

Analysis of goat value chains in Sekota Abergelle district, northern Ethiopia

L. Abebaw¹, T. Alemu¹, L. Kassa¹, T. Dessie²
and G. Legese³

¹Sekota Dryland Agricultural Research Centre, Ethiopia

²International Livestock Research Institute (ILRI)

³Value Chain Consultant, ICARDA



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ICARDA and ILRI are members of the CGIAR Consortium

ICARDA
Box 5689, Addis Ababa, Ethiopia
Phone: +251-11-617-2281
Fax: +251-11-617-2001
E-mail: S.Silim@cgiar.org

ILRI
Box 5689, Addis Ababa, Ethiopia
Phone: +251 11 617 2000
Fax: +251 11 617 2001
Email: ILRI-Ethiopia@cgiar.org

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Acronyms

ACSI	Amhara Credit and Saving Institution
ANRS	Amhara National Regional State
ARARI	Amhara Regional Agricultural Research Institute
AWAO	Abergelle District Agriculture Office
CAHW	Community Animal Health Worker
FGD	Focus Group Discussion
GO	Governmental Organization
HABP	Household Asset Building Program
Ha	Hectare
KII	Key Informant Interview
NGO	Non-Governmental Organizations
PRA	Participatory Rural Appraisal
PSNP	Productive Safety Net Program
SDARC	Sekota Dryland Agriculture Research Centre
VCA	Value Chain Analysis
WHNA	Waq-Himra Nationality Administration

Foreword and acknowledgements

In mid-2012, stakeholder discussions and planning for the Livestock and Fish small ruminant value chain development project were initiated by the International Center for Agricultural Research in the Dry Areas (ICARDA), the International Livestock Research Institute (ILRI) and national partners.

After selecting eight research sites meeting various criteria, the first step was to conduct rapid value chain assessments in each site. In November 2012, national teams were formed and trained to carry out these assessments (including for the associated 'safe food fair food' project). Field implementation of the rapid value chain analysis took place in December 2012 and January 2013 with mixed teams comprising staff from CGIAR and national organizations. The teams used a toolkit developed through the Program and undertook focus group discussions with farmers using checklists and participatory methods as well as key informant interviews with local experts, traders, butchers, livestock researchers, transporters, veterinarians and NGOs.

The preliminary reports from these assessments were reviewed at three multi-stakeholder workshops held in March and April 2013. In these workshops, participants from research and development partners validated the value chain analysis and formulated initial 'best bet' intervention plans for each of the sites.

These activities are documented at <http://livestockfish.cgiar.org/category/countries/ethiopia/>

The following people contributed to this process

- Barbara Rischkowsky ICARDA
- Jane Wamatu ICARDA
- Halima Hassen ICARDA
- Aden Aw-Hassan ICARDA
- Aynalem Haile ICARDA
- Getachew Legese ICARDA
- Tadelle Dessie ILRI
- Solomon Gizaw ILRI
- Peter Ballantyne ILRI
- Alan Duncan ILRI
- Berhanu Gebremedhin ILRI
- Hikuepi Katjuongua ILRI
- Kathleen Colverson ILRI
- Tamsin Dewe ILRI
- Zerihun Sewunet ILRI
- Getnet Assefa EIAR
- Yeshe Chiche EIAR
- Asrat Tera SARI
- Nigussie Dana SARI

Introduction

Livestock population of Ethiopia is one of the largest in the world and the second largest in Africa, after Sudan. The livestock sector contributes to the country's economy in terms of food, exports, draught power, transportation, assets, manure, and other benefits (Gebremedhin et al. 2007). Goats play an important role in the country's livestock sector. There are 30 million goats in Ethiopia (Tenna Shitarek, 2012). The Waq-Himra Nationality Administration Zone (WHNA) has 536,539 heads of goat, of which 127,889 are in Abergelle district (WHNA, 2013). The Abergelle goat is the dominant goat breed in WHNA (Belay, 2008; Dereje, 2004). The breed is predominantly found in the lowland districts (Abergelle, Zequala, and Sehala) of the zone. The central highland breed is mainly found in the highlands of Dahena district.

Abergelle district is one of six districts in the Waq-Himra Nationality Administration of Amhara National Regional State (ANRS), where Abergelle goats make the highest contribution to farmers' livelihoods, compared with other agricultural enterprises. Goats are considered important assets, which can be sold at any time when cash is needed. Their products and by-products, such as meat, milk and butter, are a valuable source of food. Sales of live goats, butter and skins are a significant source of income for farmers. Goats are also an important source of manure in the crop-livestock mixed farming system. Their dung, mixed with other biofuels, makes a significant contribution to domestic energy. However, the contribution of goat production to community livelihoods is smaller than could be expected, given the potential of the goat subsector in the area. This is due to the use of traditional goat management practices, as well as high disease prevalence and feed shortages. As a result, most farmers in the district are dependent on the Productive Safety Net Program (PSNP) for their livelihoods.

Despite the subsistent goat production system based on traditional management practices, and a fragmented marketing system whereby producers are poorly linked to potential sales outlets, there are opportunities to improve production and productivity in the goat subsector and increase the contributions it makes to farmers' livelihoods. A first step is to assess the Abergelle goat value chain to develop an efficient production and marketing system and enhance its contribution to the livelihoods of farmers.

This study

This study contributes to the Ethiopian small ruminant value chain development project of the CGIAR Research Program (CRP) on Livestock and Fish. It is being implemented in eight target districts throughout the country. For each site a team was formed to conduct a rapid value chain analysis (VCA) using a toolkit developed by an ICARDA-ILRI team and researchers from the partner centers (<http://livestock-fish.wikispaces.com/VCD+Ethiopia>). In addition to the site reports, the national team prepared a synthesis report incorporating the findings from all eight sites (<http://livestockfish.cgiar.org/focus/ethiopia/>). The synthesis report also includes the conceptual framework and describes the general methodology applied for the rapid value chain analysis.

Objectives

The general objective of the study was to gain a good understanding of the context in which the different actors in the Abergelle goat value chain are operating and thereby identify possible production and marketing research and development intervention areas. Specific objectives were:

- To assess the core functions and actors and their role in the Abergelle goat value chain.
- To map the major marketing routes and channels of Abergelle goats.
- To identify gender roles along the different levels of the Abergelle goat value chain.
- To assess challenges and opportunities in the Abergelle goat value chain.
- To recommend future development and research intervention areas in the value chain.

Study area

This survey of Abergelle goat producers was conducted in Saziba village, situated in Mekane-Genet (03) kebele¹ in Abergelle district, part of the Waq-Himra Nationality Administration located in Amhara Regional State, Ethiopia. For the traders group, assessments were carried out by following the transaction routes of live Abergelle goats in Sekota, Finarewa and Mekelle markets.

Abergelle district is located in the northeastern part of Amhara National Regional State. It is bordered by Beyeda (west) and Tselemt (north) districts of the North Gondar Zone, by Sehala (west), Ziqualla (south), and Sekota Zuria (south) districts of WHNA, and by Tigray national regional state (north and east).



Figure 1: Location of Abergelle district

The district covers a total area of 166,086 ha, of which 35,116 ha has potential for crop production. Currently about 16,364 ha of land is under cultivation. The district has about 87,601 and 9,895 ha of grazing and bushland, respectively.

¹ Kebele is the smallest administrative unit in an urban or rural centre, with its own jurisdiction.

The topography of Abergelle district is 10% plain, 20% undulated, 55% mountainous and 15% valley (AWOA, 2012). This shows the limited availability of land for crop agriculture and the potential for small ruminant production. The soil type is a mixture of sand and clay. The district's rivers are important sources of water, for domestic as well as livestock use. Some of these rivers are also becoming sources of water for irrigation. Recently, the Tekeze hydropower dam created an artificial lake. Some 90% of the Tekeze dam's water body is located in the district.

The district ranges in altitude from 1150-2500m. The temperature varies between 23C and 43C. Annual mean rainfall ranges from 250-750 mm, illustrating the arid/semi-arid nature of the area. Generally, the district's agro ecology can be classified as lowland (Kolla). This covers about 85% of the district, with the remainder classified as mid-altitude (Weinadega).

In 2011/2012, Abergelle district had a total population of 47,106, of which 23,964 were females and 23,142 males. There are 15 administrative kebeles in the district. With the exception of a few civil servants, almost all households depend on agriculture for their livelihoods. The farming system is mixed crop-livestock, dominated by livestock production (Belay, 2008). Due to erratic rainfall and poor soil fertility, crop production is restricted to some pockets that have more fertile soils and moderate levels of moisture (Dereje, 2004).

Currently, the district has a potential of 35,116.6 ha for crop farming, of which 16,364.05 ha is under cultivation. According to focus group discussants, the average farmland holding size in Saziba kebele is 0.5, 1.5 and 2 ha for small, medium and large-scale farmers respectively. The dominant crops grown are sorghum, sesame, teff and haricot beans. To a lesser extent, farmers also produce maize, barley, faba beans and horse or broad beans. Crop production is mainly rainfed. However, irrigated agriculture is emerging in some areas along the river banks. For instance, in Saziba, the average holding of irrigable land ranges from 0.125 to 0.375 ha.

Data collection and analysis

Both qualitative and quantitative data was collected from primary and secondary sources. The qualitative data and/or information included perceptions and attitudes of actors about core functions at different levels of the Abergelle goat value chain. The quantitative data included livestock holding, sales volume, price, cost and other related variables. The primary data sources were livestock producers in Saziba kebele, various experts in the district government offices, traders at different levels, private and institutional consumers, agricultural researchers at the Sekota Dryland Agriculture Research Centre (SDARC), processors and other stakeholders in the Abergelle-Mekelle goat supply chain (Annexes 1 and 2). Some of these organizations were also important sources of secondary data. In addition, some secondary data was obtained from the Internet.

Participatory Rural Appraisal techniques were used for data collection. More specific methods included Focus Group Discussions, key informant interviews, desk review and observation/visual appraisal. The main data collection tools were checklists which were drawn up for producers, traders, processors, consumers and support institutions.

Given that most of the data is qualitative in nature, and that the collection techniques were informal, it was decided to use a descriptive and thematic analysis technique. The data was triangulated by cross-checking using different methods. The quantitative data was analyzed using descriptive statistics (mean and percentages), and qualitative data was narrated. The information is presented using graphs and tables.

Results: Core functions in the goat value chain

The core functions in the Abergelle district goat value chain are input supply, production, marketing, processing and consumption. As shown in Table 1, there are different actors in each core function, who undertake various activities.

Table 1: Core functions, actors and activities in the Waq-Abergelle goat value chain

Core functions	Input supply	Production	Marketing	Processing	Consumption
Actors	<ul style="list-style-type: none"> - Smallholder Farmers - Abergelle District Office of Agriculture - Amhara Credit and Saving Institute - Non-governmental organizations - Sekota Dry Land Agricultural research Centre - Cooperatives 	<ul style="list-style-type: none"> - Smallholder farmers - Owner producers - Share producers 	<ul style="list-style-type: none"> - Smallholder farmers - Local collectors - Traders - Wholesalers - Retailers - Brokers 	<ul style="list-style-type: none"> - Smallholder farmers - Hotels & restaurants - Butchers - Abergelle abattoir 	<ul style="list-style-type: none"> - Farmers - Urban dwellers - Foreign consumers
Activities	<ul style="list-style-type: none"> - Breeding stock Livestock extension - Veterinary services - Dispersing credit - Restocking - Improved forage supply 	<ul style="list-style-type: none"> - Breeding - Housing - Herding - Milking - Conditioning - Fattening 	<ul style="list-style-type: none"> - Buying/Selling - Collection - Wholesale - Retailing - Brokering - Transporting 	<ul style="list-style-type: none"> - Milk processing - Slaughtering - Selling 	<ul style="list-style-type: none"> Consumption of: Goat meat Live goats for breeding and fattening Whole goat's milk Goat butter Other goat's milk by-products

Input supply

Input supply and utilization is one of the core functions in the Abergelle goat value chain. Inputs are all the necessary materials and services that are required for goat production. The inputs considered here include breeding stocks, feed, housing, veterinary services, credit and extension services.

Feed supply

The main sources of goat feed are different browsing species that grow wild on communal land. In most cases, goats are left to browse by themselves on these lands. Livestock producers in general, and goat producers in particular, do not use supplementary feeds based on concentrates (industrial by-products, such as wheat bran and oilseed cakes). There are no suppliers of such concentrate feeds in the district or in the zone. However, during observations at Mekelle market, it was noted that wholesalers and retailers use such industrial by-products for goat conditioning, before selling the animals to consumers.

The Abergelle District Office of Agriculture and Sekota Dryland Agricultural Research Centre have made attempts to provide improved forage seeds in the area, such as cowpea, lablab, elephant grass, vetch and oats. Although no formal study has been conducted in the area, it seems that the level of adoption of these forage technologies by local farmers is very low. Farmer responses during FGDs indicate that producers use cowpeas for household consumption and feed the haulm to kids and old goats.

Breeding stock

Breeding stock is a crucial prerequisite for goat production. The primary actors in the Abergelle goat value chain are smallholder farmers. Their initial breeding stock may come from purchases, gifts, inheritance, share goat rearing or other similar sources. Farmers use replacement stock from their own herd, and buy from market. In some cases, NGOs are involved in supplying breeding stock (generally 5 females and 1 male goat) to households benefiting from the Productive Safety Net Programme (PSNP). In Abergelle district, Save the Children – UK distributed breeding stock via revolving means to PSNP beneficiaries, so as to facilitate their graduation from the programme.

Veterinary services

Goat disease is a major constraint to production in Abergelle district. Peste des Petits Ruminants (PPR), Variola caprina (goat pox), anthrax, abortion, coenurus, and pasteurilosis are the main diseases observed in the area. Parasites, such as mange mite, ticks, orf, liver fluke, haemochus contortus and lungworm also affect goats. Goat diseases and parasites cause significant losses in production and productivity. Farmers in the district only have access to veterinary services from the District Office of Agriculture. The district has five animal health posts, each of which serves three kebeles. There is no animal health clinic at district level. Three health posts are staffed by three extension workers, while the remaining two health posts have no health extension workers. There is just one Divisional Veterinary Manager (DVM), who serves at district level.

Due to the heavy workload of district livestock health practitioners, and the need to increase access to veterinary services, Community Animal Health Workers (CAHWs) were trained in some kebeles, including Saziba. Their role is to serve the community by providing preliminary veterinary services. However, they were not working effectively due to resource limitations, such as lack of drugs and equipment, which were previously supplied by NGOs. Due to limited access to public and private veterinary services, some farmers use drugs obtained on the black market. Private veterinary services are only available in Mekelle, 100 km from the study area. Based on discussions with experts from the Abergelle District Agriculture Office (AWAO), it appears that the district's veterinary service coverage is inadequate, due to financial constraints and poor infrastructure, as well as lack of human resources.

Credit services

Credit services are important inputs for goat production. Credit delivery is particularly important for establishing initial breeding stock, especially in the case of the poor and young people. The sole formal rural financial institute operating in the area is the Amhara Credit and Saving Institute (ACSI). ACSI provides loans to farmers on a group basis for goat production, marketing and cattle fattening. Of the total 713 households who took out ACSI loans in the district, about 500 of them did so for goat production. Some 150 clients took out loans for various non-agricultural trade activities. Only four of the ACSI clients were livestock traders and five were registered as needing loans for fattening businesses.

To be eligible for a loan for goat production, applicants must be organized into groups of 3-7 people. Each person must also own goat housing and forage and be willing to use veterinary services. ACSI prepares business plans for successful applicants, in collaboration with agricultural development agents. However, such services offer limited loan sizes. For example, ACSI provides loans of 5,628 Ethiopian birr (ETB) (ETB 19 = USD 1.00 at 3 December 2013) per person, with an annual 18% interest rate. Given their short maturity timeframe, the loans were generally considered more suited to those involved in livestock trade than those in production.

The Household Asset Building Programme (HABP) is the other source of rural credit in the area. HABP has a credit component aimed at creating wealth for households due to graduate from the PSNP. The credit scheme is administered by ACSI. It encourages activities such as goat rearing and fattening, which could enable rural households to build up assets within a short period. In order to obtain HABP credit, households must develop their own business plan – with the help of extension agents. The interest rate for HABP credit is 10%. The loan is made for the purchase of goats for production.

It emerged that many farmers are reluctant to take out loans from ACSI, due to their reliance on aid and perception that the loan conditions and procedures are inconvenient, while the interest rates are high. KJIs revealed that despite close monitoring and follow-up, ACSI's loan repayment rate was low compared with that of other informal credit providers.

When it comes to informal sources, farmers obtain credit from moneylenders for goat rearing and trading purposes. Focus group discussants indicated that they obtain credit from relatives and neighbours. Relatives usually borrow money from each other, without charging interest. However, the interest rate in the informal credit system is extremely high (generally more than 100%), far exceeding that of the formal sector.

Goat production

Goat production forms the mainstay of livelihoods in the crop-livestock mixed farming system of Abergelle district. The FGD discussants in Saziba indicated crop production as facing challenges due to loss of soil fertility, a decline in farm size and recurrent drought. They identified goat production as having a comparative advantage as an adaptive/alternative livelihood strategy. Halima et al. (2012a) mentioned that the Abergelle breed is adapted to drought stress. Due to the feed requirements of goats, which are less demanding than those of cattle, production of these small ruminants is becoming the mainstay of rural household livelihoods in the study area (Belay, 2008; Dereje, 2004). Farmers keep Abergelle goats for meat and milk production, as well as for consumption and as a source of income to buy food grain during shortages and pay for other miscellaneous household expenses.

Abergelle district has 261,544 heads of livestock, of which 147,557 are goats and sheep (AWAO, 2012). Goat producers in the district are exclusively smallholders. According to the FGD carried out in Saziba village, the per capita goatherds of poor, medium and rich farmers numbered 15-30, 60-80 and 200+ heads, respectively.

Feeding

Goats browse in forest and bushlands. Farmers do not provide supplementary feeds, such as pods collected from browse trees or household products such as atela². However, during the lean period, they provide sorghum stover for sick and lactating goats. Nor do farmers provide other supplements, such as concentrates or silage. That is because such concentrates are not available in the surrounding area and there is no tradition of making silage.

Focus group discussants scored rainfall distribution throughout the year by using beans. They categorized months as having very high rainfall, which scored five; high rainfall scored four; sufficient rainfall scored three; good rainfall scored two; little rainfall scored one and no rainfall scored zero. Their scores showed that rainfall distribution is most abundant between June and August, with high rainfall recorded in July (Figure 3). The highest feed availability is in

²Atela is a residue of local beer

August, followed by September, October, July and November, in that order. Although browsing is available in the dry seasons, the volume is negligible (Figure 3). During the rainfall season (kiremt³), there are relatively higher volumes of green feed, but this ends in the Meher⁴ season (Figure 3). Browsing forage is available to some degree throughout the year, with a peak during the Meher season. During the months from February to May, feed availability is negligible, due to the long dry season. This causes body weight loss and even death among goats. Cowpea haulm and sorghum stover are produced in the Meher season and conserved for the periods first Bega⁵ and second Bega⁶ for newborn kids, even though there are only small amounts.

The type of feed available varies according to season. During keremt, green fodder accounts for almost 20% of feed, while the remaining 80% of goat nutrition is obtained through browsing (Figure 2). During first and second bega, green fodder is no longer available for goats, but sorghum stover is offered to lactating and sick goats. Other goats are not given supplementary feed during the lean period.

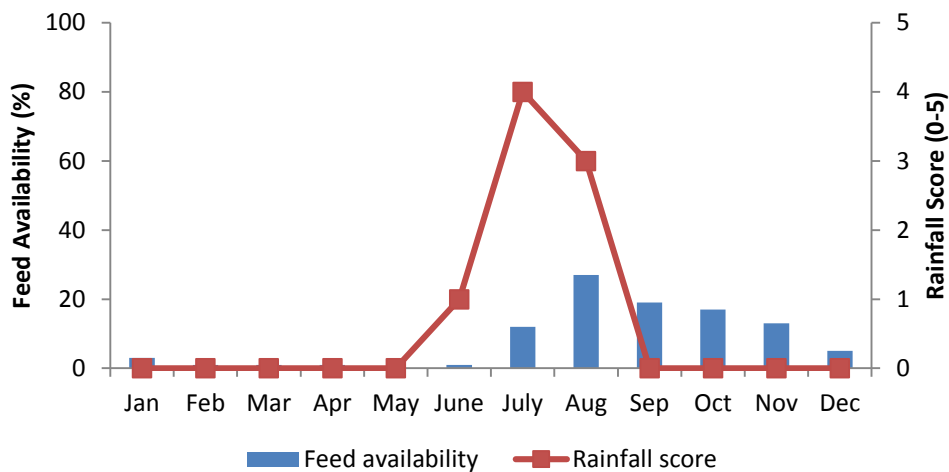


Figure 2: Feed availability relative to rainfall distribution

³Kiremet covers the months of June, July and August

⁴ Meher covers the months of September, October and November

⁵ First Bega covers the months of December, January and February

⁶Second Bega covers the months of March, April and May

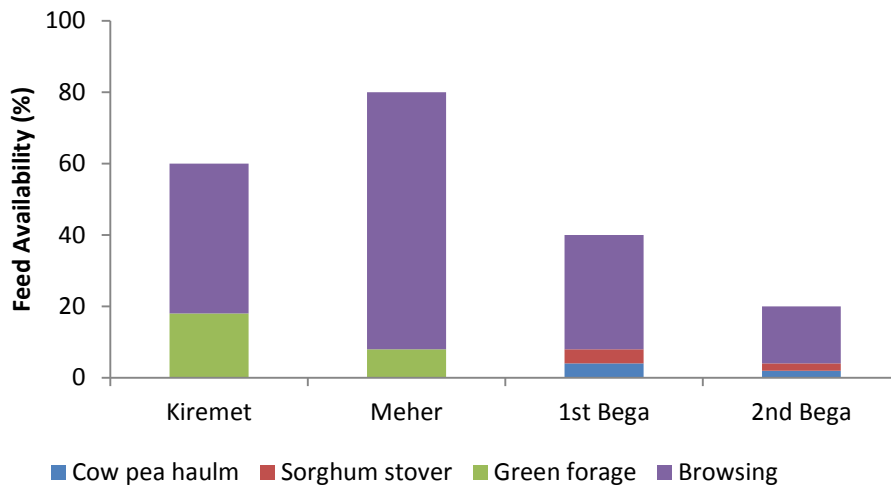


Figure 3: seasonal feed resource availability

In spite of problems caused by severe feed shortages in the area, farmers place little importance on supplementing feed for goats. Although various development and research organizations have introduced improved forage species, such as cowpea, lablab, vetch, oats and elephant grass, their use as primary or supplementary feed for goats remains negligible. This is due to the small and fragmented nature of farmholdings, with an average of just 0.7 ha per household (Tewodros, 2010).

However, there are some traditional feed management practices in the area. Traditional feeding practices used as coping mechanisms during feed shortage seasons include seasonal stock movement in search of browsing, feeding foliage from tree branches and giving sorghum stover and cowpea haulm to kids and old goats. Rotational grazing/browsing traditions also exist, whereby communal lands along rivers are reserved for use in dry seasons. These temporary protected areas are kept free of grazing from December to January. However, such practices are in decline due to land shortages.

Another traditional practice involves feeding goats salty soil during rainy seasons. In July and August, farmers take their goats to specific areas that have salty soil, or bring the soil home and feed it to their goats. Farmers believe this will help to keep goats healthy and develop good body condition.

Breeding

The Abergelle goat is the predominant breed for farmers in Waghimera Zone, and particularly in Abergelle district. Experts and farmers believe that its merit lies in the breed's drought resistance and adaptation to the unique agro climatic conditions. No improved breed has been introduced to the area. 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 favours the idea of conserving and improving the productivity of the Abergelle breed through selection before embarking on cross breeding.

FGD discussants characterize Abergelle breed as short eared, with small body size and good drought resistance. It is a breed whose does do not lose significant amounts of weight when giving birth and milking, and are able to thrive on the particular local undulated landscape.

Discussants also highlighted the good quality of the Abergelle breed in terms of the special taste of its meat.

It was learned that farmers in the area are selecting better performing animals for breeding stock. The selection criteria differ for male and female goats. Farmers consider physical appearance, colour and sexual desire as main criteria for selecting bucks. They take account of prolificacy, milk yield, kidding intervals, physical appearance and colour when selecting females. These criteria are evaluated directly for each individual animal, or inferred from its pedigree. Breeding males are used for 3-5 years, after which they are sold or castrated.

According to information obtained from FGDs, farmers keep their flocks separated so as to protect against unwanted mating among different herds. Given these conditions, goats of similar inheritance mate with each other. Farmers do not share and sell bucks to neighbours for breeding purposes, due to the traditional belief that “a farmer will lose his flock if his buck serves another farmer’s does” and also due to fear of disease transmission between herds. Farmers do not keep formal records, but they are familiar with the performance and behaviour of each goat in their herd.

In order to sustain goat production as a major livelihood strategy, there will need to be improvements in the breed, either through selection or through crosses with other indigenous or exotic goat breeds.

Animal health care

Both microbial and parasitic diseases are prevalent in the study area. Microbial diseases are PPR, Variola caprina (goat pox), orf, actinomycosis and pasteurellosis. Parasitic diseases are mange mites, lice, coenurosis and *Moniezia expansa*. Abergelle District Agriculture Office provides vaccines for PPR, pox, anthrax and ovine pastuerollosis, as well as acaricide for skin disease, such as mange mite and ticks. CAHWs were trained in some kebeles, including Saziba, to serve the community in providing preliminary veterinary services.

Housing

Housing is crucial to improve goat production and productivity. It also protects animals from predators and theft. Farmers construct houses to keep goats overnight. The type of house varies during wet and dry seasons. Dry season housing consists of temporary fencing made from tree branches. It is used for a period (e.g. two weeks) and then shifted to another place to protect goats from lice, ticks and other insects and sources of disease.

In summer (rainy season), farmers use caves or construct barns with roofs made from locally available materials, such as grass and tree branches. Farmers clean the barn every morning to protect against potential disease and prevent foot rot and problems linked to parasites. Producers interviewed said that goat milk yield will decrease unless barns are kept clean.

Goat marketing

Goat marketing involves the collection, transportation and distribution of animals to end-users. Taking live goats as a commodity, the following sections present the situation regarding marketing of goats, the actors involved and the nature of product flow in the study area.

Marketing routes

The marketing route for Abergelle goats tends to be complex. As Abergelle district is bordered by different districts within ANRS and Tigray NRS, there are different outlets (Figure 4). Some of these are interlinked, while others are independent. For example, there is live goat outflow towards North Gondar, Mekelle, Yechilla, Korem, Maichew and Adigrat. However, taking Finarwa as the central market for Abergelle district, the dominant outflow marketing route is towards Mekelle.

Although Fenarewa is the major marketplace, there are three main outlets for Abergelle goats from the district. These are Beyeda in North Gonder, Axum and Mekelle towns. The Beyeda Route takes the smallest share of goats from Abergelle; the Axum route takes the next largest volume; and the Mekele route takes the biggest share. Of the total number of goats flowing out of Abergelle district, 70% percent go to Fenarewa market, 20% go to Yechela market and 10% go to Beyeda. About 95% of goats sold in Fenarewa market are transported to Mekelle (Figure 4).

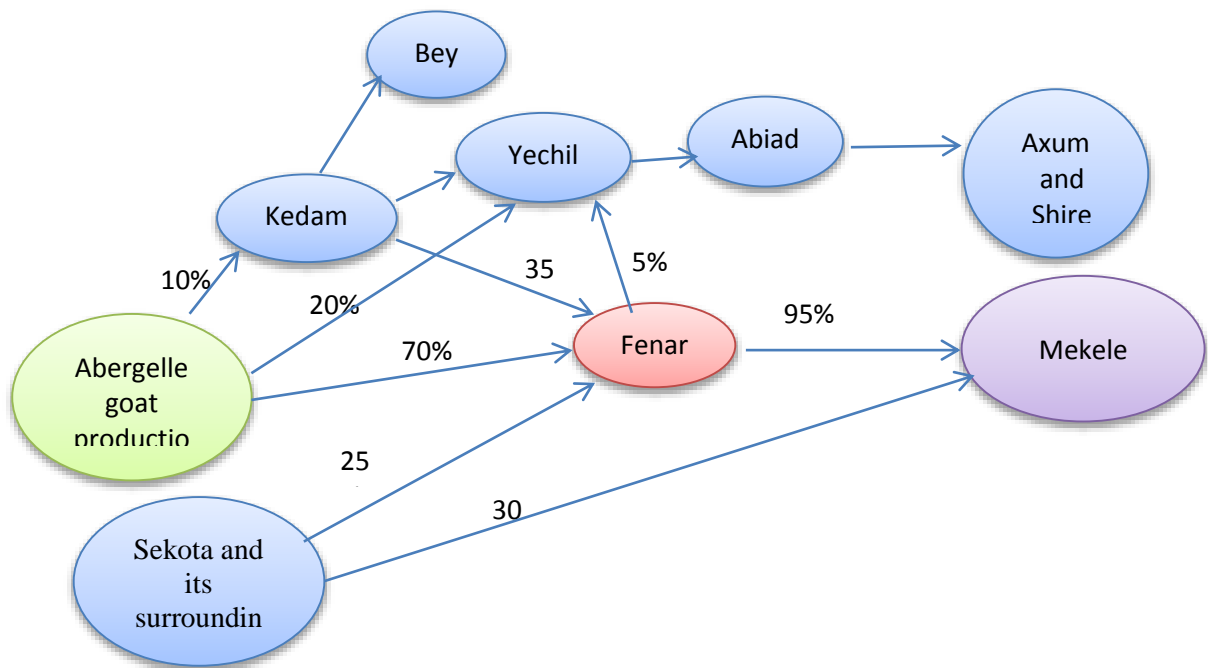


Figure 4: Waq-Abergelle goat marketing routes

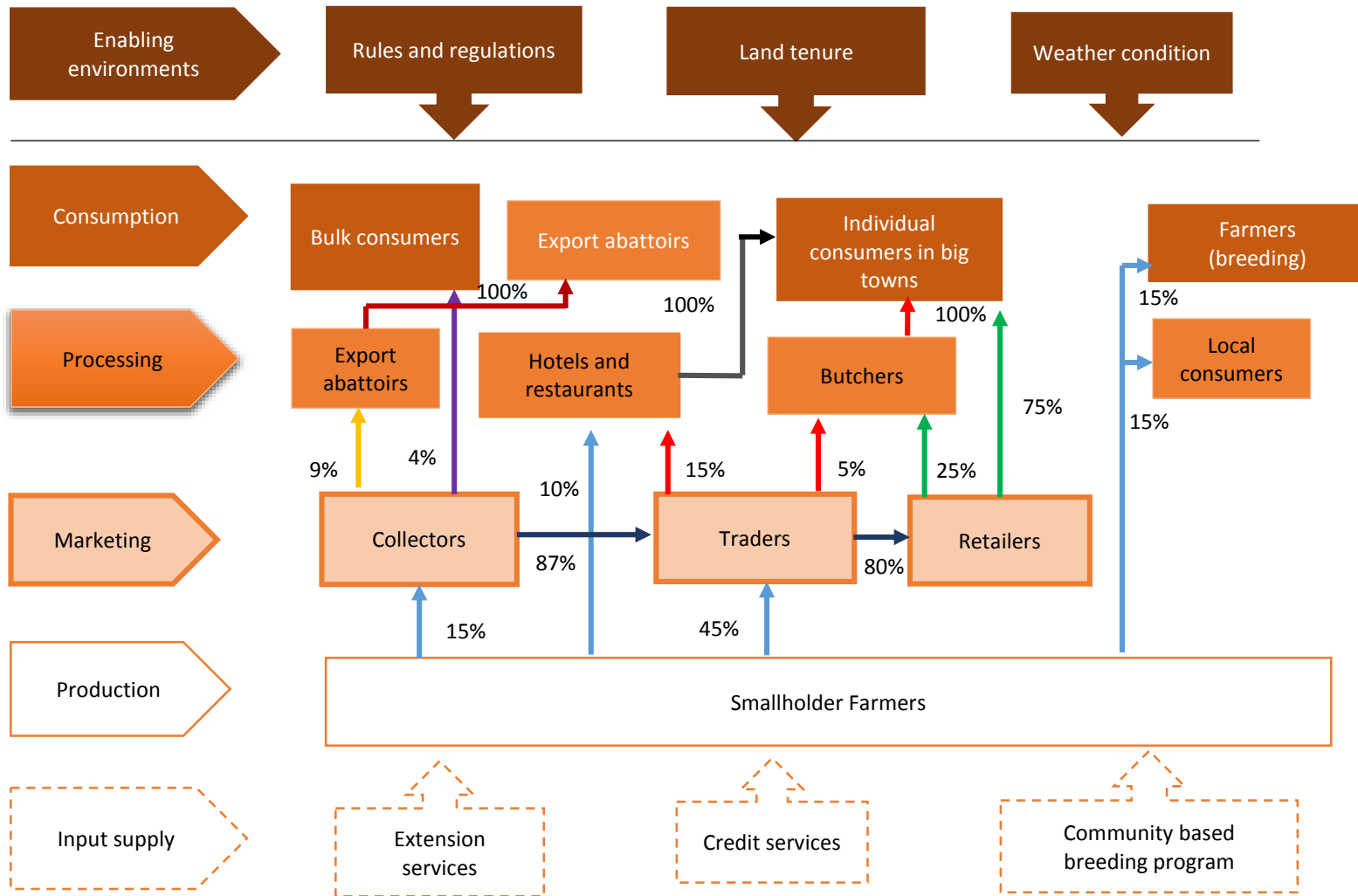


Figure 5: Wag- Abergelle goat marketing channels

Marketing channels

A marketing channel is the flow of goods and services from its point of production to its end market. In this process, there are different actors, who may be individuals and institutions involved in production, marketing, processing and consumption.

Abergelle goat marketing channels begins at the farmgate and flow out through various paths to reach consumers. The study identified five major channels, with various pathways before Abergelle goats reach the end market.

Abergelle goats reach final consumers through several channels. However, we considered only six major pathways, based on the volume of live goats channelled.

Market channel one: Producers → collectors → small-scale traders → individual consumers

This is a channel in which individual consumers (both small town dwellers and people in rural communities) buy goats to slaughter for household consumption. Such consumers usually buy slaughter goats for special festivities, such as the Ethiopian New Year, Christmas, Easter, Ramadan and Arefa. Some households also buy slaughter goats for special occasions, such as weddings and other ceremonies. The type of animals bought by individual consumers depends on their income and the occasion for which the animal is required. Generally, wealthy households buy fattened, castrated goats, while lower income groups buy male yearlings.

Market channel two: Producers → collectors → small-scale traders → retailers → individual consumers in big cities

Individual consumers in big cities, such as Mekelle, Axum and Shire, are unable to buy animals directly from producers. Rather, the animal passes through a chain of collectors, small-scale traders and retailers before it reaches the final consumer. For this reason, the transaction costs and margins of each actor along the lengthy value chain inflate the final price of the animal when it is sold to the end consumer. As indicated in the case of channel one, the type of animal bought by individual consumers varies according to levels of household income. However, most consumers in big cities opt for fattened goats, unlike those in smaller towns. As a result, traders from different parts of the region transport fattened goats to Mekelle, immediately prior to the above-mentioned festivities.

Market channel three: Producers → farmers (for breeding purposes)

Farmers usually buy young female goats for breeding purposes. Some farmers also buy slaughter goats for household consumption if they do not have one in their herd. They buy goats in primary markets, such as Fenarewa, Tsetseka and Nueraque. The farmers assess the goat's historical background for prolificacy, colour, meat and milking potential, either by interviewing the seller or by asking a neighbouring farmer who is familiar with the goat's breeding character. Price setting is done through negotiation between the two parties. The farmers mostly buy yearling female goats, though they sometimes buy bucks for breeding purposes.

Market channel four: Producers → collectors → small-scale traders → bulk consumers

Bulk consumers in the study area are Ethiopian defence forces (Semien eze). They buy goats at Fenarewa, Neuraque and Yechela markets from local collectors, traders and farmers. The major suppliers to such bulk consumers are small-scale traders, who are able to provide these clients with large numbers of animals at a time. In order to collect the required number of animals, traders use a network of collectors. These buy goats of different types,

such as infertile does, old bucks and yearlings. They transport the animals using trucks that load up to 200 heads of goats at a time.

Market channel five: Producers → collectors → export abattoir

Abergelle abattoir is the only export abattoir in Mekelle. It exports goat meat and beef to different international markets including Middle East and North African (MENA) countries and other African countries, such as Angola and the Comoros Islands. The abattoir buys goats from collectors and small-scale traders from Fenarewa, Neuraqe, Tsetsequa, Yechela and Sekota markets. The abattoir requires male, uncastrated yearling goats. However, the firm has currently stopped exporting meat because the local market price of goats and cattle is very high and the abattoir could not be competitive on international markets.

Market channel six: Producers → collectors → small-scale traders → hotels and restaurants

Hotels buy slaughter animals either directly from farmers or from small-scale traders. As illustrated in Figure 5, their major suppliers are small-scale traders. Hotels and restaurants buy infertile does and castrated goats because these yield more meat than yearling goats and have better body fat coverage, which makes a better quality wat (local stew). Hotels and restaurants process goat meat into dishes such as keywot, tibes, kikul and dulet and sell them to their customers.

Actors in the value chain

Producers: Smallholder farmers are the only producers of Abergelle goats. They use traditional breeding, feeding and housing methods to produce goats and do not receive adequate support from the extension system. They sell goats to obtain cash income for household expenses, such as buying grains for household consumption, buying agricultural inputs such as fertilizer and seed and paying the medical costs of household members. Goats also serve as a source of cash to purchase larger animals, such as cows and oxen. Farmers sell their goats at farmgate, on their way to market (on the road) and in the markets (Fenarwa and Kedamit). Producers sell both in bulk (if they are selling more than one animal) and on an individual basis. They prefer to sell their goats to traders, since these generally give better prices than individual consumers and other farmers, who try to negotiate and force down prices. Animal prices usually rise when several traders visit the same market, since they are seeking to buy large number of animals at a time.

Collectors: Most local collectors are farmers, who perform the collection service as a part-time business activity. These collectors buy up to 20 goats at a time, and sell them to traders, as well as to the Abergelle export abattoir and defence force clients, in bulk at Fenarwa market. The collectors also sell directly to producers. Sometimes, collectors from Tigray region collect goats by visiting producers in Abergelle district door-to-door. They then sell them on to intermediate traders on an individual basis or in bulk.

Small-scale traders: Intermediate traders also purchase goats from collectors and/or directly from producers and sell them to other traders, wholesalers, retailers and consumers. The traders add place-time value to the animals. They buy 30-50 goats at a time and sell them at Mekelle and Fenarewa markets. These traders sometimes transport the animals using Isuzu trucks, forming themselves into groups so as to fill a truckload of animals at a time. However, more often, they trek the animals from production areas to primary, secondary and terminal markets, such as Mekelle (which is over 120 km from the production area).

Large-scale traders: These mostly come from Tigray and purchase in bulk directly from producers and local collectors (known as *Jemela* in Amharic). The traders buy up to 100 goats at a time. However, there are not many of these traders and they only visit market centres that have road and transport access, or are located along main roads. They sell to retailers in Mekelle, as well as to export abattoirs and bulk consumers, such as the defence force.

Retailers: These buy animals from large and small-scale traders in bulk, before selling them on to individual consumers, butchers and hotels and restaurants at Mekelle terminal market. Some of them own or rent holding centres for animals and use supplementary feeding. These retailers have better financial capacities than small-scale traders and wholesalers. Retailers play a critical role in determining the market price of goats. According to a trader interviewed for this study, customers in Mekelle call and tell him the next day's price for animals at Mekelle market, so that he can negotiate with the seller (collector or producer), based on his profit margin. This indicates that retailers are in a stronger position to determine market price. Since Mekelle is the biggest livestock market for Abergelle and the surrounding area, it plays a significant role in determining the market price of goats at farmgate, roadside and at other primary and secondary market places.

Export abattoirs: Abergelle abattoir is the only export abattoir in Mekelle. It slaughters goats, removes the skins, chills the carcasses and wraps them in cotton fabric before transporting them to cargo planes. The abattoir exports chilled carcasses to the Middle East countries (Bahrain, Saudi Arabia and United Arab Emirates). It buys goats, sheep and cattle from traders, collectors and farmers in Tsetseka, Sekota, Nuraque, Fenarewa and other primary markets in Waghimera zone in general, and Abergelle district in particular. It buys goats that are less than two years-old and that have good body and health condition. The abattoir buys goats on a live weight basis. As previously observed, the price paid for animals on a live weight basis is lower than that based on a visual appraisal. The key informants interviewed for this study indicated that they are reluctant to sell to the abattoir because this buyer pays sums that are lower than the market price for goats. Producers prefer to sell their goats at Mekelle, Fenarewa and other markets, to traders and consumers, rather than to the export abattoir.

Butchers: Butchers are located in Mekelle. They buy goats from retailers and wholesalers, before slaughtering them and selling the meat to various consumers. Butchers buy mid-aged goats and castrated bucks. That is because they require fleshy animals, since raw cut meat is becoming a popular product in larger towns. Butchers serve both raw and cooked meat at their premises, and they sell raw meat for takeaway to individual consumers. Since they have processing costs, including spices, injera (a kind of thin pancake) and firewood, they charge a higher price for prepared dishes consumed on their premises.

Hotels and restaurants: Hotels and restaurants look for older does and castrated male goats. This is because the meat quantity of these animals is much higher than that of yearling goats, and they also have fat, which makes a better quality *wat* (local stew). The hotels and restaurants prepare dishes such as *keywot*, *tibs*, *kikil* and *dulet* and sell them to their customers. Hotels and restaurants in Sekota and other smaller towns can buy goats from producers, collectors and small-scale traders. However, those in larger towns, such as Mekelle, rely on retailers and large-scale traders to supply slaughter animals for their purposes.

Individual consumers: Individual consumers are market actors who buy goats for household consumption. They buy from farmers, collectors and retailers. They generally prefer infertile does and castrated bucks, due to their better meat quality (usually fatty meat is preferred) and the greater proportion of meat on a carcass. Meat quality and quantity aside, there is prestige in slaughtering fattened and sterile goats. However, most low-income consumers buy mid-aged goats, since they cannot afford the price of older ones.

Transporters: Transporters charge ETB 5-6 per head to trek goats from Fenarewa to Mekelle, a journey that takes three days. If any goats are lost on the journey, the transporter has an obligation to pay its value to the owner. However, this is rarely enforced. Isuzu and Oral trucks are used to transport goats from Fenarewa and Sekota markets to Mekele and the defence force premises (Semien eze). Truck owners negotiate charges with goat owners, using drivers as intermediaries.

Analysis of end markets

There are various consumers for live goats and goat meat, as already indicated. Both the domestic and export markets are growing, and demand for goats is increasing. Domestic market demand for goats is growing due to the rise in both urban and rural populations. Goat meat is a priority product for consumption when household income increases, especially in the lowlands.

An analysis of data from the Ethiopian Revenue and Customs Authority shows that Middle Eastern countries (12 countries) are the major market outlet for meat and live animals exported from Ethiopia. Of these, the largest share of meat is exported to Saudi Arabia and UAE. Other destination markets for Ethiopian meat are Angola, Bahrain, the Comoros, Democratic Republic of Congo, Egypt, India, Kuwait, Oman, Republic of Congo, Turkey, Vietnam and Yemen. Angola, the Comoros, Egypt, the Democratic Republic of Congo and the Republic of Congo are markets for beef, whereas Turkey and Vietnam buy offal. Saudi Arabia and UAE, Ethiopia's main markets for chilled goat carcasses, have specific requirements, especially in terms of carcass weight. The UAE market demands carcasses of 5-10 kg. This means slaughtering animals of 13-25 kg live weight. The Saudi Arabian market demands larger carcasses – 7-12 kg for goats and 8-12 kg for sheep. This means slaughtering goats of 16-30 kg and sheep of 20-30 kg live weight. Although quality requirements vary, the goat export market generally requires animals with the following characteristics: male, young (1-2 years) and with a live weight of 12-30 kg. The export market prefers uncastrated goats with a lower proportion of fat, while the domestic market prefers castrated males or female animals (Getachew et al. 2008).

Despite the challenges posed by repeated trade bans, Egypt and the Gulf States are currently the primary targets for Ethiopian meat. Due to competition from Australia, Brazil, India, Pakistan and New Zealand, Ethiopian meat sells at the low end of the market in these countries. The market is segmented according to incomes, with higher-income populations preferring freshly slaughtered meat, while lower-income populations (particularly low-income expatriates) opt for low-cost meats that are usually frozen. This is also the segment of the population that consumes chilled Ethiopian goat carcasses

Transport

In order to deliver goats purchased from producers to consumers in different areas, traders use two modes of transportation: trucking and trekking. Larger-scale traders, who collect in bulk, use Isuzu trucks for transportation.

Fenarewa is the major marketplace. The distance from Fenarewa to Mekelle is 80 km. Traders transport goats using Isuzu trucks. The volume of goats going to Mekelle is seasonal (Christmas, New Year, Arefa and Easter). During such holidays, seven Isuzu truckloads of goats are transported to Mekelle town, while three Isuzu trucks per week make the journey during other periods. The average mortality rate per Isuzu truckload is two goats. Each truckload carries 70-100 goats. The transport cost per goat is ETB 20. The number of goats transported by Isuzu truck is generally one-third of the number transported to Mekelle. Trekking goats from Finarwa to Mekelle takes three days. The mortality rate is higher when animals are transported by Isuzu truck than when they are trekked on foot.

Processing

Processing involves preparing goat meat, either for domestic or export consumption. Butchers, hotels and restaurants are involved in processing goat meat for domestic consumers. These actors slaughter goats and prepare meat for consumption in raw form, or as wat, kikil and tibs. Export abattoirs are involved in slaughtering goats, removing the skins, chilling, wrapping carcasses in cotton linen and exporting them using a cold chain. Although the Abergelle export abattoir has the capacity to prepare different cuts of meat cuts from a goat carcass, it exports carcasses without further processing.

Consumption

Households in the study area consume either whole goat's milk or milk products. They usually process the milk into butter, skimmed milk (awsa), whey (aguat) and cheese (ayib). With the exception of butter, which households sell to generate cash household income, these milk products form an important part of local diets. Special priority is given to nourishing children, then other family members will consume milk products, depending on availability. During the summer/rainy season (July, August and September), when most farm households face serious food deficits, milk and milk products play an important role in nutrition. Farmers report that goat's milk is considered good medicine, since goats browse different types of grass and leaves. However, due to cultural reasons women are not allowed to drink whole milk.

According to Dereje (2004), milk yield is high during the months of November and December. This is because most of the pregnant does give birth during these months. Most of the adult females conceive during the months of July, when feed availability is relatively good following the onset of rains.

Meat is rarely consumed by farm households. Unless it is a religious holiday, or cultural festival, farmers seldom slaughter goats for home consumption (Dereje, 2004). When a goat becomes sick or is injured, farmers will slaughter it for consumption. Producers' understanding of zoonotic diseases is poor. They believe that if meat is cooked, there is no risk of illness being transmitted to the consumer. Due to religious reasons, farmers do not eat meat from a goat that has died, unless they bless it before its death.

Goats are the primary source of income for farm households in the study area. Goat owners sell live goats, and to some extent, butter and skins, to generate income for different purposes, such as to buy oxen, grain and other miscellaneous household expenses. Farmers also sell their goats to pay for stationery and clothing for their children, procure agricultural inputs and cover household medical costs. Moreover, in times when farmers face food shortages, goats serve as an important source of cash for grain purchases (Dereje, 2004). Farmers also buy breeding stock (male and females). They mostly buy females from their neighbors, or from nearby markets (from producers).

Urban consumers buy live goats to slaughter at home, as well as processed meat from butchers before preparing wat⁷ and tibes⁸ at home for household consumption. They also consume these dishes in restaurants and hotels. Farmers purchase goats for breeding stock, selecting goats that have a good history of birthing, have high milk potential and are of an attractive colour.

According to interviews carried out at export abattoirs, goat meat is exported mainly to MENA countries, in the form of chilled carcasses. Importers may sell a carcass as it is, or first process it into different products. In these countries, different products target different market segments (ibid). The major market segments consist of the local elite class, which consumes fresh goat meat (slaughtered on the spot), the middle class, which consumes better quality meat imported from Australia and other western countries, and immigrants living in the importer countries in search of better job opportunities. These latter usually opt for cheaper priced foodstuffs. Since Ethiopian goat carcasses are classified as a lower quality, cheaper product, they are mainly consumed by low-income groups in society, chiefly immigrants.

Support institutions

The Abergelle goat value chain support institutions could be generally classified as development and research support institutions/organizations.

Abergelle District Agriculture Office (AWAO): The development support service is mainly provided at input delivery and production stages and is delivered by the Office of Agriculture. AWAO provides extension services, such as veterinary services, and distributes improved forage species, such as lablab and cowpea. It also develops business plans for HABP beneficiary households. The office sometimes assists farmers in restocking goats, in collaboration with donors and NGOs.

Sekota Dryland Agricultural Research Centre (SDARC): assists farmers by introducing adaptive forage species such as cowpea, vetch, lablab, oat and elephant grass, and selected improved Abergelle goats through a village-based participatory improved goat selection approach. However, this effort has been constrained by a shortage of financial and skilled human resources.

Gender disparities in the Abergelle goat value chain

In the context of Abergelle district, it is common to see differences in the roles and responsibilities of men and women in goat production. For instance, men are expected to be involved in herding goats in remote areas (the main herd) and selling live goats. Women are expected to be in charge of feeding and watering kids around the homestead, milking the goats and selling butter. It is rare to see these roles reversed in the study area. Butter selling is an important source of income for females, with proceeds covering miscellaneous household expenditure.

Unless a household is short of male labour for herding purposes, females are not supposed to herd goats long distances. This is due to the respect given to females in society and fear of sexual violence. As a result, households that have a shortage of male labour hire outside

⁷ Wat is a sauce prepared either from meat, pulses or vegetables, oil/butter and different spices

⁸ Tibes is roasted meat with spices and butter

labour on a yearly basis, mostly giving payment in kind (sharing one out of every four newborn kids with the herder).

Some cultural issues in goat production and consumption

During the FGD, it emerged that no goat producers want to share their bucks with other goat producers in the same village or neighbourhood. They would prefer to sell their animals to people they do not know. This is first and foremost because they want to have and maintain their own unique herds for different purposes (better productivity, social prestige), and secondly, because they believe that if they sell a goat in their village, the person who purchases it will take their luck/wealth.

Cultural traditions forbid women and girls in the study area from consuming whole goat's milk. The focus group discussants said this was due to a belief that if a woman drinks goat's milk, she will become strong and refuse to obey her husband's orders.

Value chain challenges

Input supply constraints

Inadequate animal health workers at veterinary health posts: According to the AWAO, there are not enough animal health extension workers to serve the farming community, by providing veterinary services to goats in particular, and animals in general.

Shortages of drugs, equipment and facilities: Animal health posts in the kebeles particular, and the district in general, do not have adequate equipment and drugs to provide quality veterinary services for goats.

Skills gap among available veterinary staff: Since they do not receive in-service training, the animal health extension workers were found have skills gaps in the provision of adequate animal health services. Farmers in the area also indicated a lack of skills among some technicians.

Poor vaccine efficacy: Although the root cause of the problem needs to be explored further, animal health workers in the area indicated that the efficacy level of vaccines provided to livestock is very low. This could either be due to problems in maintaining cold chains or the result of inadequate identification of strains of diseases for which vaccines are provided.

Lack of transport facilities for animal health workers at district and health post level to reach farmers: The animal health workers do not have transport services, such as cars, motorcycles or mules, in order to travel from the health post to kebeles and villages, so as to provide veterinary services. Moreover, veterinary staff do not have transport service to travel from the district capital to the kebeles.

Inflexible credit system (interest rate, collateral): ACSI is the sole credit service institute operating in the area. However, its high interest rate (18%) is not affordable for smallholder farmers. Moreover, the system requires group collateral to guarantee loan repayment. This causes problems if one or more group members take out a loan and then moves away from the area, leaving other group members to make the repayment. Such experiences have created a sense of insecurity among members of society, who are generally reluctant to use credit based on group collateral.

Shortage of feed during dry seasons and lack of alternative sources during this time of the year: In the long dry seasons and spring, trees and bushes shed their leaves, depriving goats of a major source of nourishment, causing them to lose body weight, become infertile and sometimes die. There is no alternative source of feed for animals during these periods. Marketing of goat feed, including roughage and concentrates (especially industrial by-products) is not common in the area. As a result, feed shortages constrain Abergelle goat production, posing an obstacle to better incomes for farmers and other actors along the value chain.

Production constraints

A traditional feeding system that does not consider supplementary feeding. Goat production in the area is based on browsing in the bush and forestlands. Farmers do not provide supplementary feeds, such as concentrates and silage, to goats throughout the year. This is because there is no tradition of doing so. Farmers in the area do not make silage and the limited amount of harvested feed available is given to larger animals. Producers believe that goats can survive on browsing and do not need extra feed at any time. This traditional

feeding practice must change if farmers' livelihoods are to be transformed through the development of the goat value chain.

High incidence of diseases, internal and external parasites. A high incidence of disease and internal and external parasites, causes loss of body weight and death in goats, resulting in economic losses for farmers in particular, and the district and in general.

Low productivity of Abergelle goat breed. The Abergelle goat breed is adapted to the area, though its meat and milk productivity levels are very low. As well as the breed's small body size, inbreeding has caused problems for most herds in the area, in terms of body size and condition. The same is true of milk yields. Yet farmers' livelihood strategies mainly tend towards goat production, as opposed to crop production, due to recurrent droughts and the fragility of agricultural land in the area. This being the case, there will have to be improvements in the breed, either through selection or through crossing the Abergelle with other indigenous or exotic goat breeds, if goat production is to play a major role in livelihood strategies.

Marketing constraints

Lack of proper livestock marketing facilities. There is no livestock marketing yard in the district with proper facilities, such as good fencing, veterinary clinics, watering and feeding troughs, loading and unloading ramps and toilets.

Lack of market information. There is no formal institute providing livestock marketing information to smallholder producers. Most farmers get market information from their neighbours, who sold goats a week earlier. However, this kind of information is not necessarily accurate and may hamper farmers in obtaining due benefit from their products.

Seasonality of supply. Goat supply increases during August, September, November and January, due to an improvement of body condition in goats at this time, and an increase in demand linked to holidays such as Christmas and New Year. However, during April, May and June, farmers do not sell their goats because the animals lose body weight due to serious feed shortages. However, market demand increases during April and May due to Easter and Ginbot ledeta (St. Mary's birthday) holidays. Farmers and other actors are therefore constrained by the seasonality of supply.

Seasonality of demand for goats. In a similar way, demand for goats and other meat producing animals varies according to the seasons and fasting practices. Since the majority of the population in the area follows Orthodox Christianity, demand for goats varies with the fasting seasons. It increases during the two to three weeks before and after the Ethiopian New Year, Christmas and Easter. Followers of this religion also celebrate the birth of St. Mary in June when demand for goats becomes very strong. Demand for goats declines during the fasting seasons, when the followers of Ethiopian Orthodox Christianity do not consume any animal-based food. Such seasonal demand poses a real challenge to the development of the goat value chain.

High mortality and morbidity of goats during transportation. As indicated above, both trekking and trucking are used to transport animals to market. Trekking takes a very long time (up to three days), especially to terminal markets such as Mekelle. It also involves the risk of spreading livestock disease along the route and reduces animals' body condition. Trucking is carried out using ordinary Isuzu trucks that are not designed to transport animals. These vehicles do not have floors suited to animals, they have no partitions to keep goats

separate and there are no feeding or watering facilities. The vehicles do not have a proper ventilation system or roofing to protect animals from direct exposure to sun and rainfall. Worst of all, the Isuzu trucks are usually overloaded, and the drivers have no training in handling animals during transportation. They drive at the same speeds they would use if carrying an ordinary dry load. However, the more animals that are loaded onto a single truck, and the faster the speed, the greater the number of goat deaths during the journey. There is a high rate of mortality for animals trucked in this way, due to overloading and excessive speed. There is also a high rate of morbidity, because animals are not given feed and water during the journey.

Multiple taxation as animals cross regional boundaries. Abergelle goats are produced in Amhara regional state (Abergelle district), before being sold and transported to towns in Tigray regional state. However, traders are obliged to pay taxes at markets in Amhara region and again when they enter Tigray. This reduces the competitiveness of live goats and goat meat, especially for foreign markets. The high – and increasing – prices charged for animals, partly due to such unproductive costs, will also threaten the purchasing power of domestic consumers and their access to foods with animal protein.

Lack of vertical linkages. Farmers in the area have no regular customers to whom they supply goats. Each time they go market they sell the animal to any buyer who pays them a good price. Nor do they have any market actor to provide them with reliable market information or advance payment for their animals. Thus, farmers in the area do not have any vertical linkage with other actors in the market.

Weak horizontal linkages. Farmers in the area do not share breeding bucks with their neighbours. They also keep their herds separately. Moreover, the farmers do not have access to marketing or producers' cooperatives that could help with negotiations for the market price of goats and organize sales on contractual bases to bulk consumers, such as the defense forces and the Abergelle export abattoir. This shows that Abergelle goat producers have weak horizontal linkages among themselves.

Processing constraints

Shortage of supply of quality goats. Some market actors, such as export abattoirs, need animals with specific quality parameters. As indicated above, they need male, uncastrated yearlings of a specific weight range for specific market destinations. However, such animals are not available in sufficient quantities at the time they are needed. This creates a situation of lower demand coupled with associated high prices, which makes meat exporters uncompetitive on international markets.

Value chain opportunities

Availability of preferred Abergelle ecotype: During discussions with agricultural experts and farmers, the presence was mentioned of unique Abergelle breeds (ecotypes) in some specific locations (e.g. Ambadago and Aresgi villages). These are prized by the local community for their body size and milk yield, a fact that offers an opportunity for the development of goat value chains. The presence of different ecotypes that are adapted to the area could help to improve the Abergelle breed in terms of milk and meat production, through selection.

Availability of large areas for forage development: Of the total potential arable land area in the district, bushland and forests account for the largest share (87%). Only 9.9% is currently used for arable land and 2.5% is given over to settlements. This land could be used for improved forage development that is resistant to moisture stress.

Availability of water: Water is vital for livestock production, both for animals to drink and for forage development along irrigation canals. Abergelle district is endowed with several water bodies, including rivers (Tirary, Zamera etc.) and Tekezie artificial lake. These offer a potential resource for Abergelle goat production for smallholder farmers.

Availability of adapted forage species: Understanding the need to introduce improved forage species, the Sekota Dryland Agricultural Research Centre has checked the adaptability of forage crops such as cowpea, lablab and elephant grass in specific locations of Abergelle district. The availability of such improved forage species should be considered a good opportunity for future interventions in developing the Abergelle goat value chain.

Conclusions and recommendations

An analysis of the Abergelle goat value chain revealed that production and productivity of this goat breed is constrained by lack of supplementary feed during dry seasons, low productivity, an inflexible credit service for smallholder producers, a shortage of animal health extension workers, lack of transportation facilities for veterinary service providers and inadequate drugs and equipment. In addition, marketing of the Abergelle goat is constrained by the lack of any formal market information system, multiple taxation and a shortage of transport services, which leads to overloading of animals in trucks, with sometimes fatal results. It is imperative that these limitations are addressed by public and private-based support institutes, as well as by producers and traders.

Recommendations

First, improve veterinary services through the following interventions:

- Hiring more animal health workers to staff clinics and health posts. The Abergelle District Office of Agriculture, together with the regional livestock agency, needs to hire more animal health workers so as to staff all the veterinary health posts with the necessary human resources.
- Providing in-service training to animal health extension workers. In order to bridge the skills gap among animal health extension workers, there is a need to organize in-service training for some staff. This in turn will require need assessment initiatives so as to identify which specific areas the training should cover.
- Recruiting and training more Community Animal Health Workers for remote villages and providing them with necessary equipment and drugs. This will enable farmers to obtain immediate support for their animals before reaching the health posts to access better treatment.
- Providing technical support for the smooth operation of veterinary drug revolving funds. The Amhara Regional State has decided to allocate about ETB 1 million per district for the establishment of veterinary drug revolving funds. However, there is no experience among the District Office of Agriculture or Livestock Agency in managing such a substantial amount of resources in the form of a revolving fund for the sector. This resource could be used most effectively if the district received technical support to help identify essential drugs, and set up a system for drug procurement and handling before medicines are distributed to final users. For this reason, there is a need for technical support in the establishment and smooth running of a drug revolving fund.
- Allocating budget for procurement of clinical equipment. As indicated earlier, the health posts in the district do not have sufficient clinical equipment to deliver the services required. On the other hand, the revolving fund allocated for procurement of veterinary drugs, will not be used to buy clinical equipment for health posts and clinics. Thus, there is a need to allocate specific resources for the procurement of veterinary clinical equipment for health posts and clinics in the district.
- Providing motorcycles and mules to increase the accessibility of veterinary health services for farmers. In order to enable livestock health extension workers and veterinary staff to provide services to farmers located long distances from health posts and clinics, there is a need to provide them with mules and motorcycles. Given the topography of the area, which may not allow motorcycles to reach some locations, mules are suggested as the preferred means of transport.
- Providing regular vaccinations. This is to prevent the outbreak of major diseases for which vaccines are available.

- Identifying different strains for effective vaccination (PPR and pasteurellosis). Since there is ambiguity about the exact strains of some diseases, such as PPR and pasteurellosis, there is a need to conduct an initiative to identify the strains of different diseases for which vaccines are given in the area.
- Demonstrating evaluated technologies on the control of ctenosporosis. The Debre Berihan Research Centre has developed technology to control ctenosporosis. It is possible to demonstrate and disseminate this technology in the study area. It is therefore suggested that this demonstration and dissemination initiative be supported in the study area.

Second, providing training in goat production to farmers and development agents (DA). There is a need to train farmers and extension agents in feeding, breeding, housing, health care and marketing of goats, with the aim of improving goat production practices in the area.

Third, improve the availability of feeds and feeding practices through the following interventions:

- Developing appropriate feeding packages for goats and training farmers, DAs and district experts in improved feeding methods. Given the feed resources available in the area, there is a need to develop a goat feeding package. This should include feeding packages for fattening goats that will target the quality standards of different consumers (export abattoirs, hotels and restaurants, etc.). In order to make good use of such a package, farmers, extension agents and district experts should be trained in improved feeding in general, and in the goat feeding packages in particular.
- Training farmers in conservation of locally available feed sources. Conservation of locally available feed resources by harvesting during seasons of plentiful supply is not a common practice in the study area. As a result, there is a need to train farmers in conserving feed resources. This should focus both on why feed conservation is needed, and the different techniques that can be used for conservation.
- Supporting the identification, acquisition and dissemination of improved forage species for supplementary goat feeding. There is a need to develop alternative sources of supplementary forage, especially during dry seasons. One recommended forage species is cactus, since it can tolerate drought and is easily propagated for use as a source of feed for goats. It is therefore suggested that similar forage species be identified for use as alternative supplementary feed for goats, and that these be disseminated to the community, with follow up and support for their adoption.
- Introducing forage trees, including acacia species, in areas where water is available all year round. This would help to increase alternative sources of feed for the community, and protect areas from degradation due to overgrazing. The acacia tree also provides shade for animals and maintains soil fertility.
- Linking forage development to soil and water conservation structures. Soil and water conservation structures are being developed through government watershed protection initiatives. Planting forage species close to these structures would protect soil erosion while supplying feed for animals in the area.

Fourth, organizing and supporting discussion forum for goat producers, financial institutions and political leaders. It would be useful to organize a platform for discussion with policymakers on issues of lowering interest rates for goat producers through ACSI. This could be by covering part of the interest rate on behalf of the borrowers.

Fifth, organizing/strengthening credit and savings cooperatives. To create more flexible and alternative sources of credit for goat producers, there is a need to strengthen cooperatives where credit is already available, and encourage and support farmers to establish them where they are not yet up and running. Support could take the form of seed money and building management capacity for cooperative leaders. There is also a need to develop strict follow-up procedures to ensure that loans are used for the intended purposes.

Sixth, designing and implementing an appropriate breed improvement program. In order to improve the productivity of the Abergelle goat breed, there is a need to design and implement an appropriate breed improvement program.

Seventh, providing training on principles of animal welfare and handling. Raising the awareness of traders, truck drivers and their assistants on basic principles of animal welfare and handling during transportation is a prerequisite for enforcing rules and regulations on animal welfare. Since this type of training has never been conducted in the study area, and there is scant know-how on the issue, there is a need to train pertinent business people and service providers in animal welfare and handling on journeys. It is also suggested that there should be greater enforcement of rules and regulations on the maximum number of animals that can be loaded onto a single truck, vehicle speed, the maximum number of hours the animal should be transported and similar issues.

Eighth, creating multi-stakeholder platforms to discuss cross-cutting issues and explore solutions. Value chain development involves various stakeholders, from input providers to final consumers and including policymakers and service providers. In order to maintain momentum along the different stages of the chain, there is a need to evaluate developments on a periodic basis and take corrective action to address emerging challenges. This will only be possible if stakeholders have the opportunity to meet regularly and discuss progress and challenges. For this reason, we recommend supporting the creation and smooth running of a multi-stakeholder platform for the goat value chain at district level.

Ninth, providing formal market information to farmers. The Ministry of Agriculture has set up the national Livestock Market Information System (LMIS). This initiative collects livestock market information from certain livestock markets and disseminates it via SMS and the Internet. However, livestock markets in the study area are not included in the domain of data collection for the LMIS. We therefore recommend networking with the ministry to support the inclusion of local livestock markets into LMIS data collection. In order to boost accessibility to the LMIS by smallholder farmers in the area, it is suggested that livestock market information be disseminated through local FM radios.

Tenth, supporting construction of well-designed livestock marketing yards, with all necessary facilities. In order to provide coordinated services and encourage formal livestock marketing in the area, there is a need to build well designed livestock marketing yards. These should include basic infrastructures, such as veterinary clinics, offices, feeding and watering troughs, weighing scales, loading and unloading ramps and auction platforms (for future use).

Eleventh, providing marketing training to farmers and DAs. One of the major challenges of the goat value chain is lack of livestock market extension. To help resolve this problem, it is suggested that farmers and extension agents should be trained in the basic principles of livestock marketing. Training should cover issues such as the characteristics of buyers, their quality requirements, times of high demand, the nature of destination markets and other similar information.

Intervention and implementation plan

The study has identified constraints and opportunities along the value chain. Based on these results, an intervention and implementation plan was drawn up at a stakeholders meeting held in Mekelle. The plan pinpoints possible activities and strategies for alleviating constraints to improve production and productivity of the Abergelle goat value chain (Table 3). It also highlights actors who would be involved in the process.

Table 2: Major constraints and suggested recommendations, implementing bodies and time horizon needed to implement the recommendations

Stages of value chain	Challenges	Suggested interventions	Method of implementation	Implementer	Timeframe	Rank	Type of activity
Input supply	Insufficient animal health workers at veterinary health posts	Hiring more animal health workers for clinics and health posts	- Follow the civil service office procedure for hiring human resource	- Amhara Region Livestock Agency - Abergelle district administration - Abergelle District Office of Agriculture/Livestock Agency - ICARDA/ILRI	Short term	3	Development
	Skills gap	Conduct training need assessment for animal health extension workers and district experts, then provide training	- Conduct training need assessment (where necessary) - Organize and provide training - Monitoring and evaluation	- Amhara Region Livestock Agency - Abergelle district administration - Abergelle District Office of Agriculture/Livestock Agency - ICARDA/ILRI	Short term	1	Development
	Shortage of drugs	- Provide technical support to revolving fund for veterinary drug procurement	- Identify gaps and support to fill those gaps	- Amhara Region Livestock Agency - Abergelle district administration - Abergelle District Office of Agriculture/Livestock Agency	Medium term	2	Development

Stages of value chain	Challenges	Suggested interventions	Method of implementation	Implementer	Timeframe	Rank	Type of activity
				- ICARDA/ILRI			
	Shortage of equipment at veterinary clinics and health posts	- Allocating budget for procurement of veterinary and health post clinical equipment	- Identify the equipment - allocate budget - Procure equipment	- Amhara Region Livestock Agency - Abergelle district administration - Abergelle District Office of Agriculture/Livestock Agency - ICARDA/ILRI	Short term	1	Development
	Vaccine efficacy problem	- Identification of different strains for effective vaccination (PPR and pasteurellosis)	- Follow research protocol	- Amhara Region Livestock Agency - Abergelle District Office of Agriculture/Livestock Agency - ICARDA/ILRI - Sekota Dryland Agricultural Research Centre - National Veterinary Institute	Short term	1	Research
	Lack of transport facilities for animal health workers at district	Provision of motorcycles and mules to increase accessibility of veterinary health services for farmers	- Identify the type of transport material/animal and quantity - Procure and	- Amhara Region Livestock Agency - Abergelle district administration - Abergelle District	Short term	2	Development

Stages of value chain	Challenges	Suggested interventions	Method of implementation	Implementer	Timeframe	Rank	Type of activity
	and health post level to reach farmers		distribute to the targeted institute	Office of Agriculture/Livestock Agency - ICARDA/ILRI			
	Traditional feeding system that does not consider supplementary feeding to goats	Provision of training to farmers and development agents in goat production with special focus on feeding, breeding, housing, health care and marketing	<ul style="list-style-type: none"> - Conduct training need assessment - Organize training - Provide training - Monitor and evaluate 	<ul style="list-style-type: none"> - Abergelle District Office of Agriculture/Livestock Agency - Sekota Dryland Agricultural Research Centre (SDARC) - ICARDA/ILRI 	Short term	1	Development
	Shortage of feed during dry seasons and lack of alternative sources at this time of the year	<ul style="list-style-type: none"> - Training farmers in conservation of locally available feed sources - Introduction of forage trees, including acacia species in areas where water is available all year round - Linking forage development to soil and water conservation structures 	<ul style="list-style-type: none"> - Organize training - Provide training - Monitor and evaluate - Identify appropriate technologies - Mobilize community - Offer demonstrations to farmers and other 	<ul style="list-style-type: none"> - Abergelle District Agriculture Office/Livestock Agency - Sekota Dryland Agricultural Research Centre - ICARDA/ILRI 	Short time	1	Research (adaptation and evaluation of different forage species) and development

Stages of value chain	Challenges	Suggested interventions	Method of implementation	Implementer	Timeframe	Rank	Type of activity
			stakeholders				
	Inflexible credit system (interest rate, collateral)	<ul style="list-style-type: none"> - Organize platform for discussion with policy makers on lowering ACSI interest rate for goat producers. This could be by covering part of the interest rate on behalf of borrowers - Organize/strengthen credit and savings cooperative, provide seed money and capacitate management - Develop strict follow-up procedures to ensure that loans are used for intended purposes 	<ul style="list-style-type: none"> - Identify potential stakeholders - Organize forum for discussion - Follow the cooperative organization and strengthening protocol - Monitor and evaluate 	<ul style="list-style-type: none"> - ACSI - Abergelle district administration - Abergelle District Office of Agriculture/Livestock Agency - Abergelle District Cooperative Office - ICARDA/ILRI 	Short term	3	Development
Production	Low productivity of Abergelle breed goats (low percentage of	Design and implement appropriate breed improvement programme Develop appropriate feeding package	<ul style="list-style-type: none"> - Follow the research protocol 	<ul style="list-style-type: none"> - Abergelle District Agriculture Office - Sekota Dryland Agricultural Research Centre - Farmers 	Medium term	1	Research

Stages of value chain	Challenges	Suggested interventions	Method of implementation	Implementer	Timeframe	Rank	Type of activity
	meat)			- ICARDA/ ILRI			
	Traditional feeding practices	Training farmers, DAs and district experts in improved feeding methods	<ul style="list-style-type: none"> - Organize training - Provide training - Monitor and evaluate 	<ul style="list-style-type: none"> - Abergelle District Office of Agriculture/Livestock Agency - Sekota Dryland Agricultural Research Centre (SDARC) - Farmers - ICARDA/ILRI 	Short term	1	Development
	Diseases (cenerosis, mites, pasteurellosis, PPR and other internal and external parasites)	<ul style="list-style-type: none"> - Proper diagnosis - Demonstration of evaluated technologies - Provision of regular vaccination and treatment - Strengthening health posts - Train more CAHWs for remote villages and provide them with necessary drugs and equipment 	<ul style="list-style-type: none"> - Conduct proper diagnosis - Demonstrate available technologies - Scaling up and out of technologies 	<ul style="list-style-type: none"> - Amhara Region Livestock Agency - Abergelle District Office of Agriculture/Livestock Agency - Sekota Dryland Agricultural Research Centre (SDARC) - ICARDA/ILRI 	Short term	1	Development and research

Stages of value chain	Challenges	Suggested interventions	Method of implementation	Implementer	Timeframe	Rank	Type of activity
	High incidence of abortion and kid mortality	<ul style="list-style-type: none"> - Assess causes and provide necessary treatments 	<ul style="list-style-type: none"> - Follow research protocol 	<ul style="list-style-type: none"> - Abergelle District Office of Agriculture/Livestock Agency - Sekota Dryland Agricultural Research Centre (SDARC) - ICARDA/ILRI 	Short term	1	Research
Marketing	High mortality and morbidity of goats during transportation	<ul style="list-style-type: none"> - Provide training on principles of animal welfare and handling during transportation to traders, drivers and their assistants transporting animals - Enforce regulations on maximum number of animals to be loaded onto one truck 	<ul style="list-style-type: none"> - Organize training - Provide training - Enforce regulations 	<ul style="list-style-type: none"> - Amhara Region Livestock Agency - Abergelle District Office of Agriculture/Livestock Agency - Sekota Dryland Agricultural Research Centre (SDARC) - ICARDA/ILRI 	Short term	1	Development
	Multiple taxation as animals cross regional boundaries	Create multi-stakeholder platforms to discuss such cross-cutting issues and explore solutions	<ul style="list-style-type: none"> - Identify potential stakeholders - Set agendas - Organize forum 	<ul style="list-style-type: none"> - Amhara and Tigray Regions Trade and Transportation bureaux - Amhara Region Livestock Agency - Abergelle District Office of 	Short term	3	Development

Stages of value chain	Challenges	Suggested interventions	Method of implementation	Implementer	Timeframe	Rank	Type of activity
				Agriculture/Livestock Agency - Federal and regional customs and revenue authorities - ICARDA/ILRI(facilitation)			
Marketing	Shortage of market information	Consider linkage with the national livestock market information system at EMDTI by including Abergelle livestock market as one of data collection centres Provide daily market information to farmers	Collect market information Post daily and weekly market information at <i>kebele</i> level	- Amhara Region Livestock Agency - Amhara Region Trade and Transport Bureau - Abergelle District Office of Agriculture/Livestock Agency - Abergelle District Trade and Transport Office - Sekota Dryland Agricultural Research Centre (SDARC) - ICARDA/ILRI - EMDTI	Medium term	2	Development

Stages of value chain	Challenges	Suggested interventions	Method of implementation	Implementer	Timeframe	Rank	Type of activity
	Poor marketing infrastructure Lack of proper livestock marketing yards (lack of facilities such as veterinary clinics, watering and feeding troughs, loading and unloading ramps and toilets in livestock marketing yards)	Construction of well-designed livestock marketing yard with all the necessary facilities	<ul style="list-style-type: none"> - Secure land - Float bids for contractors - Evaluate bids - Implement - Monitor and evaluate 	<ul style="list-style-type: none"> - Amhara Bureau of Agriculture - Abergelle district administration - Abergelle District Trade and Transport Office - Abergelle District Cooperative Offices - ICARDA/ILRI 	Long term	3	
	Seasonality of market supply of goats due to feed shortages and loss of body weight	<ul style="list-style-type: none"> - Create awareness to farmers about improved forage species and supplementary feeding - Support access to and dissemination of improved forage species for supplementary 	<ul style="list-style-type: none"> - Organize training - Provide training - Demonstrate improved forages 	<ul style="list-style-type: none"> - Abergelle District Agricultural Office - Sekota Dryland Agricultural Research Centre - ICARDA/ILRI 	Short term	1	Development

Stages of value chain	Challenges	Suggested interventions	Method of implementation	Implementer	Timeframe	Rank	Type of activity
		feeding					
	Seasonality of demand for goats	<ul style="list-style-type: none"> - Develop feed fattening package - Target fattening to address seasonal demand 	<ul style="list-style-type: none"> - Follow research protocol 	<ul style="list-style-type: none"> - Abergelle District Agriculture Office/ Livestock Agency - Sekota Dryland Agricultural Research Centre - ICARDA/ILRI 	Short and medium term	2	Research
	Weak vertical linkage	Create multi-stakeholder platforms to create market linkage between producers, traders and other consumers. This platform could also be used to discuss emerging marketing problems and find solutions	<ul style="list-style-type: none"> - Identify potential stakeholders - Set agendas - Organize forum - Institutionalize forum 	<ul style="list-style-type: none"> - Abergelle District Cooperative Office - Abergelle District Trade and Transport office - Abergelle District Livestock Agency - Sekota Dryland Agricultural Research Centre - ICARDA/ILRI 	Short term	2	Development
	Weak horizontal linkage	<p>Organize producer cooperatives</p> <p>Create awareness about inbreeding problems and the benefit of sharing breeding bucks</p>	<ul style="list-style-type: none"> - Follow cooperative office protocol - Organize training - Provide training - Monitor and 	<ul style="list-style-type: none"> - Abergelle District cooperatives - Abergelle District Livestock Agency - Sekota Dryland Agricultural Research Centre - ICARDA/ILRI 	Medium term	2	Development

Stages of value chain	Challenges	Suggested interventions	Method of implementation	Implementer	Timeframe	Rank	Type of activity
Processing			evaluate				
	Lack of supply of quality goats	Provide training to farmers and DAs about consumer quality parameters. Develop package to meet quality standards	<ul style="list-style-type: none"> - Organize training - Provide training - Monitor and evaluate 	<ul style="list-style-type: none"> - Abergelle District Trade and Transport Office - Abergelle District Livestock Agency - Sekota Dryland Agricultural Research Centre - ICARDA/ILRI 	Medium	1	Research

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Annex 1. Focus group discussion participants

Name	Occupation	Living place
Tadesse Kidu	Farmer	Abergelle (Sazeba)
Mareye Tekele	Farmer	Abergelle (Sazeba)
Abereha Abera	Farmer	Abergelle (Sazeba)
Chekole Sartsem	Farmer	Abergelle (Sazeba)
Tafete Melewe	Farmer	Abergelle (Sazeba)
Birhanu Kendey	Farmer	Abergelle (Sazeba)
Debesu Gebrie	Farmer	Abergelle (Sazeba)
Gebeyanesh Mengistu	Farmer	Abergelle (Sazeba)
Awetu Woldie	Farmer	Abergelle (Sazeba)
Feluye Woldeab	Farmer	Abergelle (Sazeba)
Etenu Ayenu	Farmer	Abergelle (Sazeba)
Mebrehatu Negash	Trader	Samrie
Abeba Meretse	Trader	Samrie
Wolde kirose Redie	Trader	Samrie
Tensay Hailu	Trader	Samrie
Gebre Michael tekele Medehin	Trader	Samrie
Asefa Tekele Medehen	Trader	Fenarewa
Teka Gebre Kirose	Trader	Fenarewa

Annex 2. Key informants interviewed

Name	Position	Institution	Work Place
Abebe Gebyaw	Animal production expert	AWAO	Nuraque

Endaye Tame	DVM	AWAO	Nuraque
Anteneh Yerga	Animal health expert	AWAO	Nuraque
Abay	Animal health expert	AWAO	Nuraque
Worku Demessie	Deputy of Abergelle Woreda Agriculture Office	AWAO	Nuraque
Said Negatu	03 <i>kebele</i> Development Agent	03 <i>kebele</i>	Abergelle Woreda
Getaway Btseha	03 <i>kebele</i> Development Agent	03 <i>kebele</i>	Abergelle Woreda
Kidane Mariam	Retailer	Mekelle	Mekelle
Gebre Kirstose Tesfa	Retailer	Mekelle	Mekelle
Moges Hailu	Mulu Animal Health Clinic	Mekelle	Mekelle
Tsegaye Deleso	Hotel manager	Mekelle	Mekelle
Samuel Gereselassie	Hotel owner and manager	Mekelle	Mekelle
Kahesay Gebereselassie	Butcher	Mekelle	Mekelle