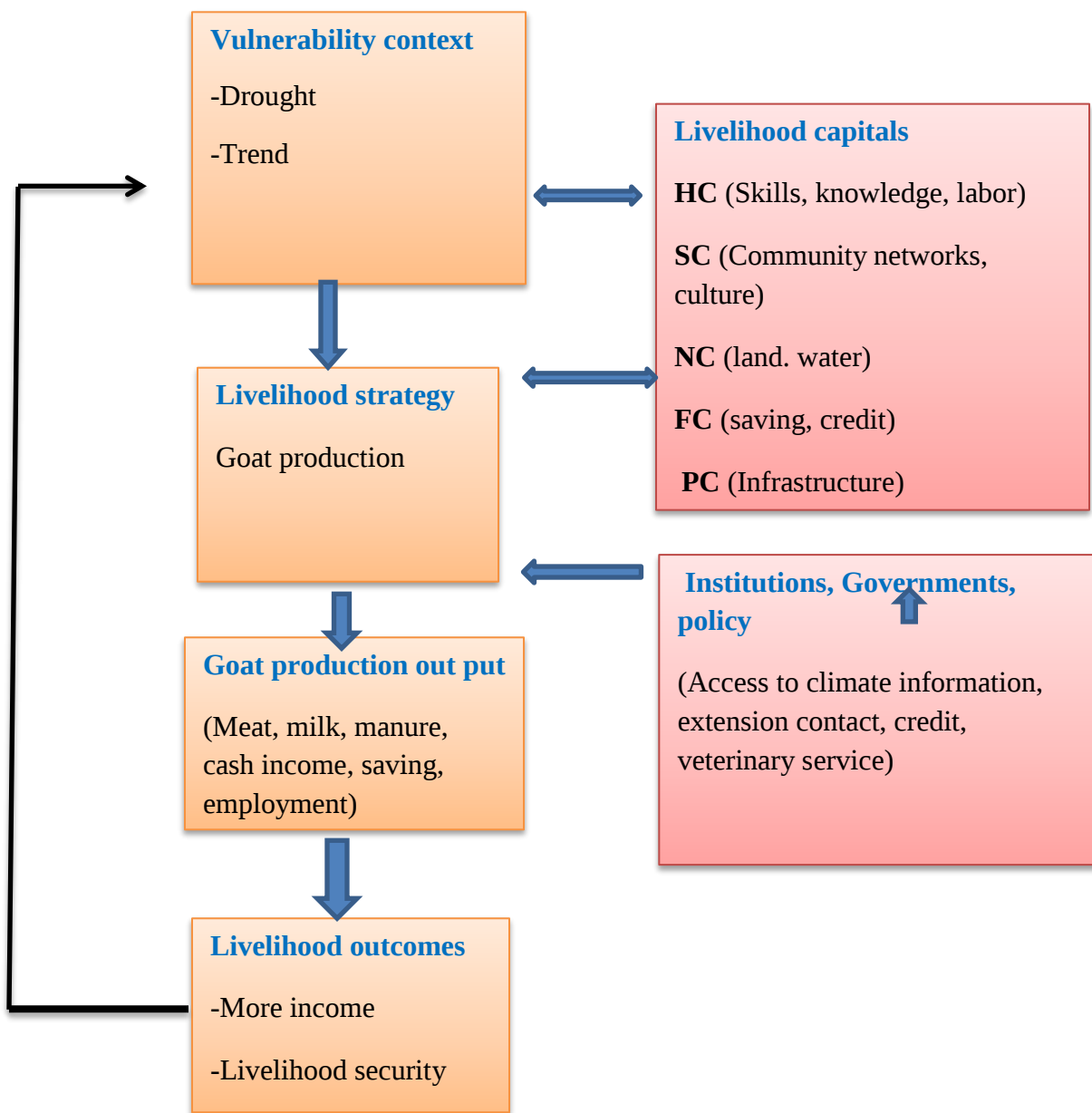


Figure 1. Conceptual farm work of the study

Source: adapted from (DFID, 2000)

Key: HC= Human Capital, SC= Social Capital, NC= Natural Capital, PC= Physical Capital, FC= Financial Capital

CHAPTER THREE

3. DESCRIPTION OF THE STUDY AREA AND METHODOLOGY

3.1. Description of the Study Area

3.1.1. Geographic Location

The study was carried out in Abergele district which is located in the Waghimra Zone of Amhara region of Ethiopia. It is bordered by Beyeda (west) and Tselemt (north) districts of the North Gondar Zone, by Sehalu (west), Ziqualla (south), and Sekota Zuria (south) districts of Waghimra administration, and by Tigray national regional state (north and east) (Abebaw et al., 2013a). The district is Located at 13°20' N' latitude and 38°58' E' longitude (Mihiretu et al., 2018).

3.1.2. Topography

Abergele district has an area of 176,664.56 hectares, which is characterized by rugged topography including mountains, steep escarpments, and deeply incised valleys. It is basically classified as plain (10%), undulated (20%), mountainous (55%), and gorge/valley (15%) (AWAO, 2020). The altitude ranges from 1150 to 2500 MASL, while the mean annual temperature and rainfall range between 23–43 °C and 250–750 mm, respectively (Mihiretu et al., 2018).

3.1.3. Climate

The district is characterized by arid and semi-arid climatic condition (Belete, 2016). The mean annual temperature and rainfall of Abergele district ranges between 23–43°C and 250–750 mm, respectively (Mihiretu et al., 2018). It is one of the most drought prone area of waghimra zone which occurs moderate to extreme drought events ($SPI < -1$) happen at every 5–8 years interval in the study area (Alemu. et al., 2023).

3.1.4. Population Size and Economic Activities

The total population Abergele district is 58207 of which 29220 are male while 28987 are female (AWAO, 2020). The woreda has a low population density, with settlements scattered sparsely. Abergele district has a total potential of 35,116.6 hectares for crop farm agriculture of which 16,364.05 hectare of land is under cultivation (AWAO, 2020)).

The dominant crops grown in the area were sorghum, sesame, teff, and haricot bean. Farmers also produce honey and rear goats (Alemu et al., (2015); Tewodros Alemu et al., 2013). Agricultural activities are dependent on a remarkably short rainy season that lasts not longer than 2 months: July and August (Ademe et al., 2019). Due to erratic rainfall and poor soil fertility, crop production is limited to a few pockets with relatively fertile soil and moderate moisture. (AWAO, 2020). In the low-lying areas, almost all of the unused land remaining comprises stony, steeply sloping, shallow soils of low fertility that would be unlikely to provide significant additional income (WSTP, 2016). Recently, irrigation agriculture has started to emerge in certain pockets along riverbanks. For example, in Saziba, the average irrigable landholding ranges from 0.125 to 0.375 hectares. Farmers majorly produce onion, tomato, and sugar cane using irrigation (Tewodros et al., 2022).

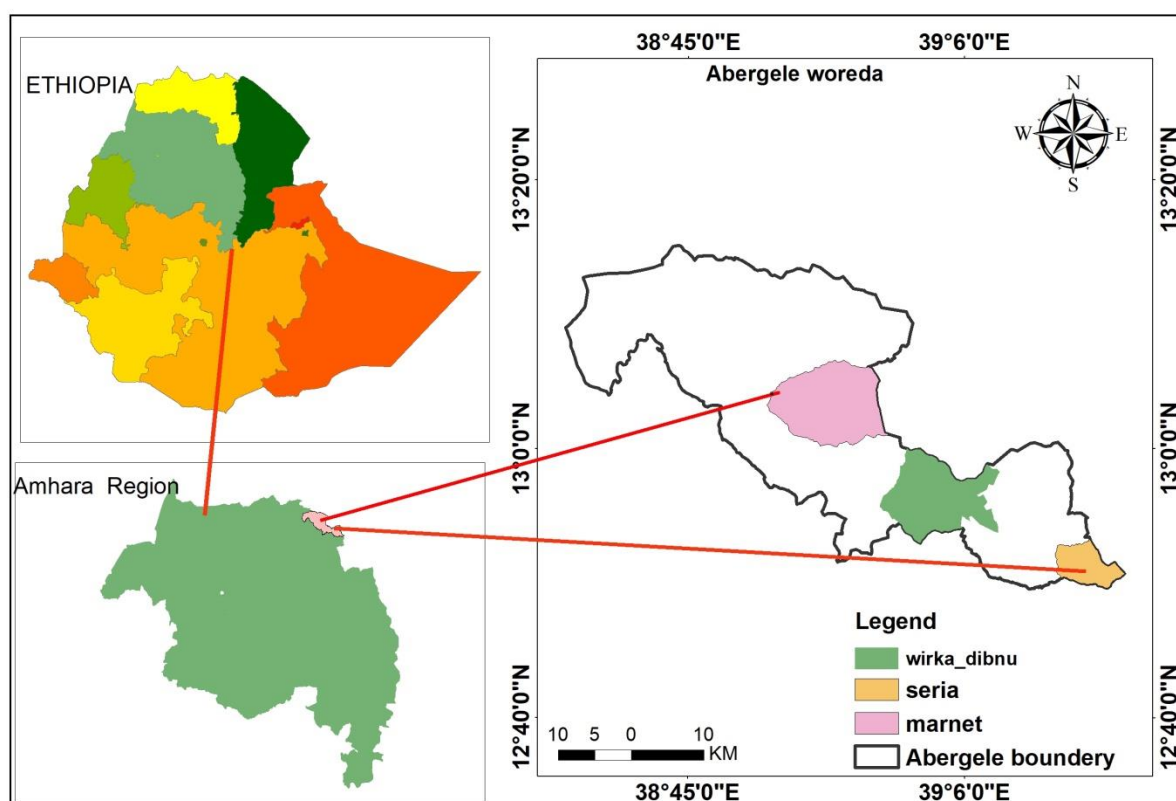


Figure 2. Map of the study area

Source: by the researcher developed.

3.2. Research Design

Research design is described as a framework of methods and techniques chosen by a researcher to combine different components of research in a reasonably logical manner so that the research

problem is efficiently handled (Khanday, 2019). Therefore, in this study, the role of goat production in improving rural livelihood was investigated using a cross-sectional survey research design. This design is used because it facilitates the gathering of a wide range of data from the study population at one particular moment (Polit et al., 2001).

3.3. Research Approach

In order to answer the aforementioned research a question, this study was employed a mixed research approach. Mixing research method cannot be fully understood by using only qualitative or quantitative methods (Dawadi et al., 2021). This makes a study more valid by looking for correlations between quantitative and qualitative data (Louise Doyle, 2009). In addition MMR approach allows researchers widen their inquiry with sufficient depth and breadth (Dawadi et al., 2021).

3.4 Types and Sources of Data

In this study, both qualitative and quantitative data types were collected from both primary and secondary data sources. The main source of primary data were sample respondents from total households through questioner, key informant interview focus group discussion, and the secondary data was collected from both hard copies and online materials such as published and unpublished articles, project reports, kebele official report, and other data available at district, zonal, regional, national, and international levels. In addition, the socio-economic background of the study was collected from Abergele woreda different government sectors for planning, monitoring, or evaluation that had previously been collected by the woreda administration, and agricultural development. Secondary data that can be used in this research was to support the primary data collected.

3.4 Sampling Technique and Sample Size Determination

To select the appropriate sample size and study units, in this study a multi-stage sampling technique was employed. First, Abergele district was chosen using a purposive sampling method based on consideration of the potential of the areas in goat production and their socioeconomic importance. Secondly, three kebeles were selected among the 17 kebeles by using stratifying the kebele based on diverse agro-ecologies zones.

Finally, the sampling frame for this particular study comprises all male and female farmer households who are found within the study kebeles. Goat farming households were the basic sampling unit for this study, through a statistical formula by Yamane (1967). In this study, 278 households were selected randomly from the three kebeles. The numbers of households to be selected from each of the three kebeles were based on probability proportional to sample size. The selection of starting point from the farmer's list sourced from each of their kebele was through the lottery method. Based on their interest and prominence in the subject matter, participants were selected for focus group discussions (FGDs). Information on household demographic characteristics, socioeconomic activities, goat production system, challenges, institutional structure, and access to them by households was collected. Further, information on numbers of goats kept, goat products obtained, proportions of products consumed and sold, sale prices, other income sources, amounts, and available resources such as land and other livestock species was also collected.

3.5 Sample Size Determination

Sample size determination is the mathematical estimation of the number of subjects or units to be included in a study (Simarjeet, 2017). Goat farmers were randomly selected from each of the three kebele, which gave a total of 278 respondents. From the requirements included, three of the samples kebele are Wirkadiebnu, Marnet, and Seria Kebele. Since households were selected from those kebeles based on proportionate stratified random sampling technique for a structured household survey. Under this technique, the target populations from three kebeles were calculated using the Yemana (1967) sample determination formula by taking the names of the population from the registration book of the kebele that comprises the list of farmers. Then the sample sizes of each kebeles were calculated by proportional allocation formula.

$$n = N / (1 + N (e)^2)$$

Where, n = the sample size,

N = t target population size

e = error term, the estimate should be within 5% of the true value (0.05)

Therefore, the sample size will be

$$n=906/(1+906(0.05)^2)$$

$$= 906/(1+2.26)$$

$$= 906/3.26= 278$$

Table 3.1 Sample households by Kebele

Rural Kebeles	Agro ecologic al zone	Total household head**			Total Sample household head *
		M	F	Total	
Marnet(01)	Kola	141	35	176	55
<i>Wirkadiebnu(03)</i>	<i>Kola</i>	356	27	383	117
Seria(09)	Weyna dega	315	32	347	106
Total		812	94	906	278

*

*Obtained Depending on the above Sampling Technique

**Obtained from Basic data of selected kebele administration

Source: computed based the formula

3.6 Data Gathering Instruments and the Procedures

Data collection tools are methods used to obtain data from a population or sample. The procedures, on the other hand, are the processes or mechanisms adopted, using the tools, to solicit the data

(Nyariki, 2009). In this study data was collected using household surveys, key informant interviews, focus group discussions and personal observation.

Questionnaires

In this research, the use of questionnaires was the basic tool that suits the magnitude of the research problem. These helped to provide quantitative information such as demographic issues, data on various aspects of goat production, such as income generation, herd management practices, constraints of goat's production, and others. In this regard, a structured questionnaire that includes both closed- and open-ended questionnaires' was designed and employed to generate quantitative and qualitative data from the respondents.

Key Informants Interview

The other method of gathering data for this study was qualitative semi-structured interviews. According to Holland & Edwards (2013), to get the answers to the research questions that they are interested in, semi-structured interviews must be based on an interview guide that covers the subjects that the writers want to explore. Therefore, to conduct semi-structured interviews to gather in-depth qualitative insights, key informants were selected from goat farmers, experts, and administrative bodies. These key informants in the ward include goat farmers, woreda agricultural office agents, and Kebele-level administrative bodies. The interviews were carried out on a one-to-one basis, allowing an in-depth analysis of the subject.

Focus Group Discussions

A focus group discussion can be defined as "a group of people chosen and assembled by academics to discuss and provide their own perspectives on the issue under investigation" (Powell et al., 1996). In this study, focus group discussions were performed with goatkeeper headmen and women's participants within each of the selected kebeles. Participants were selected from different age groups, genders, and social statuses, and the focus group discussion (FGD) was held together with men and women. The number of participants in each focus group discussion ranged from eight to 10 members who are purposefully selected in consultation with experts and local administrative bodies. Through FGDs, information was collected on the goat production system, which facilitates group interactions and captures collective perspectives on the role of goat production.

Field Observation

Goat husbandry practice, major feed resources, and any other event pertaining to investigations were observed to strengthen the information obtained by using the questionnaire. To take the record, the researcher took short transect walks with targeted households in the area to make observations on the conditions like the pastures, markets, and goat husbandry practices and aspects such as breed, feeding practices, labor force, and overall management.

3.7 Data Analysis

After collecting the required information from primary and secondary sources, the data analysis was carried out. The quantitative farming data was entered, cleaned, and analyzed by using the Statistical Package for Social Scientists (SPSS), version 22. In this study, both descriptive and inferential statistics were used for analyzing the collected data. The descriptive statistics such as mean, averages, and frequency distribution were used to summarize the socio-demographic characteristics of the rural goat-farming households. Descriptive statistics such as frequency, percentages, mean, standard deviation, and cross-tabulations were used to analyze the quantitative data for the first and fourth objectives. Inferential statistics such as chi square, Pearson correlation, and independent sample t tests were used to analyze the quantitative data.

The index ranking method was used to identify goat production constraints by assigning numerical values based on severity. This helps to prioritize key issues, providing a quantifiable measure for decision-making and resource allocation to address critical challenges. The formula used to calculate the index ranking is: $\text{index} = (\Sigma \text{ of } [3 \text{ for rank } 1 + 2 \text{ for rank } 2 + 1 \text{ for rank } 3] \text{ for a specific goat constraint}) \text{ divided by } (\Sigma \text{ of } [3 \text{ for rank } 1 + 2 \text{ for rank } 2 + 1 \text{ for rank } 3] \text{ for all goat constraints})$. The output of the data analysis was presented in the form of tables and pie charts.

3.9. Ethical Consideration

Ensuring the safety of human subjects in research studies requires the implementation of appropriate principles of ethics. This research was employed depending on the research ethics, i.e., the names of the respondents were not being listed during the data gathering and interpretation process. The selected study participants were requested kindly whether they agreed to participate in the study or not. Permission was assured from each respondent, KIIs, and FGD discussants. Ethical considerations were seriously taken into account so that the concern, integrity, consents, and other human elements of the participants and interviewees are protected. Before collection of respondents

ideas, data collectors were informed of the purpose of the study and the responsible body of the study. Similarly, before the beginning of the focus group discussion and key informant interview, participants were token-oriented on the ultimate objective of the study and gave their view on a structured question.

3.10 Data Validity and Reliability

Checking the reliability and validity of a questionnaire is crucial to ensure that the data collected is accurate, consistent, and measures what it is intended to measure. In order to check data validity and reliability the constructed questionnaire were well reviewed to verify the relevance and representativeness of the items. Researchers were assessing whether the questions are easily understandable, avoiding jargon or complex language that may lead to misinterpretation. Before full-scale implementation, this study conducted a pilot test with a small sample to identify potential issues with wording, comprehension, or ambiguity. Then analyze the pilot results and make necessary adjustments to improve the clarity and appropriateness of the questionnaire.

In this study, the validity of the research results was increased by applying more than one method. This involved employing the interviews, focused group discussion (FGD), and the documents. The results obtained from the interview were therefore cross-checked with the FGD method and then the documents. Cronbach's alpha is the most commonly used measure of reliability the result found to be for the nineteen questions of the Cronbach's alpha obtained was 0.71.

CHAPTER FOUR

4. RESULT AND DISCUSSION

4.1. The Socio-Economic Characteristics of Respondents

The socio-economic characteristics discussed include: gender (sex), age, marital status, educational level and household size. Generally knowing household socioeconomic information is vital to the nature and effectiveness of any research or development activity for intervention and policy design, technology adoption, extensions, policy analysis, evaluation, training, and other purposes (Vinicio et al., (2015).

4.1.1. Sex and Age of the Respondent

Sex and age distribution of small-holder goat farmers in the study area was an important factor considered and studied and is presented in Table 4.1. As indicated in Table 4.1, the majority 202 (78.6%) of the respondents were males, while the rest 55 (21.4%) were females. This suggests that goat production activities are mainly reared by men-headed households, even though they are performed by females in small amounts. This result is in line with Desta (2019), who reported 81.2% of the respondents in Tahtay Adyabo District, northern Ethiopia, were males. The case of variation may be due to social, cultural, and economic factors, but this gives rise to gender inequality and needs to be corrected through continuous awareness creation (Obosha, 2020).

The survey indicates that the minimum age of respondents was 20 years old, while the maximum was 78 years old. The majorities (87.5%) of the respondents were in the age category of 20–60 years, and the mean age was 45.37 years. The majority of respondents fall within the active working age group (15-55 years), which presents an opportunity to effectively undertake various agricultural activities (Tassew and Seifu, 2009).

Understanding the gender distribution across different age levels could help in formulating targeted interventions to address the specific needs and participation of both males and females in various activities. The age of respondents (20–40) years was observed to be a larger proportion of males ($n = 74$) compared to females ($n = 21$). In addition, the age group (41–50) also has the highest number of respondents, with males ($n = 55$) significantly outnumbering females ($n = 24$).

Table 4.1. Cross tabulation of sex and age of the respondents

Age of the respondent in year	Sex of the respondent		Total	Percent
	Male	Female		
20-30	34	8	42	16.3%
31-40	40	13	53	20.6%
41-50	55	24	79	30.7%
51-60	46	5	51	19.8%
>61	27	5	32	12.5%
Total	202	55	257	100%

Source: Researcher survey results, 2024

4.1.2 Marital Status and Family Size of Respondents

An assessment of the result of the analysis in Table 4.2 indicates that the majority of the respondents 235 (91.4%) are married, while the rest 3.9%, 2.7%, and 1.9% are single, widows, and divorced, respectively. The distribution generally shows that there were more married respondents than their single, divorced, or widowed counterparts. Though marital status may not have a direct and universal relationship with goat production, in Ethiopia family labor is often vital in smallholder farming and livestock production. Married couples or families may have more hands to help with activities like goat herding, feeding, and health management. With regard to family size, the majority, about 70.5% of them, has family size between 4 and 7, and a small percent (16.3%) of the sampled respondents has family size between 1 and 3. The remaining 13.3% of the sampled respondents had a family size greater than 7. The mean family size of the surveyed households was 5.43, with a minimum and maximum of 1 and 9, respectively.

Table 4.2.marital status of respondent

Status	Frequency	Percent
Single	10	3.9
Marred	235	91.4
Widow	7	2.7
Divorce	5	1.9
Total	257	100.0

Source: Researcher survey results, 2024

4.1.3 Education Level of Respondent

Education is one of the most important parts of our lives, but the probability of having an education is dependable. Regarding the educational status of the respondents, about 86.8% of the respondents were uneducated, and the rest, 13.2%, were found at different stages of literacy ranging from elementary to high school grade levels. This distribution could possibly affect the improvement of the production system. The high proportion of literate respondents presents an opportunity for easier training and adoption of improved livestock management practices and other agricultural activities (Tassew and Seifu, 2009).

Table 4.3 Educational level of respondent

educational level	Frequency	Percent
no read and write	223	86.8
Primary education	28	10.9
Secondary education	6	2.3
Total	257	100.0

Source: Researcher survey results, 2024

4.1.4 Land and Livestock Holding of the Respondent

Usually land is crucial in goat production and can directly influence the availability of essential resources like pasture and forage. The mean land holding size of the household was 1.02 hectares, with a maximum of 2 hectares of land. The mean livestock holding of the surveyed households was about 3.7 TLU (tropical livestock unit), with a maximum of 12.8 TLU based on Storck (1991). Cattle, goat, sheep, donkey, and chicken were the major livestock species found in the study areas. A high number of households are managing diverse livestock compositions.

4.2 Accusation of Goats

Modes' of flock entry by respondents for all of flock size were presented in Figure 3. The primary mode of entry was to breed kids on the farm, accounting for 79.0% of respondents. The second most common method was purchasing goats (13.6%) from the nearest available market. The remaining small proportion of acquisition was provided by herd labor, gifts from relatives, and NGO accounting for 5.1, 8.2, and 7.8 percent of sampled respondents, respectively. Acquisition in the form of donations from NGO was relatively an indicator of intervention restocking distribution of the ruminant in this study area. Goat gifting to the poorest community is very important for livelihood improvement, poverty alleviation, and developing agricultural initiatives.

A smaller yet important method of goat accession was through herd labor. Herd labor in the study area is historically a means of employment for the poor rural households where labor is exchanged for livestock. Herd labor is a common way of acquiring one thread of a small kid that was bred within his entire rearing period.

Goat acquisition may provide valuable insights for various stakeholders, especially in contexts like agriculture, rural development, or socioeconomic research. The method by which goats are acquired may provide the socioeconomic status of the respondents.

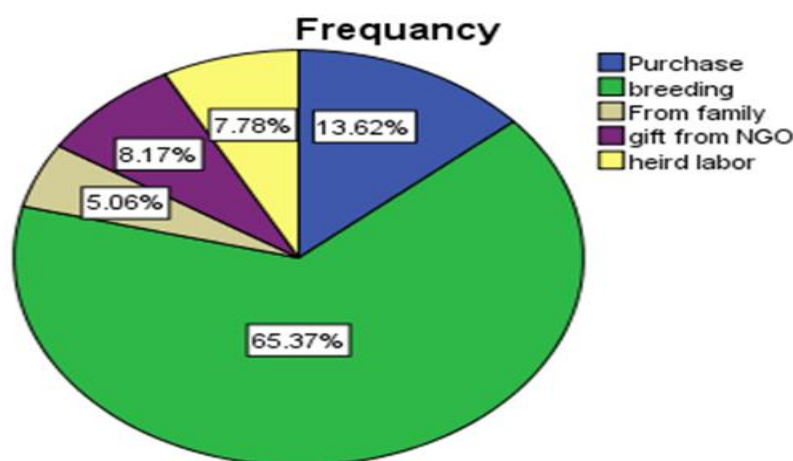


Figure 3. Means of goat acquisition in the study area

Source: Researcher survey results, 2024 frequency

4.3 Goat Flock Size Distribution

In this study, the distribution of flock sizes among sampled households is presented in Table 4.4. Flock sizes vary significantly, ranging from fewer than five goats to more than 80. The average number of goats per flock was 11 for small, 26 for medium, and 58 for large, with an overall average flock size of 23 goats. In this study, about 40.9% of respondents were found owners of small flock sizes, while nearly half (47.9%) of the respondents reared middle-sized goats. While the remaining 11.3% were owners of large flock sizes.

The data on goat herd size changes over the last 5 years highlights significant challenges faced by goat farmers in the area, with the majority of the household (70.0%) implying a decrease in herd sizes. According to the respondent, recurrent drought, the northern Ethiopian war, and its effects on agriculture were recent events that highly damaged farmers of the district in the studied area. Those trends highly hindered the need for targeted interventions to improve goat management practices and marketing. Understanding the flock size distribution helps in designing targeted interventions such as marketing and production facilities.

The findings of this study are consistent with those reported by Tsvuura (2020), which indicated that flock sizes did not exhibit significant growth due to the impact of diseases, malnutrition, and predation. Addressing the underlying factors contributing to the decline in herd sizes, alongside the promotion of sustainable and resilient farming practices, is crucial for enhancing the economic stability and productivity of goat farmers in the region.

Table 4.4 flock size distribution in the study area

	Frequency	Percent	Mean
small flock size	105	40.9	11
middle flock size	123	47.9	25
large flock size	29	11.3	58
Total	257	100.0	23

Source: Researcher survey results, 2024

4.4 Major Feed Sources and Management of Goat

The respondents reveal that natural pasture with certain browse species, crop residue, and house leftovers were the main feed resources of goats in the study area. The grazing area of goats in wet and dry seasons is indicated in Table 4.7. In this study, the most common grazing area in the wet and dry seasons was communal pastures, accounting for 72.4% and 47.1% of respondents', respectively. The results of this study are generally consistent with the findings of Solomon (2007), which identified communal grazing as the primary feed resource for goats. Rearing in own or neighboring crop fields was reported by 52.9% of respondents during the dry season; however, this practice was less common during the wet season. The remaining 26.5% of respondents utilized fallow land as an important grazing land in the wet season. According to the respondents in the study area, goats also grazed on steep mountainsides, which are difficult for other animals to reach and unsuitable for food crop production.

Overall, the analysis suggests significant seasonal variation in grazing areas for goats. This finding is supported by Zewdu (2008), who observed that the quantity and quality of feed resources available for livestock are largely influenced by climatic and seasonal factors.

The variation in grazing areas for goats from season to season in the study area could be driven by the dynamic interplay between agricultural practices, forage availability, and environmental conditions. These seasonal changes in land use and vegetation growth dictate where goats can find adequate nutrition, making their grazing patterns highly adaptive to these factors. During the wet season, agricultural activities are at their peak. Fields are often planted with crops, reducing the amount of open land available for grazing. Farmers restrict grazing in areas planted with crops to prevent damage. Grazing on crop residues was common in dry seasons when fresh forage is scarce. Water sources are more abundant during the wet season, which influences where goats can graze. In the dry season, grazing areas are often near reliable water sources. Dry matter intake and water intake are interdependent, and the suboptimal performance of small ruminants under dry conditions can be partly attributed to issues related to water availability and quality (Ben Salem & Smith, 2008).

The respondent reveals that goats are taken out to graze in the fields every day and allow their goats to roam freely in search of pasture, which is abundant during the rainy season but becomes scarce

during the dry season. The finding is in line with Agossou et al. (2017) in West Africa, who indicated goats often roam freely throughout the day in search of food, a practice that increases their exposure to disease risks, particularly those associated with feeding and nutritional disorders. During the dry season, the quality of available vegetation deteriorates, making it crucial to provide supplementary licks or feed to the flock (Ntuli & Fourie, 2021).

Table 4.5 Grazing /browsing area used during wet and dry season

	dry season		Wet season	
Goats Grazing Areas	Frequency	Percent	Frequency	Percent
Communal Pastures	121	47.1	186	72.4
Own/neighbors crop fields	136	52.9	3	1.2
Grazing fallow land	0	0	68	26.5
Total	257	100.0	257	100.00

Source: Researcher survey results, 2024

4.4.1. Response to Feed Shortage

The data indicated in Figure 4 outlines households' responses to feed shortages among goat owners. In this study, more than half of the respondents, 152 (69.1%), talked about at least one of the measures against the feed shortage problem, while the rest (105) (30.9%) of respondents did not give any coping mechanisms. It is possible to observe that a feed shortage has increased the vulnerability of goat herds to malnutrition and an overall reduction in goat herd size in the study area. This indicates the prevalence of high gaps in knowledge or awareness of the goatkeeper regarding effective strategies to address feed shortages.

The focus group discussant mentioned that the problem with feed shortages for livestock and goats is linked with environmental degradation and drought. Historically, the community had faced recurrent drought, diminishing of forage pasture, and browsing for goats both in quality and quantity undermines the development of the initiatives. This situation poses a serious threat to their livelihoods, as maintaining the health and productivity of their goats has become an ongoing challenge. The goat-keeping households may become more dependent on external aid while undermining long-term sustainability and self-sufficiency.

Among response mechanisms the respondent made, rotational grazing was the most common response, with nearly half (48.6%) of the respondents choosing this strategy. This was a popular strategy where goat owners moved their animals to different areas to find sufficient feed in time of feed or fodder scarcity. But reliance on communal or open-access resources is continued as the only browsing place for goats. Grazing alone is insufficient to support optimal growth of goats, particularly in kids and lambs. About 6.2% of households are involved in selling or slaughtering some goats to reduce the herd size. This strategy may be employed as a last resort when feed shortages are severe. Naturally, while this helps in managing feed resources and reducing pressure on available feed, it also reduces the herd size, impacting future productivity and income. Farm management decisions, such as reductions in herd size, are likely to affect farmers' profits, with direct impacts on the family income, which will increase farmers' mental pressure (Larrondo et al., 2023). Supplementing feed with additional resources (like purchased feed or agricultural by-products) was also a common response, accounting for 14.3% of respondents in the study area. According to the respondents, the major feed sources used for supplementation of goats were salt/local mineral, atela, home refusal, tree legumes, and cutting of canopy trees. Those who do use supplements only do so during the driest months when pasture is unavailable.

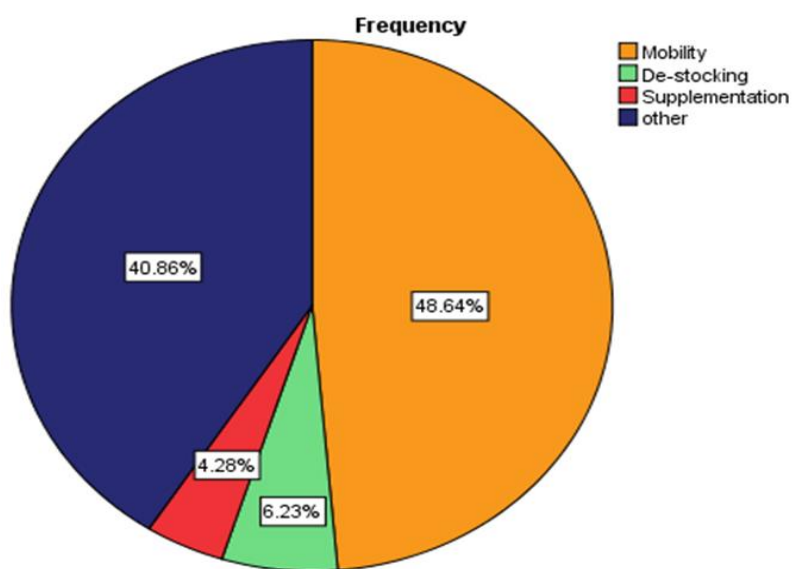


Figure 4. Household response to feed shortage in the study area

Source: Researcher survey results, 2024



Figure. 5 Goat affected by drought and poor quality and quantity of feed.
Source: Photo taken by the Researcher, 20,02, 2024

4.4.2 Sources of Water for Goats

Figure 6 highlights the varied sources of water used for goats across the study area, emphasizing the importance of rivers and springs as primary water sources. Accordingly, rivers were the main source of water for goats across all kebeles, accounting for 64.2% of respondents. This suggests that rivers are accessible and utilized for watering goats, likely due to their proximity and reliability as water sources. While spring and pipe account for 33.5 and 2.3 percent of water for the goats in the study area/

The majority of respondents in the study area water their goats once a day during both the dry and wet seasons, indicating that water availability is not a significant constraint for goat production in Abergele woreda. This study area benefits from a plentiful availability of water due to its many rivers and streams. According to the interview results, 75% of households can access water within a 30-minute walk, while 25% must travel more than 30 minutes.

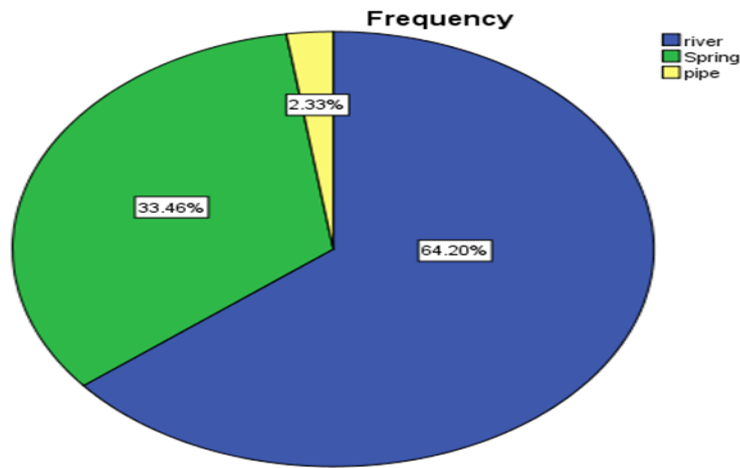


Figure 6 Source of water for goats in the study area

Source: Researcher survey results, 2024

4.4.3 Housing

Good housing is crucial for enhancing goat productivity, as it reduces stress, minimizes disease risks, prevents predators, and simplifies management. In the study area, a significant majority (65.37%) of households provided separate housing for their goats, indicating an awareness of the benefits of proper shelter. This practice helps in maintaining the health and productivity of the goats by protecting them from environmental stressors and facilitating better management. However, a small percentage (34.63%) of households lacked any form of shelter for their goats, exposing them to higher risks of disease and stress.

The respondents reveal that the households use various housing arrangements, such as side-to-main house structures, open barns, and mixed housing, though in smaller proportions. These housing choices were influenced by the availability of local materials and the need to adapt to the prevailing environmental conditions, particularly in the lowlands where hot climates necessitate protective housing. This adaptability reflects the resourcefulness of the farmers in utilizing available resources to create suitable living conditions for their goats.

4.4.4 Utilization of Labor in Goat Production

Goat husbandry, being highly labor-intensive, provides significant employment for the rural population. The majority of goat herding responsibilities fall to children, accounting for 72.8%) of sampled respondents (Table 4.6). This suggests that in the surveyed population, children are an important source of labor in goat as well as livestock management. This could be due to cultural

practices, economic reasons, or the need for adults to engage in other forms of work. Men or husbands were representing 15.6% of the sampled population responsible for herding goats. A smaller proportion of goat herding was reared by hired labor (6.2%) and women (5.4%) of households. The involvement of women in the grazing of goats was small; this might be due to the traditional gendered division of labor within the community, where women are engaged in other domestic or agricultural tasks. Children and females are also responsible for opening and closing the house as well as cleaning inside the house. The result clearly indicated that there were variations in the involvement of different household members in grazing and health management. FGD also reveals that it took at least one full-time worker to move the flocks from the shed to the grazing areas and back.

In terms of goat health care Men were predominantly responsible for goat health care, with a total of 195 (75.9%) respondents. Women and Children were also responsible for goat health care, accounting for 13.2% and 10.5%, respectively. Only 1 case (0.4%) of hired labor being responsible for goat health care was reported. The data suggests a strong gender-based division of labor in goat health care, with men being the primary caregivers. The finding aligns with Tsvuura (2020), who reported that cultural factors impact goat production, particularly due to women's reduced availability to care for goats during periods of 'impurity.' This disparity highlights potential areas for targeted interventions to support and empower women in livestock management, given their significantly lower involvement compared to men.

Table 4.6 percent of labor source in goat production

Who is responsible for grazing (herding) of the goats?			Who is responsible for goats' health care?	
Labor source	Frequency	Percent	Frequency	Percent
Men	40	15.6	195	75.9
Women	14	5.4	34	13.2
Children	187	72.8	27	10.5
Hired labor	16	6.2	1	.4
Total	257	100.0	257	100.0

Source: Researcher survey results, 2024

4.5 Role of Goat in Households income

4.5.1 Estimated Annual Income from Goat

Goat contributes to household livelihoods through a variety of direct and indirect pathways. Among these, cash income or income in kind through the sale of live goats and their products is the most significant. Quantification of the contribution of livestock to household income needs the same consideration. One would need information on the quantity and value of products, the quantity and value of services provided, and the amount and cost of inputs used (Cimarra et al., 2015). However, unlike market-oriented commercial farmers, subsistence livestock producers follow broad production objectives that are driven more by their immediate subsistence needs than demands of a market (Lavoro & Ayalew, 2001).

In this study, the economics of goat farming were worked out and have been given in Table 4.7. The net annual goat income of sampled households from goat production was estimated to have been earned in the production year of 2015/2016 EC. Annual gross income from goat was calculated from selling live goat, butter, and skin together, giving a mean return of 19462.17 Birr per household across the study area. For the analysis, only the variable cost of goat production was taken into account. The fixed cost, including the imputed value of family labor, was not included in the analysis. The variable cost of goat-rearing was the combined value of total cost on fodder, veterinary care, vaccination, and herd labor. The overall annual average variable cost was 2115.38 Birr. This indicates that the amount of investment made in goat production was very low.

The results indicated in Table 4.10 show that the contribution of goats highly varies with the study kebeles. The marnet kebele recorded the highest mean net annual income from the goat (20787.09 ETB), followed by the wirkadibnu kebele (19302.98 ETB). In contrast, the lowest total net annual income (13790.08 ETB) was recorded in the Seria kebele. Comparatively, Marnet kebel was recorded as the highest net income, but it also incurs the highest costs, indicating that higher investment may lead to higher returns.

Table 4.7: Annual net income from goat (ETB)

name of kebele	gross income	total cost of production	net annual revenue
Seria	15031.82	1241.75	13790.08
Marnet	24626.30	3839.21	20787.09
Wirkadibnu	21395.39	2092.41	19302.98
Total	19462.17	2115.38	17346.79

Source: Researcher survey results, 2024

Some of the explanatory demographic and socio-economic characteristics of household heads for categorical independent variables considered in this study, followed by explanatory demographic and socio-economic characteristics of household heads for continuous independent variables.

4.5.3 Chi square Test Analysis

According to the survey results shown in Table 4.8, sex of the household head was 202, whereas female-headed households were about $n = 55$. 73.2% and 26.8% of low-income household heads were male and female, respectively. Of the total ranked in middle goat income, 79.8% and 20.2% of household heads were male and female, respectively. While 78.9% and 21.1% of respondents were male and female household heads, respectively, with high goat income. The chi square test proves that there was no significant relationship between sex and goat income, $X^2 (2, N = 257) = 0.68, p = .648$.

In the lower goat income households, 12.2% were single while 80.5% were married, and in the middle goat income households, 93.3% were married while 2.8% were widowed. Among high-income households, 94.7% were married, while together 5.2% were divorced and widowed. The chi-square test of the distribution of marital status between the three groups was run, and the results were evident for the no association between the marital status of the household head and income at $X^2 (6, N = 257) = 12.468a, p = .052$.

From households who are low income, 73.2% of headed households were engaged in non-farm activity, while 26.8% of the households were not. Within middle-income household heads, 59.6% of headed households were involved in non-farm activities, while the 40.4% of households were not

performing in non-farm activities. The chi-square test of the distribution of non-farm activity between the groups was run, and the results were evidently not significant associations between engaged in non-farm household head and net income at $p = 0.24$ and $\chi^2 = 2.852$ (Table 4-8).

4.5.4 Pearson Correlation Analysis

The Pearson correlation coefficient provided in (Table 4.9) shows the relationships between continuous socioeconomic variables and the net annual income generated from goats during February 30, 2015, to February 30, 2016 E.C. in the study area. The correlation coefficient (Pearson) was used to show the magnitude of the relationship between the variables under study, including age, family size, farming experience, farm size and livestock in TLU. The analysis of Pearson correlation shows that there were different significant relationships.

Among the factors examined, the tropical livestock unit and land exhibit the strongest positive correlations with net annual revenue, with correlation coefficients of 0.648** and 0.595**, respectively, indicating statistically significant at $p < 0.01$. This indicates that larger tropical livestock units and greater land availability are strongly associated with higher revenue from goat farming. The current finding is in agreement with Feder G. (1985), who reported that as the size of the farm gets bigger, the goat herd size also grows and vice versa. While this study contradicted with the report of Cimarra et al. (2015), who found that poor and landless households derive a higher share of their income from livestock than the relatively better-off.

Similarly, family size and goat farming experience also show substantial positive correlations (0.520 **and 0.436**, respectively), suggesting that larger family sizes and more experience in goat farming is positively correlated to revenue at a significant level ($p < 0.01$). Larger households often have more members available to manage and care for a bigger flock more effectively. As well-experienced farmers are better at managing flock health, nutrition, and breeding, which can likely lead to quality and larger flocks.

The age of the respondent exhibits a weak yet statistically significant positive correlation ($r = 0.232$ **, $p < 0.01$) with income. This suggests that older farmers tend to have higher income levels, potentially attributable to their greater experience. The increased experience and knowledge of older farmers are likely associated with improved management practices, which may contribute to higher income. Household head age tends to be of importance in agricultural productivity as

indicated by the level of experience that a person attains as they grow old in their day-to-day rearing of goats, (Unay-Gailhard I and Bojnec Š 2021).

Table 4. 8 Chi square test

Demographic Variable	Reponse	Low income		Middle income		High income		Total	P value	df	χ^2 -value
		Freq.	Perc.	Freq.	Perc.	Freq.	Perc.				
Sex of households heads	Male	30	73.2%	142	79.8%	30	78.9%	202	.648	2	.867
	Female	11	26.8%	36	20.2%	8	21.1%	55			
Marital status of the household heads	Single	5	12.2%	5	2.8%	0	0.0%	10	.052	6	12.468
	Married	33	80.5%	166	93.3%	36	94.7%	235			
	Widow	1	2.4%	5	2.8%	1	2.6%	7			
	Divorce	2	4.9%	2	1.1%	1	2.6%	5			
Engagement in non-farm activity	Yes	30	73.2%	106	59.6%	22	57.9%	158	.240	2	2.852
	No	11	26.8%	72	40.4%	16	42.1%	99			

Source: Researcher survey results, 2024

Table 4.9 Person correlation

		net annual goat revenue in the last 12 month
net annual goat revenue in the last 12 month	Pearson Correlation	1
	Sig. (2-tailed)	
	N	257
Age of respondent	Pearson Correlation	.232**
	Sig. (2-tailed)	.000
	N	257
Family size of respondent	Pearson Correlation	.520**
	Sig. (2-tailed)	.000
	N	257

average size of land holding (in ha)	Pearson Correlation	.595**
	Sig. (2-tailed)	.000
	N	257
experience in goat farming	Pearson Correlation	.436**
	Sig. (2-tailed)	.000
	N	257
tropical livestock unit	Pearson Correlation	.648**
	Sig. (2-tailed)	.000
	N	257

Correlation is significant at the 0.01 level (2-tailed).**

Source: Researcher survey results, 2024

4.5.5. Agro Ecological Perspective of Annual Goat Income

The data in (Table 4.12) provided shows the results of an independent samples t-test, comparing net income generated from goats between two agro ecologies over the period from February 30, 2015, to February 30, 2016. The independent samples t-test result reveal a significant difference in cash income generated from goats between the production system over the specified period ($P < 0.05$). This analysis highlights households in lowland kebeles (Marnet and Wirkadibnu) generated more income from goat farming than those in the midland kebele (Seria).

Usually different agro-ecological zones have different temperatures and rainfall patterns. These factors can affect forage availability, water resources, and overall goat health, which in turn impacts productivity and household income from goats. The reason could also be that lowlanders are more involved in goat rearing than highlanders, which provide more cash income from the sale of goats and their products. The finding of (Feleke et al., 2016) in northern Ethiopia Also confirm that as the herd size increased, animals offered to the market also increased, which results in additional revenues. Showing goat income across different agro-ecological zones is important as it reveals how environmental factors impact production practices and productivity.

Table 4.10 Analysis on independent sample t test

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	T	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Net annual revenue	Equal variances assumed	.019	.890	-7.574	.000	-6053.474	799.266
	Equal variances not assumed			-7.676	.000	-6053.474	788.665

Source: Survey (2024)

4.5.6 Investment Patterns of Income Generated from Goats

In the drought-prone areas of much of Africa and Asia, small ruminants represent the principal economic output, contributing a large share of the income of farmers (Ben Salem & Smith, 2008). Income and expenditure depend on household socioeconomic factors, which shape their needs and financial decisions. In this study, the majority of respondents (n = 215) reported that their primary expenses were on food (Figure 7), highlighting a strong focus on meeting basic nutritional needs. The remaining small numbers of households' expenses are mostly in clothing, saving, investing in agriculture, and medical expenses.

The FGD reveals that goats play a crucial role in helping the community survive during drought periods or crop failure. When crops are lost due to lack of rain, income from goat sales is often the only way for families to purchase essential grains like maize and sorghum. The key informant also explained that having goats as a backup resource is essential in drought-prone areas, where crop production is highly unpredictable.

Respondent explained, *"Goats are multipurpose animals. When drought hits and our crops fail, I sell a goat to buy food grains. They are my main resource when times get hard."*

These findings align with Abebaw et al. (2013), who studied farmers keep Abergelle goats for meat and milk production, as well as for consumption and as a source of income to purchase food grains during shortages and cover various household expenses. However, the finding of this study contrasts with Kosgey et al. (2008) in Kenya, where income from small ruminant production was allocated to school fees (32%), food purchases (22%), farm investments (18%), medical expenses (10%), off-farm investments (9%), social activities (5%), and restocking (4%).

Results from the questionnaire surveys and focus group discussions (FGDs) indicate that smallholder farmers prefer goats over other livestock within the production systems under study, primarily due to their shorter breeding cycles, which enable quicker herd recovery. This finding is consistent with the observations of Ben Salem and Smith (2008), who noted that in drought-prone areas, small ruminants offer advantages over larger livestock, as they allow for a higher number of animals per unit of land, thereby reducing risk (e.g., six ewes are approximately equivalent to one cow).

A key informant from Marnet Kebele further emphasized the importance of goats, describing them as crucial buffers during periods of low crop production. Goat husbandry is the predominant agricultural practice for many households. During years of sufficient rainfall, goats serve as a source of cash for various household expenses, including food, clothing, and taxes. However, during drought periods, such as the current year, goats are primarily sold to purchase food grains for household consumption and crop residue for cattle feed. These findings are consistent with other studies, which indicate that in times of crop failure due to drought or illness within the household, goats are often sold to buy food or medicine (Aziz, 2010). Additionally, goats provide essential income to meet general household expenditures (Aldosari, 2017).

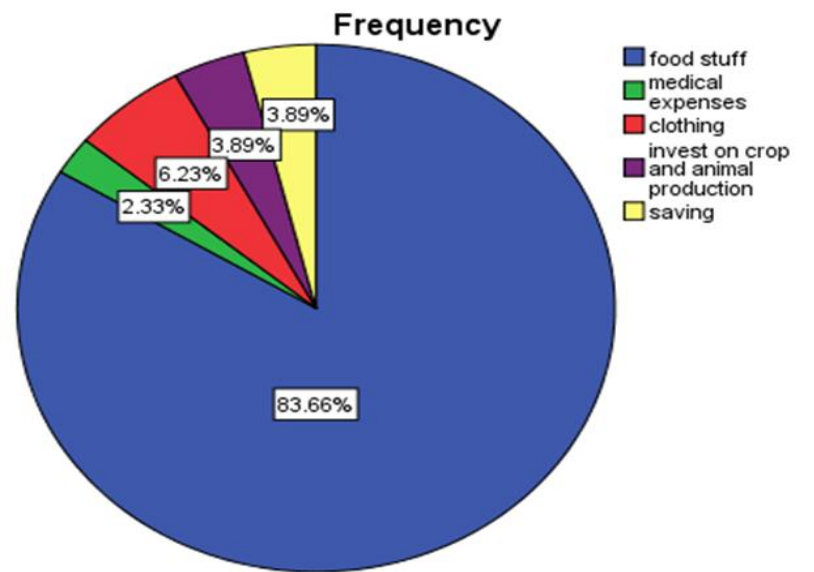


Figure 7. The Household Investment patterns of income generated from goats in Abergele district.

Source: Researcher survey results, 2024

4.5.7 Goat Milk and Meat Consumption

The survey results indicate that all respondents (100%) consume goat milk within their households, with the exception of fasting periods, during which only children consume the milk. This finding aligns with Belete (2016), who highlighted the cultural practice of consuming goat milk, particularly for children and the elderly, in arid agro-pastoral systems. However, the respondent revealed that goat milk lactation or harvesting is highly dependent on the season due to the effect of feed and forage barriers. The study suggests that improving goat milk production through enhanced management of feed resources and genetic improvement could significantly boost the nutritional status of children.

However, the finding of this study contrasts with the report by Zone and Zereu (2016), who noted that 96% of respondents did not consume goat milk, largely due to cultural factors (85%), lack of awareness about the benefits of goat milk (9%), and the low quantity of milk produced by goats (7%).

The FGD reveals that common products include butter, yogurt, and cheese, each of which serves as both a staple food item and a source of income. In the study areas, butter was the only- product of goat milk that is commercially sold, while other dairy products are used solely for household

consumption. Butter was highly valued for its long shelf life and versatility in cooking, making it a marketable commodity.

The poor credit on fresh milk and by-products, such as cheese or yogurt, in the market can be attributed to traditional practices that focus only on self-sufficiency rather than commercialization. In regard to meat consumption, the respondents of the study reveal that it was relatively low and is typically reserved for special occasions such as social and cultural ceremonies and religious holidays like New Year, Christmas, and Easter. Moreover, goat meat consumption is typically low in low-income households due to its valuable life, providing ongoing benefits such as milk, manure for fertilizer, and the potential for breeding. This economic value discourages frequent slaughter for meat while mainly reserve goat meat for special occasions, making it a less common part of daily diets.

4.5.8 Goat Manure Usage and Socio Cultural Benefit of Goat

The respondents indicated that goat manure is significantly utilized as fertilizer on their farms and/or land tenure areas. In this woreda, where the use of chemical fertilizers is too low, goat manure provides an affordable and effective alternative. The researchers observed that soil fertility tends to be higher on farmland closer to homes compared to more distant fields. This improvement is partially attributed to the application of manure, which also contributes to soil conservation efforts by preventing erosion and enhancing overall farmland fertility.

However, this finding contrasts with Nigussie et al. (2015), who reported that less than 10% of crop residues and animal manure available to smallholder farmers in Ethiopia are applied to soils, indicating a generally low level of manure usage.

Focus group discussions and interviews reveal that goats play a significant role in social solidarity beyond their economic value and contribution to household consumption. Goats were found a crucial element in social cooperation, such as evident in practices of gifting milk, particularly during religious holidays marking the end of fasting periods. This tradition builds the social significance of goats, as their milk becomes a symbol of goodwill and solidarity.

In addition, goats were reported as a source of employment, meaning that large flocks of goats offer significant employment opportunities, especially for herders who are integral to managing these herds, particularly for households with a small herd size or not at all. Herders often receive a portion of the kids born during their employment, a practice known as "Rbie" in Amharic. This

system not only provides a livelihood for herders but also supports the poor, large-sized families by creating employment and facilitating herd expansion through shared labor agreements.

Moreover, goat manure contributes to social cooperation in unexpected ways that manure is utilized to support agricultural activities and foster relationships within the community.

Goat was used to establish temporary shelters or houses on others' farmland, specifically for the purpose of depositing manure. Thus, goats serve multiple roles that enhance both economic stability and social cohesion, demonstrating their broader benefit to rural life. According to Misbah, F., & Belay, B. (2016). In Afar, goats confer social status upon their owners, as they are traditionally regarded as a common means of demonstrating wealth. Additionally, goats provide economic benefits by facilitating access to informal credit and loans for households, further enhancing their economic standing.

4.6 Constraints to Goat Production

Livestock development in Ethiopia is hindered by a combination of technical and institutional factors. Hence, a deep understanding of the existing production constraints in the study area is essential for planning appropriate interventions. Identification of major constraints for a given farm animal production in a given area is a prerequisite to planning appropriate intervention strategies (Alemu, 2015). The key constraints in goat production in the study area are given in Table 4.13. In this study, key constraints of goat recognized by the farmers interviewed were identified, including diseases, feed problems, drought, a lack of veterinary services, and a problem of infrastructure. However, the result indicates that these major constraints of goat production were varied across the three kebeles. Marnet Kebele faced the most limiting challenges from drought and feed problems. Seria was reported, which was affected by diseases and a lack of veterinary services, while Wirkadibnu also found diseases to be the primary issue but had a notable problem with feed availability.



Figure 8 . Goat mortality by disease in Abergele woreda

Source: photo by Researcher 2024

Disease of Goat: An outbreak of disease can be the critical factor determining whether a household has sufficient food stocks or faces food insecurity, and whether it maintains a secure income or suffers the loss of key assets (Chikura, 2009). The presence of diseases further hinders the poor from participating in both local and national livestock economies (Perry & Grace, 2009). For small-scale farmers, the impact of livestock diseases often disturbs their livelihoods, leading to further economic and social consequences.

The data of this study indicates that farmers generally believe disease is the serious problem across the entire studied kebeles, with an index of 0.5, 0.5, and 0.17 for Seria, Wirkadibnu, and Marnet kebeles, respectively. This might result from the combined effects of climatic conditions, poor veterinary care, vaccination, and poor management. The key informant from Seria indicated that they did not know the name of the disease happened but mentioned the impact of the disease how it was serious as follows:

The current goat disease is so evil, if they are ill as soon as they died. The disease for all of them is identical damage there liver. Several goats have been lost due to this disease. I was owners of more than 100 goat within this year but within two cycle round of disease the number dropped to 60, and then to 40. We all need vaccination and veterinary service to reserves for breeding in future. We all say, anybody who help us our goat!

This result is consistent with the findings of Tekle et al. (2018) and Onzima et al. (2018), who reported that farmers generally regard diseases as the most significant constraint affecting goat

production. Similarly, Belete et al. (2015) identified disease, feed shortage, and predation as the primary challenges hindering indigenous goat production in the Bale Zone of the Oromia region, with disease being the most critical. Kajevhu and Mabika (2023) also noted that diseases, feed shortages, theft, and the lack of commercial breeds were the major constraints impacting goat farmers in Mushowani, Zimbabwe. The prevalence of diseases observed in this study further aligns with broader findings, where animal disease is recognized as a major limitation to livestock production and the safe utilization of animal products globally (Chikura, 2009). In Adami Tulu Jido Kombolcha district of the East Shewa Zone, Girma et al. (2013) also highlighted disease as the primary health issue affecting small-scale goat production. Additionally, Fikru and Gebeyew (2015) reported that goat farmers face a range of interlinked technical, socioeconomic, and institutional challenges, with disease and parasites being the major constraints, affecting 33.3% of flock owners across their study sites. In West Africa, Agossou et al. (2017) found that goats often roam freely in search of food, a practice that increases their exposure to disease risks, particularly those related to feeding and nutritional disorders.

Drought: Drought was the most affecting constraint in Marnet (index 0.43), whereas it was ranked third in Wirkadibnu (index 0.14) and not ranked in Seria at all. Recurrent drought in the study area imposed severe challenges on rural goat farming households by exacerbating feed shortages, increasing disease risk, and causing heat stress, all of which affected goat health and productivity while straining the financial stability of farming families. The key informants also reveal that the current drought results in a severe reduction in available forage, which was essential for goat browsing. Not only that, the stress of drought conditions has affected goats' health, making them more susceptible to diseases and parasites. Goats are usually sensitive to extreme heat, which can affect their feeding behavior, reproductive cycles, and overall health. Climate change and extreme weather conditions, such as drought and shortened rainy seasons, significantly impact the quality and availability of feed resources, particularly pasture and drinking water (Agossou et al., 2017).

Feed and Fodder Problem: It was the most-limiting constraint in Marnet and Wirkadibnu, ranking second with an index of (0.40) and (0.32), respectively. The limited availability of feed resources, especially during dry seasons and droughts, affected goat nutrition and productivity. Seria had moderate concerns with feed problems comparatively to other constraints indexed (0.17); however, respondents reveal that surprisingly, feed problems were severe in the summer season due to the scarcity of communal pasture land, which many of them graze in available fallow land. Goat

production faces several constraints, including high mortality rates caused by feed shortages (both in quantity and quality), diseases, predation, uncontrolled grazing management, water scarcity, and inadequate marketing infrastructure (Solomon et al., 2014). Goat production is significantly affected by feed shortages, diseases and parasites, market fluctuations, high predation, genetically less productive breeds, water scarcity, and labor shortages (Gobena, 2016). The respondents in the lowlands of Abergele district reveal that a lack of locally available goat feed resources, such as crop residues and by-products, in drought and dry season has led to high feed costs. Hence, improving farmers' skills and understanding of fodder production and conservation technique will be the main area of intervention in this field.

Lack of Veterinary Service: Lack of veterinary services was the second most significant constraint in Seria with an index of 0.32, while in Wirkadibnuit it was also ranked as a critical issue with an index of (0.03). The respondents in both kebele reveal that the absence of veterinary services in the study kebele has been severely affecting goat and livestock health, as there are no established animal clinics to provide essential care. This absence of formal veterinary facilities means that farmers have no access to professional medical assistance, which is crucial for preventing and treating diseases. Without a dedicated center for animal health, the identification of goat diseases is often inaccurate, leading to poor management of outbreaks and higher mortality rates among livestock. Furthermore, the inefficiency in disease identification and management further compounds the problem. The lack of proper veterinary intervention not only affects individual animals but also affects the overall health of the herd, reducing milk production, growth rates, and reproductive success. This situation limited the critical need for improved veterinary services and animal health infrastructure to support the well-being of goats and other livestock in the study area.

Problem of Infrastructure: The problem of infrastructure was mentioned in Seria as a key challenge of goat production (Index 0.01). In addition, key informants also inform that due to the absence of a road network to the center of woreda, they did not access health services for animals and marketing. Many of the farmers sell their goats in informal local markets and farmland. Distance to market was observed as a key market access problem for producers. A similar observation was reported by Berhanu et al. (2007), who found farmers in Metema and Fogera woredas identified distance to market and associated transportation problems as the major livestock market access problems in the woredas.

Table 4.11 major constraint of goat production in the study area

Marnet	Rank 1	Rank 2	Rank3	Index	Rank
Drought	29	26	0	0.43	1 st
feed problem	26	29	0	0.40	2 nd
Diseases	0	0	55	0.17	3 rd
Lack of veterinary	0	0	0	0	4 th

Seria	Rank 1	Rank 2	Rank3	Index	Rank
Diseases	106	0	0	0.5	1 st
Lack of veterinary	0	97	9	0.32	2 nd
feed problem	0	9	90	0.17	3 rd
Infrastructural problem			7	0.01	4 th
Drought	0	0	0	0	

Wirkadibnu	Rank 1	Rank 2	Rank3	Index	Rank
Diseases	96	0	0	0.5	1 st
feed problem	0	91	5	0.32	2 nd
Drought	0	0	86	0.14	3 rd
Lack of veterinary	0	5	5	0.03	4 th

Source: Survey (2024)

4.6.1. Severity of Goat Deaths

Animal diseases lead to goat mortality, reduction of goat numbers, and reduce production parameters such as milk production and quality of goat products. Climate change is contributing to and exacerbating the occurrence of livestock diseases (García-Winder and Chavarría, 2017). The

result of the study survey showed that about 79% of the respondent farmers were reported as the mortality of goats was recorded in the previous 12 months in the study areas, while a smaller portion (21.0%) did not experience any losses.

According to the data indicated in Table 4.12, the average number of goat deaths in the study area was six goats per household. Of which the largest mean deaths of goats were recorded: 6 for Wirkadibnu and 8 in Marnet.

The high percentage of goat losses in the last 12 months indicates the severe challenges faced by goat farmers in the area. The respondent revealed that the primary causes of goat mortality are diseases and drought-induced feed scarcity, limiting their access to adequate nutrition. The comparative analysis of goat losses among the three kebeles reveals significant differences in mean losses and variability. Wirkadibnu and Marnet experience the highest goat losses, indicating a need for urgent and comprehensive support. Seria also faces higher losses. According to Abebaw et al. (2013), finding goat disease is a major constraint to production in Abergelle district.

Table 4.12 Average numbers of goats' mortality among three kebeles

If yes, how many goats do you lose?			
name of kebele	Mean	N	Std. Deviation
Seria	4	106	4
Marnet	8	55	8
Wirkadibnu	6	96	6
Total	6	257	6

Source by the researcher 2024

4.7 Institution and Goat Production

The improvement of goat production depends on the institutional structure and the availability of services. Goat keepers and their enterprises' adaptability to change relies on support from technical and policy research, as well as practical and advanced training (Peacock & Sherman, 2010). The

finding of Nedumaran (2023) also confirms that developing goat potential will require a coordinated and multi-functional approach where subject matter specialists work together as a team. Particularly those accesses to modern technology depend on information providers on which farmers rely, such as progressive farmers, input dealers and radio, training, friends and relatives, and television (Bairwa, 2011). Moreover, the government has a duty and desire to alleviate poverty and achieve the Millennium Development Goal. Hence, the role of goat is extremely important in the process of poverty alleviation. A subsistence farmer usually needs government and non-governmental intervention to improve goat health and productivity.

According to the FGD and interview with an Abergel district agricultural expert, it was mentioned that a government institution, including the Abergelle District Office of Agriculture, Amhara Credit and Savings Institute, Sekota Declaration, and Sekota Dry Land Agricultural Research Centre, was identified as contributing to improving the production practices of goat keepers. According to Abebaw et al. (2013), the Sekota Dry Land Agricultural Research Centre was involved in crossing the Begayet (Barka) and Abergelle breeds in an attempt to improve meat and milk productivity. However, the initiative has already been abandoned due to a change in strategy, which favors the idea of conserving and improving the productivity of the Abergelle breed through selection before embarking on cross breeding. The researcher also reported that the Abergelle District Office of Agriculture and Sekota Dryland Agricultural Research Centre have made attempts to provide improved forage seeds to the area mall-holder farmers.

Non-governmental organizations, including Save the Children UK, FH Ethiopia, and Woman Empowerment Action, also support goat husbandry households, focusing on restocking, financial support, and training in managing goat populations. These organizations have provided essential services aimed at improving goat production practices, thus supporting the development of local livestock economies and addressing immediate production needs.

The key informant agricultural expert acknowledged that several NGOs have been active in Abergele woreda, implementing various programs related to agriculture, education, and health. Despite the range of support, the programs have had little impact on poverty reduction. The reason may be that NGO interventions primarily focus on immediate relief, such as providing food aid or short-term financial assistance, rather than addressing poverty in the long run.

The respondent revealed that NGOs were mainly involved in supporting the poorest households by focusing on restocking goats and providing financial aid to those who currently lack these assets. This helps to address the immediate needs of the same vulnerable groups, enabling them to rebuild their livelihoods. According to Abebaw et al., (2013) NGOs are involved in supplying breeding stock (generally 5 females and 1 male goat) to households benefiting from the Productive Safety Net Program (PSNP).

However, the support provided by these NGOs is somewhat limited in scope, only targeting asset restoration rather than the broader challenges faced by these communities. As the key informant mentioned, even training was delivered to the target population before distribution of goats or restocking, which lacks continuous training, and extension services struggle to sustainably manage their new assets, potentially leading to inefficiencies or losses in the long term.

E.g., Save the Children UK has been described as limited, targeting a narrow segment of the community, particularly poor households with children less than five years of age. This narrow focus has resulted in the exclusion of other community members who could benefit from similar support. Additionally, the training and extension services offered were delivered as one-time events rather than as part of a continuous, long-term capacity-building effort.

Key informants also support that the involvement of NGO in vaccination programs, veterinary services, and drug supplies was almost nonexistent, while these communities were at risk of losing their livestock to preventable diseases. This gap in support undermines the initial investment made through restocking, as poor animal health can quickly erode the gains made. This narrow focus on restocking and financial support, without addressing these major constraints, limited the overall effectiveness of the NGOs' efforts. Without comprehensive support that includes training, veterinary care, and access to vital information, beneficiaries may remain vulnerable to future shocks.

The lack of a holistic approach risks perpetuating a cycle of poverty, where immediate needs are met but sustainable progress is not achieved. Therefore, while the NGOs' efforts are crucial, they need to be expanded and integrated into a broader framework that considers the full range of factors affecting these communities.

4.8. Institution supports for goat production

In this study to evaluate the role of institutions such as government, non-governmental organizations, and cooperatives in enhancing drought resilience, goat production practice was focused on basic services, including access to credit, veterinary, vaccination, training, market, and climate information.

4.8.1. Training and Extension Service

Training is crucial for improving farmers' knowledge and skills in goat management, including best practices for feeding, breeding, health care, and general husbandry. The current study indicates that 78.2% of respondents did not gain training on goat production practices and marketing. This implies there is a substantial gap in the availability or delivery of training programs for goat farmers. This was in line with the finding of Bairwa (2011) in India, which shows that there is a huge gap between innovation policy and its implementation in regard to the development of human resources and social capital and increasing their income portfolio through best delivery of services and extension services, as well as adaptation of research, which means to provide the solution that suits local socio-economic and environmental conditions.

FGD also reveals that both NGOs and government agencies have shared similar limitations for a decade in their approach to delivering training on goat or livestock production. The training provided by NGOs was mainly targeted at beneficiaries in the PSNP (productive safety net program), while on the other hand, government training initiatives have mainly focused on model farmers with the expectation that these individuals will disseminate their knowledge to others in their communities. However, this indirect approach has proven insufficient and ignored the wider community in ensuring widespread adoption of best practices in goat production in particular and agricultural development in general. Direct interaction is important for addressing specific challenges and ensuring that farmers fully understand and apply the techniques being trained. Without such comprehensive engagement, many farmers remain unable to implement an improved practice, which hinders overall productivity and development in the sector.

Hence, governments and NGOs should prioritize developing the skills and knowledge of smallholder farmers to improve their productivity and resilience. Since, promote training and technical support for goat keepers with a crucial need for technology transfer and collective governance of the local projects (Nedumaran, 2023).

Training goat farmers needs a long way in trying to improve their knowledge base and manner of management in goat production and marketing. The training would help to raise farmers' awareness on main production constraints, management options, and marketing. Without this inappropriate training, farmers may continue with the existing way-rearing practices, leading to lower productivity and higher mortality rates. Hence, effective management practices learned through training will be performed to prevent and control diseases, optimize nutrition, and improve overall herd health. The periodic training session should be set up to strengthen the research-extension link and the capacity and knowledge of breeders to improve the keeping and management practices of their business (Agossou et al., 2017).

Table 4.13 respondent access to training in the study area

Do you get training on management of goats?	Frequenc y	Percent
Yes	56	21.8
No	201	78.2
Total	257	100.0

Source: Survey (2024)

4.8.2. Access to Climatic Information

The household Access to climate information is given in Table 4.14. The data indicates that there was a lack of access to climatic information among goat farmers, with 80.5% not receiving this important data. Though climate data helps farmers anticipate and prepare for adverse weather conditions in Waghimra, weak institutional links of support relating to drought were observed in the years 2022-2023, when the government failed to adequately warn farmers about the impending threat of drought. The drought led to livestock losses, high crop failures, and an increase in the number of dependents on foreign aid. To be prepared and able to react, severe event forecasting and prediction are essential (Hazell, 2011). Providing early warning drought forecasts can be a valuable tool for preventing problems that arise when farmers, herders, and other decision-makers must allocate resources without knowing the year's rainfall outcomes. Hazell (2011) notes that reliable drought forecasts could help governments and relief agencies prepare for more efficient and cost-effective drought interventions.

There is a need to develop and implement systems that provide reliable climatic information to goat farmers. This could include weather forecasts, seasonal climate predictions, and early warning systems for recurrent drought in the area. Local agricultural extension agents and the woreda administration could play a role in bridging the gap by providing accurate and reliable climatic information before extreme events happen.

Table 4.14 Respondent access to climatic information in Abergele district

Do you have access to climatic information?	Frequency	Percent
Yes	50	19.5
No	207	80.5
Total	257	100.0

Source: (survey 2024)

4.8.3. Access to Veterinary Service

The survey result showed that 180 (70%) of the sampled respondents did not receive veterinary services, while the remaining households 77 (30%) get veterinary service from either government or private veterinary pharmacies (Table 4.17). Out of 77 sampled farmers who have gotten veterinary services, 75% of them were from Marnet Kebele. This suggests that the veterinary services are exclusively available in Marnet Kebele, the center of the Abregele woreda administration. The key informant revealed that even the drugs and veterinary services supplied by the office of agriculture and rural development of the district for goats, such as treating illness and vaccinations, were not enough as compared with demand and the high population of ruminants. This inadequate veterinary services and drug supply were what caused high mortality of goats, resulting in low productivity.

Veterinary services in Ethiopia are also provided almost only by the woreda Office of Agriculture and Rural Development, and often far below the demand by farmers (Berhanu et al., 2007). The study supported Belay et al. (2013), who found that lack of veterinary services has led to farmers using traditional medicines, and these were reported to be functioning poorly.

Among 180 respondents who don't have access to veterinary service (n = 165), 91.7% of respondents from Seria and Wirkadibnu cited the absence of health clinics in their Kebele and the distance to available clinics as the main reason for not accessing veterinary services. FGD from Seria Kebele reveals that many farmers are unable to reach veterinary services due to the distance, emphasizing the importance of establishing local health clinics and mobile veterinary services. The FGD voiced the need for more affordable and accessible veterinary care for their goats. Unsatisfactory veterinary services delivered the majority of goat keepers in Ziquala (61.4%), Tanqua Abergelle (51.1%), and Lay Armachiho (57.9%) districts did not send their sick goats to the nearby animal clinic regularly due to the manly long distance to the nearest veterinary services. (Alemu, 2015)

About 2.78% of respondents mentioned that there is a high price for veterinary drugs and services, which was a barrier to accessing care. While remaining (10) 5.5% of respondents pointed to the low availability of veterinary drugs as a reason for not receiving services. Among 180 respondents who don't have access to veterinary service (165), 91.7% of respondents from Seria and Wirkadibnu cited the absence of health clinics in their Kebele and the distance to available clinics as the main reason for not accessing veterinary services. FGD from Seria Kebele reveals that many farmers are unable to reach veterinary services due to the distance, emphasizing the importance of establishing local health clinics and mobile veterinary services. Similarly, Alemu (2015) pointed out that unsatisfactory veterinary services delivered by the majority of goat keepers in Ziquala (61.4%), Tanqua Abergelle (51.1%), and Lay Armachiho (57.1%) districts did not send their sick goats to the nearby animal clinic regularly due to the manly long distance to the nearest veterinary services. About 2.78% of respondents mentioned that there is a high price for veterinary drugs and services, which was a barrier to accessing care. While remaining (10) 5.5% of respondents pointed to the low availability of veterinary drugs as a reason for not receiving services.

Table 4.15 Respondent access to veterinary service in the study area

Do you have access to veterinary service for your goats?	Frequency	Percent
Yes	77	30.0
No	180	70.0
Total	257	100.0

Reason for not accessing veterinary	Frequency	Percent
There is no health clinic in the Kebele and it is found in the distant area	165	91.7
High prices requested for veterinary drugs and for the service provided	5	2.8
Low availability of veterinary drugs	10	5.5
Total	180	100

Source: researcher Survey 2024

4.8.4. Access to Vaccination

The respondent Access to vaccination services is indicated in Table 4.16. Among the sampled respondents (201), 78.2% of respondents did not have access to vaccinations for their goats. This high percentage indicates a significant gap in the availability or uptake of vaccination services among goat farmers. While $n = 56$ (21.8%) of respondents had vaccinated their herds against diseases through vaccination. The high percentage of farmers not receiving vaccinations puts a

large number of goats at risk of preventable diseases. This exactly leads to higher mortality rates, reduced productivity, and overall poor herd health. Unvaccinated goats are more likely to suffer from diseases that can affect their growth, milk production, and reproductive performance. Therefore, it needs to improve expanding access to vaccinations so farmers can better manage herd health, reduce disease outbreaks, and enhance overall productivity and profitability in goat farming.

The current finding is generally in contrast with those of Ntuli, L., & Fourie (2021), who found that a total of 18 (25.71%) farmers do not vaccinate at all, while 74.29% (n = 52) vaccinated at least against one disease. According to Rowe (2016), prevention is better than cure, and it is therefore important that any goats introduced to an existing flock be disease-free and healthy. It is necessary to have a strict vaccination program to control common diseases. Similarly, the finding of Tsvuura (2020) in South Africa reported a considerable number of male-headed households vaccinated their goats (76%), as compared to female-headed households (62%) ($p < 0.05$). According to the Williams et al. (2022) report in Tanzania, most of the respondents (190 out of 216, 88.0%) had vaccinated their flock or herd in the last 12 months.

Table 4.16 Respondent access to vaccination service in the study area

Do you get vaccination?	Frequency	Percent
Yes	56	21.8
No	201	78.2
Total	257	100.0

Source: Researcher survey results, 2024

4.8.5. Access to Credit Services

In the study area, Amhara credit and saving institutions have been identified as the only source for formal credit on a cash basis. The survey result showed that only 31.5 percent of the sampled respondents take credit for goat production restocking and improvement practices from this institution (Table 4.17). The respondents reveal that credit is provided in groups and follows a set procedure. Credit services for livestock development are insufficient due to several factors: the amount of credit offered is small, the application procedures are complex, and producers often lack

awareness of available opportunities and their significance (Duressa et al., 2014; Tegegne et al., 2013).

Credit supply is not enough; continuous evaluation is important whether they invest effectively in improving goat production or not. Farmers who are living below the poverty line often focus on immediate needs, such as feeding their families, making short-term survival their higher priority. Investments in animal health may have to be deferred until smallholders can shift their focus from mere survival to profit-making.

Table 4.17 Respondent access to credit service in the study area

Do you have access to any credit facilities for increasing goat production?	Frequency	Percent
Yes	81	31.5
No	226	91.8
Total	257	100.0

Source: Researcher survey results, 2024

4.8.6. Access to Market Information

Access to market information enables farmers to make informed decisions about when and where to sell their goats, negotiate better prices, and identify market opportunities. In this study, goat farmers were accessing relevant information regarding market conditions, prices, and opportunities, accounting for 76.3% of the sampled households.

Most information flows were between farmers, though information flows from farmer-to-farmer are not highly effective and have limited sources of new information or improved technologies. The present result is in agreement with previous findings of Abebaw et al. (2013) in the study area, who found marketing of the Abergelle goat is constrained by the lack of any formal market information system. The result was also in line with Desta (2019) in northern Ethiopia, who reported that 67.4 percent of sampled respondents got market information from other farmers who are neighbors, friends, and farmers through personal observation. Marketing should play an important role in the process of transforming small-scale farmers into commercial producers; according to Coetzee et al.

(2005), the market is the institution that should provide the necessary incentives for farmers to increase their income.

Table 4.18 respondent access to market information

Do you have access to market information?	Frequency	Percent
Yes	196	76.3
No	61	23.7
Total	257	100.0

Source: Survey (2024)

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

This section summarizes the major findings of the study and proposes recommendations for policy purposes. In changing climatic and socio-economic situations, there is a need to develop goat production systems for obtaining sustainable income for small and marginal farmers in drought-prone environments.

5.1 Conclusion

The study revealed that the average number of goats per flock was 11 for small, 26 for medium, and 58 for large, with an overall average flock size of 23 goats. Communal pastures were the most commonly used grazing areas, with 72.4% using communal pastures in the wet season and 47.1% during the dry season. Goats were also grazed in their own or neighboring crop fields, particularly during the dry season, by 52.9% of respondents. Some respondents (26.5%) utilized fallow land for grazing in the wet season. The analysis highlights that allocation of labor uses in goat husbandry indicates children playing a key role, responsible for herding in 72.8% of households. In terms of health care, men dominate, with 75.9% of respondents managing goat health, while 13.2% and 10.5% are women and children, respectively.

This study has found that generally goat husbandry is an integral part of subsistence households, contributing to diversifying livelihood income and providing milk and meat for home consumption.

The findings provide sufficient evidence to warrant support regarding adequate policies and other institutional facilities to improve the development of goat production practices of smallholder farmers in the study area. On average, households had net annual revenue of 17,346 Ethiopian Birr from goats in the study area. Significant variations in net income were observed across the study kebeles, with Marnet kebele recording the highest net income (20787.09 ETB) due to its higher investments, while Seria kebele had the lowest (13790.08 ETB). Comparatively, annual net incomes from goats in Wirkadibnu were close to Marnet (19302.98 ETB). Investment patterns of income generated from goat farming show that majority farmers prioritize household food expenses, especially households that faced drought events. Goats act as financial buffers during crop failures, providing cash for households to buy stable food grains.

In addition to income, in the study area, goats had contributed to household nutrition through milk and meat consumption. All respondents consume goat milk after processing it into yogurt, cheese, and butter. Of those products, butter was the only product of goat milk that is sold to generate cash income. Utilization of meat as daily diets were low but slaughtered were mainly to social and cultural ceremonies and religious holidays like New Year, Christmas, and Easter. In addition, the result of the analysis shows that goat manure has been significantly utilized as fertilizer on their farms and/or arable land.

Though goat production had various socioeconomic contributions in the study area, it is severely constrained by various environmental, technical, and institutional factors. Based on severity rank-based index diseases, feed shortages, drought, lack of veterinary services, and infrastructure problems were the major challenges identified in the study area. Diseases were the major constraint across all kebeles, with farmers in Seria and Wirkadibnu ranking them as the most critical issue (indexed 0.5) as well as Marnet ranking the third (indexed 0.17). Feed shortages, particularly during dry seasons, present another substantial challenge in the Marnet and Wirkadibnu indexes of 0.40 and 0.32, respectively. Drought (0.43) is another major constraint, especially in Marnet, where it ranks as the most limiting barrier. In Seria, the absence of veterinary clinics prevents farmers from accessing essential medical care for their goats, leading to poor disease management. The lack of infrastructure also limits farmers' access to markets, forcing them to sell their goats locally at lower prices, reducing their income.

According to the FGD and interviews with an Abergel district agricultural expert, government institutions like the Abergelle District Office of Agriculture and the Sekota Dry Land Agricultural Research Centre have significantly improved goat production and breeding. NGOs, including Save the Children UK and FH Ethiopia, have also supported goat-rearing households with restocking, financial aid, and training, contributing to the local livestock economy and addressing key production needs.

The role of the government's and NGO's in addressing the constraints and sustainability of goat production practices in the study was insufficient and largely ignored. The study shows that household access to modern technology or improved production practices of goats, like access to training, credit, veterinary and vaccination supply, climate, and market information, were seriously limited and poorly supplied by the government and other institutions. While the NGOs' provide

essential immediate relief for their target beneficiaries, the intervention has shortcomings in improving the production method due to a lack of focus on the major constraint. Poor coordination and an inadequate understanding of farmers' specific needs result in the poorest goat keepers often failing to achieve their poverty reduction goal and graduation from PSNP.

5.2 Recommendation and Policy Implications

The integration of policy and institutional support, tailored to the needs of smallholder farmers, is essential for maximizing the potential of the small ruminant sector. This includes reorienting government and NGO roles, investing in human resources, and enhancing the capacity of smallholders to manage their resources effectively.

The potential of goat development in this drought-prone area is enormous and needs to be further exploited. The optimization of goat production will greatly contribute to farmers' livelihood improvement and capacity to withstand drought effects and can become a more reliable source of livelihood security for resource-poor rural households in the study area.

Based on the study's findings or results, to address these shortcomings and improve goat production the following recommendation and policy implications are forwarded.

- In order to reduce the temporary massive loss of goats' mortality, the government must implement disease identification, mobile veterinary clinics, and vaccination services to address the current goat diseases.
- In the study area, livestock producers in general and goat owners in particular have dealt with diseases for generations, resulting in a farming system with ingrained low productivity. Establishment and construction of an animal health clinic should be a priority of the government strategy to safeguard the health of the goats, reducing losses due to preventable diseases in the long term.
- For improving fodder availability for the goats, there is a need to institutionalize linkages between goat farmers in fodder scarce regions and areas with better fodder availability, like western Amhara, particularly during periods of prevalent drought.
- The government must be made to invest in rural road infrastructure to facilitate better access to health services and goat markets and to enhance the bargaining power of smallholder farmers and revenue from goats.

- Both government and non-governmental organizations should be training and retraining farmers on best management practices, including improved feeding strategies, fodder conservation, proper breeding skills, disease prevention and control, and value-added processing. The training should focus on improving management skills and fostering synergies between livestock and crop production.
- The long-term preventive vaccination of goats in such at-risk areas should be planned and addressed at least one month to three months before the expected high-incidence season. Additionally, year-round herd health programs should include prevention and treatment for internal and external parasites.
- Effective goat development strategies require active participation from local government, NGO, and farmers themselves. Therefore, engaging goat keepers should include in identifying problems, developing solutions, planning, and decision-making processes is essential for creating relevant and effective solutions.
- Both NGOs and government have been contributing to the development of goat production, but their roles were limited in scope and effectiveness. Hence, governments and NGOs should be collaborated in more organized manner through research and extension services to align with broader national and regional development plans.
- NGOs involved in goat development must implement a clear, transparent, and comprehensive handover of improved husbandry practices to farmers.
- Government must develop and strengthen early warning systems to provide timely and accurate information about impending drought conditions. This will enable farmers to make informed decisions fodder conservation, regarding destocking and feed management, reducing the adverse effects on animal through effective drought preparedness.
- All stakeholders should facilitate access to formal market information, enabling farmers to make informed decisions about when and where to sell their products and how to manage their herds in response to environmental conditions.
- To address the growing demand in goat marketing and enhance sustainable goat production practices, they need to be supported and stimulated through national policies and strategies.

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Appendix 1

Questionnaire for Survey

Introduction

A dear respondent, my name is Mebratu Getahun. I'm conducting research on analyzing the role of Goat Production in Supporting Rural Livelihoods in Drought-Prone Areas of Waghimira Administrative Zone. The information you will provide has both academic and policy relevant values. I confirm you that all data will be used for academic purpose and will be analyzed anonymously, and hence you are not exposed to any harm because of the information you give. Therefore, you are free to respond these questions honestly. In addition, feel free to ask if you have any doubt. I would appreciate your participation in answering the questions in advance.

Thank you for your cooperation.

Part I Demographic Characteristics

1. Kebele :.....
2. Sex of household head. 1. Male ----- 2. Female.....
3. Age of the household head
4. . Education level 1) no read and write 2) Primary education 3) Secondary education 4) college or university graduate
5. Marital Status 1) single 2) married 3) widow 4) Divorced
6. Number of total family members 1) Male 2), Female.....
7. What is the average size of land holding (in ha)?

Part II Herd Size

1. How many goats do you have now? 1) Old ----- 3) mature ----- 4) kid less than 6 month age-----
2. How long have you been involved in goat farming?
3. How do you acquire your goats? 1) Purchase 2) breeding 3) From family 4) other species
4. How is your goat herd size in the last 5 years? 1) Increasing, 2) Decreasing, 3) Stable

Part III Fodder and Management Systems

5. Who is responsible for herding of the goats? 1) Men 2) Women 3) Children 4) Hired labor
6. Who is responsible for goats health care? 1) Men 2) Women 3) Children 4) Hired labor
7. What are the many sources of feed for goat?
8. What is the Goats grazing areas in both season?

Grazing Areas	Dry season Tick (√)	Wet season Tick (√)
Communal Pastures		
Own Pasture		
Own/neighbors crop fields		
Grazing fallow land		

9. In which season do you encounter shortage of forage for your Goats? _____
10. What is your coping mechanism or responses to feed shortage? multiple choice is possible

1) Mobility 2) De-stocking, 3) Supplementation 4) no solution _____

Part IV Watering

11. What Source of water for goats/livestock?

1, Borehole 2, river 3, Spring 4, Others specify-----

12. How frequently do you water your goats per day? 1) Wet season 2) dry season ...

13. What distance to nearest watering point for goat? Specify in minute.....

14. How do you justify the quality of water, your goats drink?

1, Good/clear 2, Muddy 3, Smelly 4, other specify

Part V Housing

15. Do you have shelter for your goats? 1) yes 2) no

16. If yes, how do you shelter your goats in different seasons?

Way of housing	Dry season Tick (√)	Wet season Tick (√)
Fence		
Shed		
Yard/in-house		
None (roam wherever)		

17. Where is the housing or shelter for goat? Dry season Wet season

Part VI Other Livelihood of the Household

18. What is your major farming activity? 1) Livestock production 2) Crop production 3)

Both mixed activities

19. What are the sources of household income? Then rank the 3 major ones.....

1) Selling of live animal and product 2) Crops & vegetables 3) Government subsidy
Food aid 4) other specify

20 Are you engage on non-farm Activities? yes no

20. Do you have other livestock? 1) Yes____ 2) No____

If yes, how many of these types of livestock do you have? Oxen____ Donkey____
Sheep____ chicken _____ Other (Specify) _____

Part VII Livelihood Significance of Goat

21. Please can you rank the purpose of keeping goats

- 1) Income from goat selling 2) Milk 3) Fertilizer 4) Meat
22. Do you consume milk from the goats? 1) Yes 2) No
23. If yes, how many litters of milk do you consume in a day? morning____ afternoon____
24. In what occasions do you slaughter goats? _____
25. How often do you eat meat from these goats? _____
26. How many goats do you sell in the last 12 month?
- Old female _____ mature female _____
- Old male _____ mature male _____
27. What is the average selling price of a goat in the last 12 month?
- Old female minimum____ maximum _____mature female minimum ____maximum____
- Old male minimum____ maximum____ mature male minimum____ maximum____
28. What is cash Income generated from goats during February 30, 2015 to February 30 2016?
- Please specify in Birr:
- 1) From selling of live goats _____
- 2) From selling of butter in local market _____
- 3) Sell of skin_____
- 4) Total annual income from goats' _____
29. How much money do you use for the upkeep of your goats such as vaccination, veterinary service and other? -----
30. Do you believe that the goats adequately support your family needs in income?
- Yes__ No__
31. If yes, what are your three most important needs that the goats could help you to meet?
- 1) School fee 2) medical expenses 3) food stuff 4) Clothing 5) saving 6) Other Specify _____
32. What percentage of the generated income is spent on food stuff? _____
33. Did you face any shortage of food in household before you rear the goats? 1) Yes 2) No
34. If yes, what was the main Cause of food shortage? _____
35. Did you think shortage of food in household is improved due to rearing of goats?
- 1) Yes 2) No If no why _____
36. Are there any specific assets acquired or investments made as a result of goat farming?
- 1) Yes 2) No If yes please specify _____
37. What benefits do you get from manure of goats? 1) Sale 2) fertilizer 3) Fuel

38. Do you consume goat milk and its product regularly? 1) yes 2) no
39. Given the recurrent drought and other constraints, is holding onto goat still the best option?
1)Yes 2) no
40. If yes, what are the reasons for this? -----
41. If not, what are the reasons for this? -----

Part VIII Institutional Opportunity

42. Did you get training on management of goats? Yes ____ No ____
43. If yes, who gave you the training? _____
44. What was the training about? 1) Housing 2) Feeding 3) Health care 4) ma-rketing 5) other
45. Do you have access to climatic information? 1) Yes 2) No
46. Do you have access to market information?
1) Yes 2) no
47. Do you have access to any credit facilities for increasing goat production? 1) yes 2) no
48. Do you access veterinary service for your goats? 1) Yes 2) No
231/321/213
213/126
49. If yes, where do you access? 1) Government veterinary clinic 2) Private veterinary clinic and drug suppliers
50. If no, reason? 1) There is no health clinic in the Kebele and it is found in the distant area 2) the shortage of veterinary personnel's 3) High prices requested for veterinary drugs and for the service provided 4) Low availability of veterinary drugs
51. Do you get vaccination? 1) Yes 2) No
52. If your answer is yes, when?
1) During disease break out happens 2) At any time in the year 3) before periodical on set of disease break-out
53. Are you member of in any institution in your area? 1) yes 2) no
54. If yes, in which institution? 1) Cooperatives 2) Kebele Administrations 3) Other _____

Part VI Constraints

55. What are the major constraints of goat production in the area? Rank in order.....

- 1) Feed problem 2) Animal diseases 3) drought 4) Market problem 5) infrastructure 6) veterinary service 7 predator
56. Do you lose your goats in the last 12 month? 1) Yes 2) No
- 2) If yes, how many goats do you lose 1) Old goat. ... 2) Mature goat3) Kid goat.....
 - 3) What is Reasons for this? 1) Drought 2) disease 3) Predator 4) feed problem 5) other
 - 1) What do you suggest as measures to improve and maximize goat development?-----

Appendix 2: Check List for Key informants

1. What is the role of goat in your livelihood security?
2. How significant is goat rearing as a source of livelihood?
3. In your opinion, what are the main challenges hindering the growth and development of goat production as a viable livelihood option for you and other communities?
4. What do you do to overcome the constraints of goat production?
5. What is the role played by Government and other Institutions in goat production?
6. What is your plan or strategies to sustain goat production?

Interview question for kebele leaders and woreda level agricultural experts:

1. What has the government implemented to support and promote goat production as a means of livelihood in rural areas?
2. How does the government collaborate with non-governmental organizations and other stakeholders to support goat farming initiatives?

Appendix 3. Check List for Focus Group Discussion

1. What are the advantages of raising goats over other livestock?
2. What goats play a role in your household livelihood as well strengthening social ties or solidarity within your community?
3. What are the main constraints that affect goat production in your locality?
4. What are the major goat diseases in the area?

5. What kind of institutions there is in the area that supports goat production?
6. What kind of support is missing?
7. What are the opportunities for supporting goat production in the area?