Baseline survey report for the Regional Pastoral Livelihoods Resilience Project in Ethiopia

ILRI PROJECT REPORT


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Ministry of Livestock & Fisheries
MoLF


R.P.L.R.P
Ethiopia

Baseline survey report for the Regional Pastoral Livelihoods Resilience Project in Ethiopia

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Contents

Tables

Figures

Executive summary

Background

As part of its efforts to improve the livelihoods of the pastoral and agro-pastoral communities, the Ethiopian Ministry of Livestock and Fisheries (MoLF) leads and coordinates drought resilience initiatives within the framework of the Ethiopia Country Program Paper (CPP) that contributes to the Intergovernmental Authority on Development (IGAD) Drought Resilience and Sustainability Initiative (IDDRSI) strategy. Currently, the MoLF is implementing the Regional Pastoral Livelihoods Resilience Project (RPLRP) in 21 *woredas* in the regions of Afar; Somali; Oromia (Borana zone); and the Southern Nations, Nationalities and Peoples (SNNP) (South Omo and Bench Maji zones). The World Bank funds the project.

The Ministry of Livestock and Fisheries (MoLF), in a letter written on 3 May 2016, requested the International Livestock Research Institute (ILRI) conduct a baseline survey in the RPLRP intervention *woredas* as well as selected control *woredas* in order to establish a baseline data that will be used for impact evaluation and for the monitoring and evaluation of the project. ILRI honoured the request and implemented the baseline survey.

This report is prepared based on the baseline survey of the RPLRP intervention and control *woredas* to measure changes among the target beneficiaries (in terms of before and after the intervention) and the attribution of changes to the project interventions (in terms of with and without intervention, alongside the before and after comparison).

Methodology

The baseline survey envisions the difference-in-difference (DD) approach to impact evaluation. Hence, data was collected based on the 'with-without' and 'before-after' framework. Qualitative methods including focus group discussions (FGDs), key informant interviews (KIIs) and various secondary sources of data were also used.

To obtain a representative random sample of potential beneficiaries, a stratified (by livelihood zone and regional state) clustered approach was used with two stages of sampling (*woreda* and *kebele*) to select proportionally representative sample households. This approach aimed to ensure that each beneficiary has an equal probability of being included in the sample so that the resulting sample is representative of the larger target population of beneficiaries. A total of 1,295 (intervention and control) households were interviewed. Computer-assisted personal interviews (CAPI), an electronic-based survey method that was expected to reduce cost and time and avoid the need for double entry, was used to administer the interviews.

Results framework was populated for baseline values for whole sample households (i.e. including control households) and by intervention and control households. Extrapolation methods to livelihoods zones, regions and whole project target population level are given in detail in the methods section. The variables of interest for extrapolation include livestock holdings, household income, savings/loans, market participation as seller (proportion), number and value of animals sold and proportion of animals that died.

Household characteristics

The proportion of female-headed households ranges from 2.78 to 19.14. Average household head is aged 42–45. Household sizes of 5.99 to 6.87 seem to be not too far off from those in the highlands. The number of female members of the households is lower than the number of male members across all the regions and almost across all age groups. Between 26.82% and 32.30% of total household members are enrolled in school. Clearly, enrolment is higher in agro-pastoral than in pastoral households and for males than for female household members across regions and livelihood zones.

The most common type of residential roofs is thatched roof while the most common floor material is earth. Investment in house improvements or the construction of new houses was reported by 7.5 to 29.3% of households.

Livestock ownership

Mean livestock holding in tropical livestock unit (TLU) ranged from 21.73 to 43.41. Only a small proportion of the TLU is accounted for by equines. Cattle, followed by goats, account for the highest share of the TLU in Afar, Borana and SNNPR. Calf death rates are significantly higher in the pastoral areas across all regions, perhaps because of the harsher environment in the pastoral areas. Interestingly, lamb death rates are consistently lower than kid or calf death rates across all the regions and livelihood zones.

Livestock market participation: sellers

Between 11.05% and 84.92% of households sold cattle during the survey period. Apparently, selling goats is much more common than selling cattle, sheep or camels. Overall, higher proportion of households sold livestock in drought than in normal years. In general, the proportion of households who sold cattle during drought period seems to be consistently higher in pastoral than in the agro-pastoral areas in Borana and SNNPR, accompanied with some exceptions in Afar and the Somali region.

As in drought years, the proportion of households who sold cattle during normal years seems to be higher in pastoral than in the agro-pastoral areas in Borana and SNNPR, while the opposite seems to be the case in Afar and the Somali region. Comparisons by drought and normal years (ignoring effect of livelihood system) show that, in general, higher proportions of households sell livestock during drought years than during normal years.

Household cash income

There do not seem to be significant differences in mean total household cash income across the regions. However, there seem to be wide differences in cash income across households. Total household cash income ranged from ETB23,179 to ETB25,694. In general, there are clear significant differences in total household cash income by livelihood system. Average household cash incomes are higher in pastoral than in agro-pastoral areas in Afar, the Somali region and Borana, while there are no significant differences in SNNPR.

As would be expected, cash income from the sale of livestock is the most important contributor to household cash income. The second most important source of cash income varies from region to region. While crop farming is second most important source of cash income in Borana and SNNPR, businesses are second most important source of cash income in the Somali region. In Afar, miscellaneous cash income sources such as productive safety net program (PSNP) and transfers are second most important source of cash income.

Savings and loans

Between 3.23% and 37.70% of households saved money during the survey period. In general, the proportion of households who saved money seems to be higher in agro-pastoral than in pastoral areas. Among those who saved money, the average saving amount ranges from ETB6,605–22,920. Our data suggests that while various ways of savings are used, most saving is done at home.

Livestock productivity and diseases

Milk yields range from as low as 0.15–1 litre/day. When investigating the most important causes for livestock death, diseases and starvation were the most frequently reported causes. There was, however, a significant difference between production systems, with starvation being more important in pastoralist areas and diseases responsible for most mortality in agro-pastoralist areas, for all species.

Natural reasons of death, such as old age or predators, were largely uncommon. The most common diseases in cattle were: contagious bovine pleuropneumonia (CBPP), lumpy skin disease (LSD), foot-and-mouth disease (FMD) and trypanosomiasis which is in line with diseases prioritized at national level. Respiratory diseases were reported as the top priority for sheep in all regions. The reasons for the death of goats were similar as for cattle and sheep. Compared to other species, predators were responsible for deaths in goats.

Chicken keeping is relatively rare in the project area with only 210 households (16.2%) reporting keeping chicken. Wide differences in egg production per year indicated differences in poultry husbandry systems. Newcastle disease (ND) was the most commonly suspected disease, followed by avian influenza and Gumboro.

Livestock health services

While several *woredas* reported that veterinary clinics were available, they nevertheless reported a lack of veterinary drugs and services delivery. They blame the lack of efficient veterinary services for ongoing disease problems. Use of different animal health services overall was rather low across regions with ranges from 0 to 4 times per year. Results of household satisfaction in animal health services revealed some level of dissatisfaction among households.

Watering frequency of different classes and types of livestock

Watering frequencies for milking and dry cows, heifers/calves, bulls/oxen and sheep/goat showed once per day to be the most frequent watering frequency in Afar, the Somali region and SNNP regions, while in Oromia, the most frequent watering frequency was once every two days. The watering frequencies by production systems, pastoral and agro-pastoral, also followed a similar pattern to that of the regional realities.

The most frequent watering frequency for equine (donkey, mule and horse) was once/day in all regions and by production systems. Camels are mostly watered once a week in Afar, Oromia and the Somali region. The overall mean frequency of watering showed to be in the range of 2–2.5 days for the different classes and kinds of livestock except for camel where the mean was about four days.

Access to water for livestock

The most common source of water for livestock in Afar and SNNPR are rivers or permanent springs. Though in many *woredas* in SNNPR piped water has been supplied, this is generally not used for livestock not only because it requires payment (between ETB2–10 per month) but because the community say that if the livestock drink from it, it makes them ‘thin’.

According to the survey, the most frequent water point types used for livestock in Oromia are shallow community wells (traditional). The most frequently reported watering point types in some *woredas* of the Somali region in the household survey are traditional deep community wells with pump (Shekosh), communal cisterns/storage tank (birked) (Aware and Boh) and shallow community well (Dhuxun).

Households indicated that 63.5% of water points in the different regions are permanent although the percentage varied among regions. The most common time it took to livestock watering points from residence in Afar, Oromia and the Somali region was within one to three hours while it was less than one hour in SNNPR. According to the household survey, the three most important challenges in accessing water are low quantity and quality of water (Afar and Somali) and too many animals for the available water points (Oromia and SNNPR).

Water for human consumption

The most frequent sources of water for human consumption as per the household survey are tap water (Afar and Oromia), river or permanent spring (SNNPR) and deep community well with pump and traditional community well in the Somali region.

Regarding the quantity of water, about 51.51% of the sampled households replied that it was not adequate. Regarding the quality of water, the majority of survey respondents from Afar (61.22%) and Oromia (52.91%) replied that the quality was adequate; while in the Somali region and SNNPR, 69% and 78.57%, respectively, said that the quality was not adequate

Use of irrigation

The sampled households in the different regions were interviewed about the use of irrigation to produce crops, vegetables, fruits or fodder. Of the total sampled households of 1,295 only 78 (6.02%) used irrigation to produce crops. The largest response was from Afar (65 households), followed by Oromia (10 households), the Somali region (2 households) and SNNPR (1 household).

Land use and sustainable land management

The main land use change mentioned by FGDs over the last five years was loss of grazing areas (particularly in the Somali region) and increased crop growing including with plough (SNNPR). Significant problems were mentioned with bush encroachment in Oromia and invasive species in Afar and Somali regions.

About 19.54% of survey households reported having an enclosure or other individual/household landholding they used for household livestock. In all the regions the number of agro-pastoral households 'owning' private land for livestock was higher than that of the pastoral households. Only 7.91% of the households that had individual/household grazing land (1.54% of 1,295) replied that sustainable land management (SLM) (land improvement) investments had been made in these areas over the survey period. This indicates that despite land being operated privately by individuals/households the investment in SLM in grazing areas remains negligible.

A vast majority of survey respondents (83.6% households) said that they had access to communal lands. A significant number of grazing areas (626) are used all year round. In general and considering the stresses that pastoralists and agro-pastoralists face on a daily basis, conflicts are minimal.

Market access and use

Market access as measured by distance to nearest livestock market varies considerably across households and across regions. Some households use more than one market place to sell their animals. Market users travel between less than an hour to more than two days to reach market places. In general, market access seems to be much more of a challenge in pastoral than in agro-pastoral areas.

The most common frequency of market use in Afar, Borana and SNNPR is once a week. In the Somali region, the most frequent use of markets is once a month (43% of users) followed by once a year (42% of users). Services related to markets and marketing are very limited in the study areas.

Market fees

Marketing fees are applied in some places and not in others. Overall, an average of ETB33 is paid as a marketing fee for cattle. Average marketing fees per cattle (among those who sold livestock) ranged from ETB15.77 to 71.72. There do not seem to be significant differences in cattle marketing fees between pastoral and agro-pastoral areas. Shoat marketing fees range from ETB5.20 to 17.66. As in the case of cattle, marketing fees for shoats did not vary significantly between pastoral and agro-pastoral areas. Camel marketing fees ranged from ETB24.97 to 109.23. Camels are not reared in SNNPR. Livestock market infrastructure is generally limited in the study area.

Market information

Pastoral and agro-pastoral communities seem to have reasonable access to livestock price information. However, the sources of livestock price information used are primarily informal, including family members, clan members and neighbours. Interestingly the role of mobile phones in accessing price information has been reported by significant proportions of households surveyed. In general, about 37.5% of livestock sellers reported that price information influenced their decision to sell livestock.

Disaster risk

When asked to name the last disaster or major shock the household experienced, almost all disasters reported were droughts, with the majority experienced in 2016 (2008 Ethiopian calendar). Overall, the most common response to disaster seems to be moving livestock only or household and livestock, followed by selling livestock and dependence on food aid. Early warning was not in place for most households interviewed with only 0–22% of households responding that they had received information about the disaster in advance. This is in line with findings of FGDs, but contradicts results from key informants at *woreda* level, who confirmed that early warning systems were in place.

Recovery

Recovery seemed to be especially difficult in Afar where over 90% of households estimate their level of recovery at a score of 5 or below out of 10. The Oromia and Somali regions had the highest recovery scores. Similarly, households in Afar had the longest time to recovery, with more than 40% reporting that they were still recovering and more than 20% indicating that they would never fully recover.

In all regions, the majority of households mentioned that it has become more difficult to recover from shocks (65–92% of households per region). Amongst the reasons for experiencing recovery difficulties, loss of grazing land, climate change and lack of government assistance were the most prevalent. When taking total herd size (in TLUs) into

account, it was clear that time to recover tended to be shorter for those livestock keepers with larger herd sizes. Combining this with the fact that TLU herd size in female-headed household was significantly lower, indicates that female-headed households were more vulnerable to shocks and struggled more to recover.

Some households also mentioned that recovery has become easier. The most frequent reasons for easier recovery include government/aid assistance, savings, having small herd of animals, having large herd of animals, migration of livestock, community support and help and taking loans.

Crop technologies

As expected crop technologies are important only in the agro-pastoral areas. Among the reported crop technologies adopted by agro-pastoralists are included drought resistant crops and dual purpose crops. While no fertilizer use was reported in the Somali region, about 40% of agro-pastoralists reported using fertilizer to their crop fields in SNNPR, 31% of agro-pastoralists report applying fertilizer in Borana and about 7% reported applying fertilizer in Afar.

Livestock technologies

While no improved livestock breeds were reported in the Somali region, about 3.6% of agro-pastoralists in Afar and 4.49% of agro-pastoralists in SNNPR adopted improved breeds. Just less than half a per cent of agro-pastoralists adopted improved breeds in Borana. Interestingly, about 1.37% of pastoralists in Borana reported adopting improved breeds while no pastoralist reported adoption of improved breeds in the other regions.

Electric power

None of the respondents in the pastoral and agro-pastoral areas of the Somali region reported having a connection to the main grid electric power supply system. Connections to the main grid supply systems seem to be better in the agro-pastoral than in the pastoral households of Afar and Borana. Interestingly, solar power supply is more widely available than the main electric supply both in the pastoral and agro-pastoral areas.

Introduction

1.1 Background

As part of its efforts to improve the livelihoods of the pastoral and agro-pastoral communities, the Ethiopian Ministry of Livestock and Fisheries (MoLF) is leading and coordinating drought resilience initiatives within the framework of the Ethiopia Country Program Paper (CPP) that contributes to the IGAD Drought Resilience and Sustainability Initiative (IDDRSI) strategy. Ethiopia's CPP has six components with the overarching objective of improving food and nutrition security and enhancing resilience to external shocks with particular focus on the arid and semiarid lands (of the Somali region; Afar; Oromia (Borana zone); and the Southern Nations, Nationalities and Peoples region (SNNPR). The six priority intervention areas in the Ethiopian CPP are:

- Natural resources and environmental management,
- Market access, trade and financial services,
- Livelihoods support and basic social services,
- Disaster risk management,
- Research and knowledge management, and
- Conflict prevention, resolution and peace building.

Currently, with funding from the World Bank through the Regional Pastoral Livelihoods Resilience Project (RPLRP), the MoLF is undertaking various drought resilience initiatives in the regions of Afar, Somali, Oromia (Borana zone) and SNNP. The implementation of the RPLRP required a baseline data and reports to serve as a benchmark for project evaluation. The International Livestock Research Institute (ILRI), upon request from the MoLF, conducted the baseline study in 21 beneficiary *woredas* and selected control *woredas* in the four regional states, upon which this report is based.

1.2 The project

The aim of the RPLRP is 'to enhance livelihood resilience of pastoral and agro-pastoral communities in cross-border drought prone areas and improve the capacity of the selected countries' governments to respond promptly and effectively to an eligible crises or emergency'. The project is in line with the overall goal of eradicating extreme poverty and hunger through the enhancement of livestock and other alternative sources of income and is closely aligned with the government's five year Growth and Transformation Plans (GTP), the national food security programs and SLM programs, among others.

The project is regional based on an agreement between IGAD, Ethiopia, Kenya, Uganda and the World Bank. The project emphasises four major project-level outcomes:

- reduction in livestock death rate,
- number and value of animals sold,
- reduction in time between early warning and response, and
- number of direct project beneficiaries with clearly indicated percentage of women beneficiaries.

The project has five major components:

- Natural resources management (NRM): This component relates to SLM technologies and practices, water resources development and securing access to natural resources.
- Market access and trade (MAT): This component relates to the development and improvement of market infrastructure along the regional trade routes; capacity building on market development, the strengthening and integration of the national Market Information System (MIS) with the regional MIS, and capacity building of the pastoral populations and relevant stakeholders on the utilization of the MIS; enhanced market flows through harmonization of regional trade policies, regional animal disease surveillance, laboratory diagnostic capabilities and disease information networks.
- Livelihood support (LS): This component relates to livestock productivity and production, disease control and animal health, feed production and livestock feeding, household food production and income and alternative livelihood options.
- Pastoral risk management (PRM): This component relates to early warning and response system, disaster risk management and coping strategies.
- Project management and institutional support (PMIS): This component relates to project management; results-based monitoring, evaluation and learning (RBME&L); knowledge management and communication; and supporting regional and national efforts. The RBME&L will be founded on sound baseline information related to project performance indicators.

The project is operational in 21 *woredas* with an estimated total population of 1.4 million (roughly 200,000 households) in the 4 regional states. The project intends to directly benefit a population of 660,000 (roughly 94,285 households). In addition to the pastoral and agro-pastoral households, cooperative societies, the private sector involved in livestock trade, input suppliers, service providers and other stakeholders are potential beneficiaries of project intervention.

The MoLF is the executing agency of the project in Ethiopia. At the federal level, the project is managed by federal project coordination unit (PCU) consisting of a national project coordinator, a monitoring and evaluation specialist, an infrastructural engineer, a veterinary specialist, a disaster risk management specialist, a financial management officer, a procurement officer and support staff. At regional level, regional PCUs are established who are responsible for day-to-day project coordination activities. At the zonal level (in zones with more than one intervention *woreda*), mobile support teams are established. At the *woreda* level, the day-to-day operations of the project are facilitated by *woreda* project coordinator (reporting to the *woreda* head of pastoral/agriculture office).

1.3 Objectives

The overall objective of the baseline survey is to produce results that will be used to measure changes among the target beneficiaries (in terms of before and after the intervention) and the attribution of changes to the project interventions (in terms of with and without intervention, alongside the before and after comparison) in the pastoral and agro-pastoral areas of the four regions.

The specific objectives of the baseline survey are:

- To identify benchmark information for the national, regional and *woreda* level project performance indicators as outlined in the project results framework to measure project achievements and impact.
- To identify and propose more indicators and define their corresponding benchmarks for those project outputs/ interventions missing in project logical framework.

2. Methodology

2.1 Overall survey framework

The overall framework of the baseline survey was based on the planned impact evaluation requirement that promises to establish attribution to project interventions. While there are a number of impact evaluation methodologies, this baseline survey framework envisions the difference-in-difference (DD) approach to impact evaluation. The DD approach is also implied in the terms of references provided to ILRI by the MoLF. Hence data was collected based on the 'with-without' and 'before-after framework', i.e. both intervention and control households were interviewed during the baseline survey as will be during subsequent surveys. The same households and communities surveyed during the baseline survey will also be the sample households and communities during subsequent surveys.

The overall survey framework also emphasized the important role of qualitative methods of data collection and analysis. Issues that are not easily or adequately captured with quantitative methods were addressed through in-depth qualitative methods. Focus group discussions (FGDs), key informant interviews (KIIs) and various secondary sources of data were used for this purpose. Reliability of qualitative information was checked by triangulation (sourcing a piece of information from at least three different sources). To ensure complementarity, the framework made explicit link between the quantitative and qualitative methods. The household survey data refer to the 2008 Ethiopian calendar year (September 2015 to August 2016).

2.2 Performance indicators and baseline instruments

The baseline survey was designed to generate an information base that relates to the project intervention areas and households, as well as carefully identified control groups to enable attribution of project impacts. A results framework had been prepared for the national RPLRP-Ethiopia project. The project baseline survey was also required to be harmonized with the IGAD Disaster Drought Resilience and Sustainability Initiative (IDDRSI) results framework.

The project development objectives were translated into project performance indicators at various levels: household, community, *woreda*, regional and federal level indicators. The data collection instruments were developed following the performance indicators. However, data was also collected on several additional variables that are believed to provide important information both for the RBME&L and the impact evaluation.

The hierarchy of results implied the need to use a combination of baseline data collection methods including household surveys, community FGDs, KIIs and secondary sources. Survey instruments for household surveys, as well as guides and checklists for FGDs and KIIs were developed.

Baseline team members who are familiar with the agro-ecological and cultural contexts of the *woredas* and who are fluent in local languages implemented both the qualitative methods as well as the interviews. CAPIs were used to administer the interviews which avoided the need for double data entry. Enumerators and supervisors were trained on the qualitative instruments, the survey questionnaires and the use of CAPI.

The household survey instruments collected information on the following variables. These variables are more than what the performance indicators listed in RPLP results framework require.

- Household demographics (household size and composition by age, sex, education)
- Household physical assets (excluding livestock)
- Livestock holding and composition and production (reproduction, feeds, livestock diseases and death rates, disaggregated by drought and normal years)
- Crop technology adoption and use
- Herd mobility
- Livelihoods (income and income sources, employment, enterprises, savings, investment, loans, income transfers, seasonality)
- Welfare (housing and amenities, human health and health services, access to education and enrolment)
- Networks (formal and informal organizations)
- Access to services (extension, credit, savings, input supply)
- Livestock marketing and trade (volume and value traded, market places and market infrastructure, market information, trade routes, disaggregated by drought and normal years).

The community level FGD instruments collected data on the following variables:

- Time lapse between early warning and response
- Number of water infrastructure available and access to (new, rehabilitated) and their sustainable management
- Number and proportion of households with access to improved water sources (new and rehabilitated)
- Land areas under SLM practices (new and rehabilitated)
- Number of platforms for solving cross-border natural resource use conflicts (new, strengthened)
- Number of regional or cross-border market infrastructure (new or rehabilitated).

The *woreda* and regional KII instruments collected information on the following:

- Regional market information (prices, diseases etc.) disseminated to partner countries
- Number of new technologies demonstrated in the project area
- Number of alternative livelihoods and subprojects realized and sustainably managed two years after initial investment
- Whether reliable information from early warning system disseminated timely.

Federal level

At the federal level the following information will have to be collected from the federal project coordination unit:

- Number of regional protocols on sanitary and phytosanitary standards ratified by Ethiopia
- Number of stakeholders trained on policy and regulations in Ethiopia

- Number of suspicious outbreaks of *peste des petits ruminants* (PPR), FMD, contagious caprine pleuropneumonia (CCPP), CBPP, LSD, Newcastle disease reported and tested in central laboratories in Ethiopia
- Disaster risk management policies from two countries harmonized, and
- Contingency plans in place in Ethiopia.

2.3 Sampling

The RPLRP project is being implemented in 131 selected *kebeles* in the 21 *woredas* in the 4 regional states. The intervention *woredas* have a total of 200,000 households, of which 94,285 households are expected to be direct beneficiaries of the project. Due to the large beneficiary population and resource limitations it was not possible to measure outcome and impact indicators for every beneficiary. A total of 1,295 households were interviewed both from the intervention and control households. In addition to the household level surveys, three FGDs per *kebele*, three KIIs per *woreda* and three KIIs per region were conducted. Secondary data was collected at various levels.

Design and approach

To obtain a representative random sample of potential beneficiaries, within the logistical constraints of the program, a stratified (by livelihood zone and regional state) clustered approach was used with two stages of sampling (*woreda* and *kebele*). This approach was aimed to ensure that each beneficiary has an equal probability of being included in the sample so that the resulting sample is representative of the larger target population of beneficiaries. To adjust for the correlation between data points inherent in this cluster approach, as opposed to a purely random sample across the whole project focus areas, the sample size was adjusted upwards (see below).

There was also a need to identify counter-factual areas to provide the 'without project' comparison. These areas should have similar characteristics as the project areas in terms of livelihood zone, socio-economic context and agro-ecological environment but are not part of the project. These areas were identified using spatial maps to identify areas comparable to project areas as well as expert on-the-ground knowledge and included into the survey in an appropriate ratio.

The household survey and FGD followed this same design with the randomly selected *kebele* for the household survey providing the lowest level of sampling for the FGD, i.e. FGD was conducted in the same *kebele* as the household survey. KIIs were carried out at *woreda* and regional state level.

Before *kebele* and household sampling, the overall target population (i.e. all 21 *woredas*) was stratified by livelihood zone and regional state. The main reason for this is that estimates of indicators with sufficient precision are required for each livelihood zone (pastoral, agro-pastoral) and given expected large differences between states it was also important to ensure sufficient sample size within each regional state. The sample size, for *kebele* and households, was calculated for each livelihood zone by regional state combination independently. This resulted in some differences in the total numbers to survey in each regional state (see sample size). The alternative approach of proportional sampling, across livelihood zone and regional state, to the total number of project target beneficiaries, was considered but the change in precision of this is negligible and this would result in larger differences in sample size between states. The sample size for *kebele* and households was calculated according to key indicators of animal mortality and number of livestock marketed. Sampling procedure followed the following stages.

Table 1. RPLRP *woredas* and control *woredas* used for survey

Regional state	Intervention			Control *woredas* selected for survey	
	Zone	*Woreda*	No. of project *kebeles*	Zone	*Woreda*
Afar	Zone 01	Afambo	5	Zone 01	Mille
	Zone 02	Abala	5	Zone 01	Chifera
	Zone 04	Teru	5		
	Zone 04	Yalo	5		
	Zone 05	Semurobina Gelalo	5		
Oromia	Borana	Yabello	7	Borana	Bule Hora
		Moyale	7		Abaya
		Dire	7		Gelana
		Teltele	7		
		Delo Mena	7		
		Meyo	7		
SNNPR	South Omo	Hamer	7	South Omo	South Ari
		Dasenech	7	Bench Maji	Selamago
		Gnangatom	7		
	Bench Maji	Surma	7		
Somali region	Fik	Dhuxun	6	Fik	Hamero
	Liben	Moyale	6		Fik
	Degehabur	Aware	6	Warder	Boh
	Warder	Warder	6		
	Korahe	Shilabo	6		
	Korahe	Shekosh	6		

Stage one of the process involves random sampling of *woredas* with equal probability for different livelihood zones by state combinations. This should provide approximately equal probability of selection for an individual beneficiary and when aggregating *woreda* level outcome and impact indicators up to project level no post-weighting adjustment may[1] be required. Sampling for KII will end at stage one of sampling.

Stage two then involves randomly sampling four project *kebeles* in each of the step one sampled *woreda*. At this step the sampling will also consider the agro-ecological variation within a *kebele*, e.g. if the area has clear wet versus dry environments, different focus species etc. then ensure sampling across all types. Sampling for FGD will end at stage two of sampling.

Stage three (for household survey only) will sample a number of potential beneficiaries in each *kebele* selected in stage two. The number sampled in each *kebele* will be proportional to the number of potential beneficiaries in the *kebele*.

Sample size

In total 1,295 household heads were interviewed, of which 11.9% (154) were women. The interviews were conducted in the four regions of which about one-third were intervention households. The sample size for number of *woreda* to survey in the baseline ensures all environments are represented (livelihood zones by regional state), approximately proportional to their presence in the total sample (e.g. if 50% of *woreda* are pastoral then 50% of the baseline *woreda* should be pastoral) and that it is logistically feasible. To calculate the total household sample size required per livelihood zone and regional state to survey, key program impact indicators of animal mortality (%) and number of

1 Yearly reporting of project indictors may use actual beneficiary numbers to weight *woreda* outcomes when aggregating to project level. This will be particularly important if impact of the project varies between *woreda*, state and/or livelihood zone.

livestock marketed were used. The targeted changes in impact indicators for each indicator are provided in the RPLRP results framework.

A standard calculation to obtain an initial estimate of the number of beneficiaries required per livelihood zone × regional state combination (group) is used for number of livestock marketed*:

$$n = 2 \times \frac{\left(Z_{\frac{\alpha}{2}} + Z_{\beta} \right)^2}{d^2} \sigma^2$$

*Usually an alternative binomial sample size equation for percentage indicators (e.g. mortality) is used but in this case the project is looking for per cent changes in indicators along with assumed per cent variation so utilize this version.

This initial estimate is then adjusted to account for intra-cluster correlation (ICC) between beneficiaries in the same *kebele* using:

2 Groups = Before and After (or With and without)

n = number of beneficiaries per Group

σ2 = expected variation in indicator for each group (expressed as a per cent of the mean)

d = target impact of the project for the indicator, i.e. change before to after (expressed as a per cent of the mean);

$Z_{\frac{\alpha}{2}}$ = 2-sided significance level (taken as 5%, giving Z value of 1.96)

$$Deff\,(DesignEffect) = 1 + ICC(K - 1)$$

The final N = number of beneficiaries required per group = Initial n × Deff. No finite population correction has been made because the large potential beneficiary population size would not change the required n. Note that the above process is iterative in terms of balancing the number of *kebele* and average cluster size (beneficiaries per *kebele*).

ICC = intra-cluster correlation, correlation between beneficiaries in the same *kebele* relative to beneficiaries in different *kebele*.

K = average cluster size (number of beneficiaries per *kebele*)

Only pastoral or agro-pastoral households were included in the survey (i.e. livestock ownership was a required criterion for inclusion in the survey). The FGD participant selection was made such that the members represent the different classes in the community, based on gender, wealth status, education, age and roles in the community. Such selection was made in consultation with community leaders. The KII participants were selected from the relevant government offices at *woreda* and at regional levels. Our data show that it is possible to get purely pastoral and agro-pastoral households in the same *woreda*.

2.4 Extrapolation methods

Total and average value indicators

The average value of a given variable (e.g. income per household, number of animal deaths per household) can be extrapolated to livelihood zone, regional or project level without adjustment. This is because the survey used proportional size of target population, sample size of households across livelihood zones and regions leading to an unbiased estimate of the averages within the survey sample.

The survey sample total values (e.g. total value of sales in sample) in a given livelihood zone also gives an unbiased sample estimate of the population level value due to the proportional sampling. Hence, the extrapolated values at livelihood zone, regional and project level can be calculated as follows:

Livelihood zone level total value =	total of all sample household level values in a livelihood zone divided by the number of households in the sample in the livelihood zone multiplied by the number of target households in that livelihood zonet
Region level total value =	total of all sample household level values in a region divided by the number of households in the sample in the region multiplied by the number of target households in that region
Project level total value =	total of all sample household level values divided by the number of households in the sample multiplied by the number of target households in the project area

Proportion indicators for discrete (yes/no) values at household level

The sample household level proportion values (for Yes/No variables such as market participation) are unbiased estimators of the population proportion values for livelihood zone, region and project level. Hence, the computed sample household proportion values at livelihood zone, region and project levels are the respective livelihood zone, region and project level proportion values without any adjustments required.

Proportion indicators for proportion values at household level

The sample averages of proportions at household level (e.g. proportion of herd that died, sold) in a livelihood zone, region or project level are unbiased estimates of the proportion values at livelihood, region and project levels and are extrapolated using the same principle as the average indicators above.

2.5 Implementation of the field survey

The field survey implementation was subcontracted to a private survey company that had experience in implementing surveys in pastoral/agro-pastoral areas. ILRI scientists developed the sampling technique, the survey instruments and the FGD and KII guides. ILRI scientists also trained field staff and made close supervision of the field work to ensure quality data and timely delivery of the data. Analysis of the quantitative data and report writing was entirely done by ILRI scientists.

CAPI, an electronic-based survey method that was expected to reduce cost and time and avoid the need for double entry, was used to administer the interviews. CAPI minimizes errors in data entry as error correction programs are inbuilt into the electronic version of the survey instruments. The field survey was completed during October–December 2016.

3. Household characteristics

3.1 Household head characteristics

Analysis of household characteristics revealed interesting household features. The proportion of female-headed households ranges from 2.78 in SNNPR to 19.14 in the Somali region (Table 2). The proportion of female-headed households is significantly higher in the pastoral than in the agro-pastoral systems of Afar and Borana. There is no significant difference in the proportion of female-headed households between pastoral and agro-pastoral systems in the Somali region and the SNNPR. It will be interesting to find out the reasons why the proportions of female-headed households vary by livelihood zone.

Table 2. Proportion of female-headed households (%)

Region	Pastoral	Agro-pastoral	P-value for mean difference	Total
Afar	13.66	7.21	0.089	11.22
Oromia (Borana)	26.03	7.87	0.000	11.38
Somali region	20.91	14.81	0.175	19.14
SNNPR (South Omo and Bench Maji)	1.35	3.37	0.374	2.78

The mean ages of household heads indicate that most households are led by relatively young household heads. The average age of household heads ranges from 42 (Afar and SNNPR) to 45 (the Somali region), with 40 years of age as a mode in Afar, the Somali region and SNNPR (Table 3). The mode age of household heads in Borana was 35. The average age of household heads does not show significant difference across livelihood systems.

Table 3. Age of household head (total)

Region	Total			
	Mean (st. dev.)	Minimum	Maximum	Mode
Afar	42 (11)	20	85	40
Oromia (Borana)	44 (16)	20	90	35
Somali region	45 (13)	20	83	40
SNNPR (South Omo and Bench Maji)	42 (10)	20	78	40
Total	44 (13)	20	90	40

Table 4. Age of household head by livelihood zone

Region	Pastoral				Agro-pastoral				P-value for mean difference
	Mean (st. dev.)	Minimum	Maximum	Mode	Mean (st. dev.)	Minimum	Maximum	Mode	
Afar	42 (12)	20	85	40	43 (10)	25	78	35	0.5711
Oromia (Borana)	46 (17)	20	90	40	44 (16)	20	90	35	0.2062
Somali region	45 (14)	20	80	40	46 (13)	21	83	50	0.7244

Region	Pastoral				Agro-pastoral				P-value for mean difference
	Mean (st. dev.)	Minimum	Maximum	Mode	Mean (st. dev.)	Minimum	Maximum	Mode	
SNNPR (South Omo and Bench Maji)	42 (9)	20	65	39	42 (11)	21	78	45	0.8713
Total	44 (13)	20	90	40	43 (13)	20	90	35	

About 71.7% of household heads are married with one spouse, while about 19% of households are married with more than one spouse (Table 5). Only about 1.8% of household heads are divorced, indicating that divorce is not common in pastoral and agro-pastoral systems. Only 7.2% of household heads indicated that they were widowed. Single households are very rare. Marriage with more than one spouse is the lowest in Afar and the highest in SNNPR. Only 3.4% of households reported marriage with more than one spouse in Afar while nearly 50% of sample households in SNNPR reported marriage with more than one spouse.

About 15% of households reported marriage with more than one spouse in the Somali region and Borana. Marriage with one or more than one spouse does not show significant difference between livelihood systems in Afar, Borana and the Somali region (Table 6). However, in SNNPR, marriage with more than one spouse is higher in pastoral (62.2%) than in agro-pastoral households (40.4%).

Table 5. Marital status for all household heads (total) (%)

Region	Married, single spouse	Single	Divorced	Widowed	Not together for any reason	Married, more than one spouse
Afar	86.7	0.7	1.4	7.8	0.0	3.4
Oromia (Borana)	77.5	0.5	1.1	5.6	0.3	15.1
Somali region	68.5	0.5	4.0	11.6	0.3	15.1
SNNPR (South Omo and Bench Maji)	50.0	0.8	0.0	2.4	0.0	46.8
Total	71.7	0.6	1.8	7.2	0.2	18.6

Table 6. Marital status of household head by livelihood zone (%)

Region	Livelihood type											
	Pastoral						Agro-pastoral					
	Married, single spouse	Single	Divorced	Widowed	Not together for any reason	Married, more than one spouse	Married, single Spouse	Single	Divorced	Widowed	Not together for any reason	Married, more than one spouse
Afar	85.8	0.5	1.6	8.7	0.0	3.3	88.3	0.9	0.9	6.3	0.0	3.6
Oromia (Borana)	72.6	0.0	1.4	9.6	1.4	15.1	78.7	0.7	1.0	4.6	0.0	15.1
Somali region	65.4	0.8	4.2	13.7	0.0	16.0	75.9	0.0	3.7	6.5	0.9	13.0
SNNPR (South Omo and Bench Maji)	36.5	0.0	0.0	1.4	0.0	62.2	55.6	1.1	0.0	2.8	0.0	40.4
Total	69.0	0.5	2.5	10.1	0.2	17.7	73.9	0.7	1.1	4.7	0.1	19.4

The average number of years of residence in the current residential place ranges from 24 to 36, indicating that pastoralists and agro-pastoralists maintain a specific residential place for long (Table 7). Overall, residence is longer in agro-pastoral (34 years) than in pastoral systems (26 years). Maximum residence in one location of up to 90 years were observed. Interestingly, there is no significant difference in the average years of residence in one location between pastoral and agro-pastoral systems in Afar and Borana regions, contrary to what one would expect. Residence in one location seems to be significantly longer in agro-pastoral than in pastoral areas in the Somali region and SNNPR (Table 8).

Table 7. Years lived in the same residential location (total)

Region	Total			
	Mean (st. dev.)	Minimum	Maximum	Mode
Afar	27 (15)	1	67	40
Oromia (Borana)	36 (18)	1	90	30
Somali region	24 (17)	1	70	20
SNNPR (South Omo and Bench Maji)	36 (17)	1	78	2
Total	31 (18)	1	90	30

Table 8. Years lived in the same residential location by livelihood

Region	Pastoral				Agro-pastoral				P-values for mean difference
	Mean (st. dev.)	Minimum	Maximum	Mode	Mean (st. dev.)	Minimum	Maximum	Mode	
Afar	26 (15)	1	67	40	28 (15)	2	60	30	0.1860
Oromia (Borana)	36 (21)	0	90	40	37 (17)	4	90	30	0.7082
Somali region	23 (17)	1	70	20	28 (17)	2	60	4	0.0067
SNNPR (South Omo and Bench Maji)	32 (19)	1	65	2	38 (16)	1	78	45	0.0070
Total	26 (18)	0	90	40	34 (17)	1	90	30	

3.2 Household size, household structure and dependency ratio

The average household size in the study area does not differ significantly across the regions. The household sizes range from 5.99 (SNNPR) to 6.87 (the Somali region) (Table 9). Significant differences are observed in average household size by livelihood system, where the agro-pastoralists tend to have higher household size in Borana and the Somali region both in male and female members of the household. There is no significant difference in household size by livelihood zone in Afar and SNNPR. Households with only one person and households with as many as 18 members are observed in the pastoral system, while households with as many as 25 households are observed in the agro-pastoralist system (Table 10). The mode household size in the pastoral system ranges from 5 to 7, while in the agro-pastoral system, the mode household size is 6 or 7.

Table 9. Average household size (total)

Region	Total			
	Mean (st. dev.)	Minimum	Maximum	Mode
Afar	6.47 (2.52)	1	15	6
Oromia (Borana)	6.80 (2.98)	2	25	7
Somali region	6.87 (2.87)	1	18	7
SNNPR (South Omo and Bench Maji)	5.99 (1.90)	1	12	6

Table 10. Average household size by livelihood

Region	Pastoralist				Agro-pastoralist				P-value for mean difference
	Mean (st. dev.)	Minimum	Maximum	Mode	Mean (st. dev.)	Minimum	Maximum	Mode	
Afar	6.40 (2.52)	1	15	6	6.58 (2.52)	1	13	6	0.5586
Oromia (Borana)	6.26 (3.03)	2	16	5	6.93 (2.96)	2	25	7	0.0845
Somali region	6.60 (2.77)	1	18	7	7.51 (3.01)	1	17	7	0.0054
SNNPR (South Omo and Bench Maji)	6.11 (1.77)	2	10	6	5.94 (1.95)	1	12	6	0.5325

The number of female members of the households is lower than the number of male members across all the regions and almost across all age groups[2] (Tables 11 and 12). This is also confirmed by the data obtained from the qualitative survey where female population in the survey *woredas* is lower than male population. No significant differences were observed in the female to male ratio either across livelihood systems or across regions. The female to male ratio ranges from 0.858 (Afar) to 0.969 (the Somali region) (Table 11).

Table 11. Female to male ratio

Region	Female to male ratio		
	Pastoral	Agro-pastoral	Total
Afar	0.870	0.839	0.858
Oromia (Borana)	0.858	0.927	0.917
Somali region	0.969	0.944	0.961
SNNPR (South Omo and Bench Maji)	0.923	0.903	0.909

Household members aged 7–15 are more in number than the other age categories and household members above 64 years of age account for the lowest proportion, as would be expected (Table 12). The number of male and female household members showed little difference by livelihood zone (Table 13).

Table 12. Household structure (total) (mean)

Region	Age category	Total		
		Male	Female	Total
Afar	Greater than 64	0.10	0.11	0.21
	30–64	0.88	0.79	1.68
	16–29	0.76	0.69	1.45
	7–15	0.98	0.78	1.75
	Less than 6	0.77	0.62	1.39
	Total	3.49	2.99	6.48
Oromia (Borana)	Greater than 64	0.16	0.18	0.34
	30–64	0.74	0.70	1.44
	16–29	0.79	0.70	1.49
	7–15	1.11	0.91	2.02
	Less than 6	0.74	0.77	1.51
	Total	3.54	3.25	6.79
Somali region	Greater than 64	0.09	0.08	0.16
	30–64	0.69	0.72	0.69
	16–29	0.70	0.72	1.42
	7–15	1.20	1.11	2.31
	Less than 6	0.82	0.74	1.56
	Total	3.50	3.36	6.86
SNNPR (South Omo and Bench Maji)	Greater than 64	0.04	0.01	0.05
	30–64	0.85	0.75	1.60
	16–29	0.67	0.58	1.25
	7–15	1.04	0.93	1.97
	Less than 6	0.55	0.58	1.13
	Total	3.14	2.85	5.99

2. We used five age groups: greater than 64, 30–64, 16–29, 7–15 and up to 6 years old.

Table 13. Household structure by livelihood zone (mean)

Region	Age category	Pastoralist			Agro-pastoralist		
		Male	Female	Total	Male	Female	Total
Afar	Greater than 64	0.10	0.11	0.21	0.10	0.12	0.21
	30–64	0.88	0.77	1.64	0.89	0.84	1.73
	16–29	0.75	0.73	1.48	0.77	0.63	1.40
	7–15	0.92	0.70	1.62	1.07	0.89	1.96
	Less than 6	0.78	0.67	1.55	0.76	0.53	1.29
	Total	3.43	2.98	6.41	3.59	3.01	6.59
Oromia (Borana)	Greater than 64	0.22	0.22	0.44	0.16	0.17	0.33
	30–64	0.73	0.67	1.40	0.74	0.71	1.45
	16–29	0.74	0.56	1.30	0.81	0.73	1.53
	7–15	0.99	0.79	1.78	1.14	0.93	2.07
	Less than 6	0.70	0.64	1.34	0.75	0.80	0.75
	Total	3.37	2.89	6.26	3.60	3.33	6.93
Somali region	Greater than 64	0.09	0.11	0.20	0.07	0.01	0.09
	30–64	0.67	0.70	1.37	0.76	0.77	1.53
	16–29	0.69	0.67	1.36	0.72	0.84	1.56
	7–15	1.12	1.03	2.16	1.40	1.28	2.68
	Less than 6	0.79	0.74	1.53	0.91	0.74	1.65
	Total	3.35	3.25	6.60	3.86	3.64	7.50
SNNPR (South Omo and Bench Maji)	Greater than 64	0.01	0.00	0.01	0.04	0.02	0.06
	30–64	0.92	0.76	1.68	0.83	0.75	1.57
	16–29	0.45	0.51	0.96	0.76	0.61	1.37
	7–15	1.12	1.03	2.15	1.00	0.89	1.89
	Less than 6	0.68	0.64	1.31	0.49	0.56	1.05
	Total	3.18	2.93	6.11	3.12	2.82	5.94

Dependency ratio[3], a measure of the number of people a working age household member has to feed, ranges from 1.075 (Afar) to 1.426 (Somali region) (Table 14). Dependency ratios do not seem to differ significantly across livelihood systems.

Table 14. Dependency ratio

Region	Dependency ratio		
	Pastoral	Agro-pastoral	Total
Afar	1.054	1.109	1.075
Oromia (Borana)	1.320	1.058	1.321
Somali region	1.426	1.426	1.426
SNNPR (South Omo and Bench Maji)	1.318	1.023	1.103

3.3 Education

Considering total household members, between 26.82% (SNNPR) and 32.30% (Afar) of household members are enrolled in school (Table 15). The proportion of total household members enrolled in schools is higher in Afar and the Somali region, but lower in Borana and SNNPR. Clearly, enrolment is significantly higher in agro-pastoral than in pastoral households. The enrolment rates vary by age groups (Tables 16 and 17). The following paragraphs discuss enrolment by age group.

Table 15. Proportion of total household members who are in education (%)

Region	Pastoral	Agro-pastoral	P-value for mean difference	Total
Afar	27.75	39.59	0.0001	32.30
Oromia (Borana)	22.54	28.62	0.0102	27.54
Somali region	29.61	36.13	0.0054	31.68
SNNPR (South Omo and Bench Maji)	20.80	29.40	0.0207	26.82

3. Dependency ratio is measured as the ratio between number of household members up to 15 years of age plus number of people above 64 years of age and the number of people between 15 and 64 years of age.

Table 16. Proportion of household members enrolled in school by age category (%).

Region	Age category	Total	
		Male	Female
Afar	Greater than 64	3.45	0.00
	30–64	13.46	3.86
	16–29	56.76	34.98
	7–15	69.34	59.65
	Less than 6	8.37	9.89
Oromia (Borana)	Greater than 64	1.52	0.00
	30–64	1.80	0.75
	16–29	40.00	31.94
	7–15	60.14	53.64
	Less than 6	13.57	7.59
Somali region	Greater than 64	9.38	0.00
	30–64	12.45	4.49
	16–29	52.90	44.57
	7–15	58.30	49.02
	Less than 6	8.85	5.82
SNNPR (South Omo and Bench Maji)	Greater than 64	0.00	0.00
	30–64	0.93	0.53
	16–29	36.31	20.55
	7–15	50.21	60.54
	Less than 6	13.77	10.96

Table 17. Proportion of household members enrolled in school by age category (%) by livelihood zone

Region	Age category	Pastoralist		Agro-pastoralist	
		Male	Female	Male	Female
Afar	Greater than 64	5.56	0.00	0.00	0.00
	30–64	9.32	2.86	20.20	5.38
	16–29	51.09	26.32	65.88	51.43
	7–15	64.88	51.94	75.63	69.70
	Less than 6	9.09	8.94	7.14	11.86
Oromia (Borana)	Greater than 64	0.00	0.00	2.00	0.00
	30–64	3.77	0.00	1.33	0.93
	16–29	25.93	29.27	43.09	32.43
	7–15	54.17	41.38	61.38	56.14
	Less than 6	15.69	8.51	13.10	7.41
Somali region	Greater than 64	8.33	0.00	12.50	0.00
	30–64	11.43	3.26	14.63	7.23
	16–29	49.72	46.02	60.26	41.76
	7–15	55.25	46.32	64.24	54.35
	Less than 6	9.18	3.59	8.16	11.25
SNNPR (South Omo and Bench Maji)	Greater than 64	0.00	0	0.00	0.00
	30–64	0.00	0.00	1.36	0.75
	16–29	30.30	26.32	37.78	18.52
	7–15	44.58	35.53	67.98	57.23
	Less than 6	12.00	8.51	14.77	12.12

Between 0.93% (SNNPR) and 13.46% (Afar) of male household members between 30 and 64 years of age were enrolled in education in the study areas (Table 16). The Somali region reported enrolment rate of 12.45% for this age group. Generally, enrolment seems to be higher in the agro-pastoral areas than in the pastoral areas, except for Borana where the opposite seems to be true. For the same age group, female enrolment is significantly lower than male enrolment. Female enrolment for the same age group ranged between 0.53% (SNNPR) and 4.49% (Somali region). As in the male population, enrolment is clearly higher in agro-pastoral than in pastoral systems for females.

Enrolment for male household members between the age of 16 and 29 years ranged between 36.31% (SNNPR) and 56.76% (Afar). The Somali region reported enrolment rate of 52.9% while Borana reported 40.0% enrolment rate. Enrolment is clearly higher in agro-pastoral than in pastoral systems for male household members of this age group.

Female enrolment rate for the same age group is much lower than male enrolment rate and ranges from 20.55% (SNNPR) to 44.57% in the Somali region. For this age group, female member enrolment is higher in agro-pastoral areas in Afar and Borana, but higher in pastoral areas in the Somali region and SNNPR.

Enrolment rate is the highest for the age group between 7 and 15 years, compared to all other age groups. For male members of this age group, enrolment rate ranges from 60.14% (Borana) to 69.34% (Afar). Enrolment is higher in agro-pastoral areas than in pastoral areas for this age group. Female enrolment for this age group ranges from 49.02% (Somali region) to 59.65% (Afar). As with the male members of this age group, enrolment of females is higher in agro-pastoral households than the pastoral households.

Interestingly, significant proportions of children up to six years of age are enrolled in school. Between 8.37% (Afar) and 13.77% (SNNPR) male members of this age group are enrolled in school. Between 5.82% (Somali region) and 10.96% (SNNPR) female members of this age group are enrolled in school.

3.4 Livelihoods

Households were asked to identify their livelihood source from among nine livelihood categories, five of them centred on livestock ownership and four of them with no livestock ownership. There was no household in the sample that did not own livestock, so results are only for households that owned livestock. About 24% of the households depend purely on livestock rearing with no other sources of income and constant movement of livestock from place to place in search of grazing land and water without a central location of residence (Table18).

About 22.2% of sample households move mobile livestock regularly to grazing areas within the *woreda*, with milking/weak animals kept around the settlement, but no crop growing and no other income-generation activities. About 28.3% of the sample households move mobile livestock regularly to grazing areas within the *woreda*, with milking/weak animals kept around the settlement with crop growing but no other income-generation activities. Only about 3.4% of the households move mobile livestock regularly to grazing areas within the *woreda*, with milking/weak animals kept around the settlement, with crop growing and other income-generation activities. About 22.5% of households rear livestock but do not move them from their private land (i.e. livestock are kept in enclosures) with crop growing and with other income generation activities.

Table18. Livelihoods of households (%)

Region	Proportion of households by livelihood type				
	A 'pure' pastoral household with no permanent residence, 100% income from livestock and no crop growing and no other income-generation activities	A pastoral household where members move mobile livestock regularly to agreed grazing areas within the *woreda*, with milking/weak animals kept around the settlement (i.e. a 'satellite' system), with no crop growing and no other income-generation activities	An agro-pastoral household where members move mobile livestock regularly to agreed grazing areas within the *woreda*, with milking/weak animals kept around the settlement (i.e. a 'satellite' system) with crop growing and no other income-generation activities	An agro-pastoral household where members move mobile livestock regularly to agreed grazing areas within the *woreda*, with milking/weak animals kept around the settlement (i.e. a 'satellite' system) with crop growing and with other income-generation activities	An agro-pastoral household where members own livestock but do not move them from their private land (i.e. livestock are kept in enclosures) with crop growing and with other income-generation activities
Afar	51.0	11.2	10.5	3.1	24.1
Oromia (Borana)	5.6	13.8	43.9	1.6	35.2
Somali region	36.1	34.8	18.1	4.6	6.5
SNNPR (South Omo and Bench Maji)	0.0	29.4	40.9	4.8	25.0
Total	23.6	22.2	28.3	3.4	22.5

3.5 Housing quality and investment

The most common type of residential roofs is thatched roof (Table 19). Between 47.4% (Somali region) and 74.1% (Borana) of households have thatched roofs. SNNPR reported that 69.4% of households use thatched roofs. The second most common roofing in Borana, the Somali region and SNNPR is corrugated iron sheets, while mud is the second most important roofing material in Afar. Interestingly, mud roofing is rarely used in the other regions. Plastic roofing is also important in Afar (12.6%), the Somalia region (23.5%) and SNNPR (11.1%). No plastic roofing was reported in Borana.

Table 19. Proportion of roofing material (total households) (%)

Region	Total				
	Thatched roof	Corrugated metal roof	Mud/sand/ stone etc.	Plastic sheeting	Other
Afar	61.9	6.5	14.3	12.6	4.8
Oromia (Borana)	74.1	22.8	2.9	0.0	0.3
Somali region	47.4	25.3	1.1	23.5	2.7
SNNPR (South Omo and Bench Maji)	69.4	19.4	0.0	11.1	0.0
Total	62.8	19.2	4.4	11.7	1.9

Table 20. Proportion of roofing material by livelihood zone

Region	Livelihood type									
	Pastoral					Agro-pastoral				
	Thatched roof	Corrugated metal roof	Mud/sand/ stone	Plastic sheeting	Other	Thatched roof	Corrugated metal roof	Mud/ sand/ stone	Plastic sheeting	Other
Afar	65.6	7.1	6.6	14.2	6.6	55.9	5.4	27.0	9.9	1.8
Oromia (Borana)	82.2	9.6	8.2	0.0	0.0	72.1	25.9	1.6	0.0	0.3
Somali region	42.6	27.4	1.1	25.9	3.0	59.3	20.4	0.9	17.6	1.9
SNNPR (South Omo and Bench Maji)	63.5	8.1	0.0	28.4	0.0	71.9	24.2	0.0	3.9	0.0
Total	57.2	16.5	3.5	19.4	3.4	67.5	21.4	5.1	5.3	0.7

There seems to be no clear pattern of preference of roofing material by livelihood zone, perhaps because roofing preferences are explained by something else than the livelihood systems (Table 20). In Afar and Borana, thatched roofs seem to be favoured in pastoral livelihoods, while in the Somali region and SNNPR, thatched roofs seem to be preferred in agro-pastoral areas. Corrugated iron sheets seem to be preferred in agro-pastoral areas of Afar and SNNPR, while they seem to be preferred in the pastoral areas of Borana and the Somali region.

The most common floor material is earth reported by 88.5 to 98.3% of sample households (Table 21). Cow dung is used as floor material by 8.7 and 11.5% of households in Borana and SNNPR, respectively. Cow dung is not used as floor material in Afar and the Somali region. Cement/tile floors are used by 6.7% of households in the Somali region and 4.5% of households in SNNPR. While no household reported using cement/tile floor in SNNPR, about 1.7% reported using it in Afar region. As with roofing materials, there does not seem to be clear preference pattern for floor materials by livelihood zone (Table 22).

Table 21. Proportion of floor material (total households) (%)

Region	Total				
	Earth	Cow dung	Concrete/stone/cement	Tile/bricks	Other
Afar	98.3	0.0	1.7	0.0	0.0
Oromia (Borana)	86.0	8.7	4.5	0.3	0.5
Somali region	92.7	0.5	6.7	0.0	0.0
SNNPR (South Omo and Bench Maji)	88.5	11.5	0.0	0.0	0.0
Total	91.2	4.9	3.6	0.1	0.2

Table 22. Proportion of floor material by livelihood zone

Region	Livelihood type									
	Pastoral					Agro-pastoral				
	Earth	Cow dung	Concrete/ stone/ cement	Tile/ bricks	Other	Earth	Cow dung	Concrete/ stone/ cement	Tile/ bricks	Other
Afar	99.5	0.0	0.5	0.0	0.0	96.4	0.0	3.6	0.0	0.0
Oromia (Borana)	86.3	5.5	8.2	0.0	0.0	85.9	9.5	3.6	0.3	0.7
Somali region	91.3	0.4	8.4	0.0	0.0	96.3	0.9	2.8	0.0	0.0
SNNPR (South Omo and Bench Maji)	100.0	0.0	0.0	0.0	0.0	83.7	16.3	0.0	0.0	0.0
Total	94.3	0.8	4.9	0.0	0.0	88.6	8.4	2.6	0.1	0.3

Investment in house improvements or the construction of new houses was reported by 7.5 to 29.3% of households (Table 23). The highest proportion of households who invested in their house improvement was reported in Afar region (29.3%), followed by Borana (28.8%) and the Somali region (19.9%). Only about 7.5% of respondents in SNNPR reported investment in housing. There does not seem to be clear difference in the proportion of households who made housing investment by livelihood zone. However, there is a clear difference in the amount of expenditure on housing investment by livelihood zone.

Households in the agro-pastoral system invest significantly higher amount than those in the pastoral system. Average housing investments across all sample households who made the investment ranged from ETB5,314 (SNNPR) to 22,461 (Borana). Average housing investment in SNNPR was ETB5,858, while the average investment in the Somali region is ETB13,315. The standard deviation of housing investments is very high indicating that there is a huge difference among households in their housing expenditure. Interestingly, the minimum housing investment reported was ETB50 and the maximum being 640,000.

Table 23. Proportion of households who made investment in housing (%)

Region	Livelihood type		
	Pastoral	Agro-pastoral	Total
Afar	29	29.7	29.3
Oromia (Borana)	21.9	30.5	28.8
Somali region	20.5	18.5	19.9
SNNPR (South Omo and Bench Maji)	5.4	8.4	7.5
Total	21.4	22.9	22.2

3.6 Official position in the *kebele* or *woreda* and migration

Between 5% (Afar) and 22% (Borana) of household heads reported having had an official position in their *kebele* or in the *woreda*, with an overall average of 10.27% of heads having official positions. The Somali region and SNNPR also reported 5.39 and 5.95% of heads having official positions, respectively. Spouses also hold official positions, although to a much lower proportion than heads. Between 0.27% (Somali region) and 4.76% (Borana) spouses held official positions either in their *kebeles* or in the *woredas*. Overall, about 2.18% of spouses hold official positions. Official position by other household members is very rare with an overall average of 0.54% of household members holding official positions.

Migration of household members to other places does not seem to be important. For those who reported migration, the most frequently reported reason is to tend to livestock. Only about 13% of households reported migration of at least one member to other places during the year.

4. Household assets and income sources

4.1. Livestock ownership

Mean livestock holding in TLU ranged from 21.73 (Somali region) to 43.41 (SNNPR) (Table 24). Mean TLU holding in Afar and Borana stand at 26.75 and 26.04, respectively. Only a small proportion of the TLU is accounted for by equines, indicating the importance of small and large ruminants in the livelihoods of the pastoral and agro-pastoral communities. The importance of the different types of ruminants shows some difference by region. Cattle, followed by goats account for the highest share of the TLU in Afar, Borana and SNNPR. We see a different picture in the Somali region, where goats followed by camels and sheep contribute the highest share to TLU. Interestingly, cattle make the lowest contribution to TLU in the Somali region. Average holding in TLU is significantly higher in pastoral than in agro-pastoral areas (Table 25).

Table 24. Livestock holdings in TLU

Region	Cattle	Sheep	Goat	Camel	Total TLU
Afar	9.38	2.89	5.64	4.42	26.75
Oromia (Borana)	18.66	1.58	2.41	1.7	26.04
Somali region	2.85	4.19	5.38	4.65	21.73
SNNPR (South Omo and Bench Maji)	35.32	2.7	5.39	0	43.41

Table 25. Livestock holdings in TLU by livelihood

Region	Pastoralist					Agro-pastoralist				
	Cattle	Sheep	Goat	Camel	Total TLU	Cattle	Sheep	Goat	Camel	Total TLU
Afar	8.86	3.57	6.46	5.02	23.9	10.22	1.78	4.31	3.43	19.74
Oromia (Borana)	23.76	3.59	4.25	2.78	34.38	17.43	1.1	1.97	1.44	21.94
Somali region	2.67	4.33	5.61	4.81	17.41	3.29	3.86	4.82	4.27	16.25
SNNPR (South Omo and Bench Maji)	43.77	4.9	7.75	0	56.42	31.8	1.79	4.4	0	38

In terms of number of heads of animals, the average cattle holding per household ranged from 4.07 (Somali region) to 50.54 (SNNPR) (Table 26). Average cattle holding in Afar and Borana were 13.39 and 26.65, respectively. As many as 542 cattle per household (Borana) and 199 cattle per household (SNNPR) were also observed. Mean cattle holdings is significantly higher in pastoral areas than in agro-pastoral areas in SNNPR only, while there does not seem to be significant difference by livelihood system in Afar, Borana and the Somali region (Table 27). Excluding SNNPR where households do not own camels, the average camel holdings range from 1.70 (Borana) to 4.65 (Somali region) (Table 26). Afar reported an average holding of 4.42 camels per household. As many as 77 camels per household (Afar) and 60 camels per household (Somali region) were observed. The average camel holding seems to be significantly higher in pastoral than in agro-pastoral areas only in Borana.

Table 26. Livestock ownership by species (number)

Region	Total			
	Cattle	Sheep	Goat	Camel
	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)
Afar	13.39 (18.53)	28.92 (38.35)	56.44 (44.30)	4.42 (8.96)
Oromia (Borana)	26.65 (46.79)	15.84 (36.10)	24.10 (37.30)	1.70 (5.10)
Somali region	4.07 (8.26)	41.92 (48.42)	53.77 (45.85)	4.65 (10.02)
SNNPR (South Omo and Bench Maji)	50.45 (38.85)	27.04 (45.72)	53.92 (74.68)	0.00 (0.00)

Table 27. Livestock ownership by species and livelihood zones (number)

Region	Pastoralist				Agro-pastoralist				P-values for mean difference			
	Cattle	Sheep	Goat	Camel	Cattle	Sheep	Goat	Camel				
	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Cattle	Sheep	Goat	Camel
Afar	12.65 (20.44)	35.74 (41.32)	64.57 (44.33)	5.02 (5.02)	14.60 (14.91)	17.76 (29.85)	43.12 (41.07)	3.43 (6.39)	0.3832	0.0001	0.0000	0.1422
Oromia (Borana)	33.95 (71.46)	35.86 (53.33)	42.51 (59.49)	2.78 (2.78)	24.90 (38.60)	11.04 (28.69)	19.70 (28.04)	1.44 (4.72)	0.1383	0.0000	0.0000	0.0428
Somali region	3.81 (8.98)	43.27 (51.27)	56.05 (48.93)	4.81 (4.81)	4.70 (6.16)	38.64 (40.73)	48.22 (36.93)	4.27 (11.19)	0.3444	0.4040	0.1353	0.6347
SNNPR (South Omo and Bench Maji)	62.53 (35.57)	48.97 (56.11)	77.54 (108.95)	0.00 (0.00)	45.43 (39.14)	17.92 (37.16)	44.04 (51.64)	0.00 (0.00)	0.0014	0.0000	0.0011	NA

NA: not available.

Average goat ownership ranged from 24.10 (Borana) to 56.44 (Afar) (Table 26). The average goat holding in the Somali region and SNNPR was about 54. Goat holding is clearly significantly higher in pastoral than in agro-pastoral areas across all regions, except in the Somali region, sometimes by about 50% (Table 27). The average sheep holding size is consistently significantly lower than the average goat holdings. Mean sheep holding per household ranged from 15.84 (Borana) to 41.92 (Somali region). Mean sheep holding in SNNPR and Afar was similar at 27 to 29. As many as 520 sheep per household (Somali region) and 350 sheep per household (Borana) were observed. The average sheep holding is significantly higher in pastoral than in agro-pastoral households, except in the Somali region, sometimes by threefold (Borana).

The average donkey ownership in the study area is below 2 and ranged from 1.12 (Somali region) to 1.44 (Borana). Average donkey ownership is higher in pastoral than in agro-pastoral areas. As many as 40 donkeys per household (SNNPR) and 21 donkeys per household (Borana) were observed. Mules or horses are not important in the pastoral or agro-pastoral areas.

Between 40.70% (Somali region) and 98.8% (SNNPR) of households owned cattle during the survey year (Table28). About 98.4% and 65.65% of households owned cattle in Borana and Afar, respectively. Interestingly, the proportion of households who own cattle is significantly higher in agro-pastoral than pastoral households in Afar and the Somali region, while there are no significant difference in Borana and SNNPR (Table 29).

Table 28. Proportion of total households who own livestock by species (%)

Region	Total			
	Cattle	Sheep	Goat	Camel
Afar	65.65	67.69	91.84	44.22
Oromia (Borana)	98.41	52.65	82.80	20.63
Somali region	40.70	80.86	95.42	34.50
SNNPR (South Omo and Bench Maji)	98.81	46.43	81.35	0.00

Table 29. Proportion of households who own livestock by species and livelihood zones (%)

Region	Pastoral				Agro-pastoral				P-values for mean difference			
	Cattle	Sheep	Goat	Camel	Cattle	Sheep	Goat	Camel	Cattle	Sheep	Goat	Camel
Afar	55.19	75.96	96.72	40.44	82.88	54.05	83.78	50.45	0.000	0.000	0.000	0.094
Oromia (Borana)	97.26	75.34	95.89	32.88	98.69	47.21	79.67	17.70	0.380	0.000	0.001	0.004
Somali region	34.60	80.61	95.44	36.88	55.56	81.48	95.37	28.70	0.000	0.846	0.978	0.132
SNNPR (South Omo and Bench Maji)	98.65	75.68	91.89	0.00	98.88	34.27	76.97	0.00	0.879	0.000	0.006	NA

NA: not available.

The proportion of households who own camels are much lower than those who own cattle. About 44.22% of households in Afar and 34.50% of households in the Somali region own camel, while only 20.63% of households own camel in Borana. No household owns camels in SNNPR. The proportion of households who own camels is significantly higher in the pastoral areas than the agro-pastoral areas in Borana, while there is no significant difference in the Somali region. However, the proportion is significantly higher in agro-pastoral areas than the pastoral areas in Afar.

Between 81.35% (SNNPR) and 95.42% (Somali region) of households owned goats. Afar reported that 91.84% of households owned goats, while SNNPR reported about 81.35% of households own goats. The Proportion of goat owning households is higher in pastoral areas than in the agro-pastoral areas across all the regions.

Between 46.43% (SNNPR) and 80.86% (Somali region) of households own sheep. About 67.69% of households in Afar and 52.85% of households in Borana also own sheep. Proportion of households who own sheep is much higher in pastoral than in agro-pastoral areas in Afar, Borana and SNNPR. There is no difference in the proportion of sheep owning households between pastoral and agro-pastoral households in the Somali region.

4.2 Livestock birth rates and young animal mortality rates

Calf birth rates ranged from 24.02% (Afar) to 38.59% (Borana) (Table 30). Calf birth rates are higher in agro-pastoral than pastoral areas, perhaps because of better feed and water availability in agro-pastoral areas (Table 31). Goat kid birth rates range from 24.62 (Afar) to 47.67% (Borana). Kid birth rates seem to be similar between agro-pastoral and pastoral areas in Afar, the Somali region and Borana, while kid birth rates seem to be higher in agro-pastoral areas in SNNPR. Lamb birth rates range from 21.50% (Afar) to 48.44% (Borana). In general, lamb birth rates seem to be higher in agro-pastoral than in pastoral areas. However, lamb birth rates seem to be higher in pastoral areas in Afar and Borana.

Table 30. Birth rates of calves, lambs and kids total (%)

Region	Total		
	Calves	Lambs	Kids
Afar	24.02	21.5	24.62
Oromia (Borana)	38.59	48.44	47.67
Somali region	28.55	22.79	23.49
SNNPR (South Omo and Bench Maji)	29.15	45.03	40.85
Total	31.97	29.39	30.48

Table 31. Birth rates of calves, lambs and kids by livelihood (%)

Region	Pastoral			Agro-pastoral		
	Calves	Lambs	Kids	Calves	Lambs	Kids
Afar	20.92	22.65	24.55	28.62	17.65	24.78
Oromia (Borana)	35.77	58.86	47.85	39.58	41.46	47.58
Somali region	24.41	21.31	23.21	37.69	26.98	24.29
SNNPR (South Omo and Bench Maji)	27.44	41.52	36.22	30.12	49.12	44.42
Total	27.51	27.33	27.37	34.77	33.55	35.44

Calf death rates range from 18.18% (SNNPR) to 54.22% (Afar) (Table 32). Calf death rates are significantly higher in the pastoral areas across all regions, perhaps because of the harsher environment in the pastoral areas (Table 33). Death rates of kids also range from 15.43% (SNNPR) to 41.13% (Afar). Kid death rates seem to show no significant difference by livelihood zone in Afar, while kid death rates are higher in pastoral areas in Borana and the Somali region and the opposite seems to be true in SNNPR.

Table 32. Death rates of calves, lambs and kids, total (%)

Region	Total		
	Calves	Lambs	Kids
Afar	54.22	9.81	41.13
Oromia (Borana)	20.40	18.12	29.09
Somali region	13.88	3.2	19.03
SNNPR (South Omo and Bench Maji)	18.18	11.24	15.43
Total	23.88	9.83	26.02

Table 33. Death rates of calves, lambs and kids by livelihood (%)

Region	Pastoral			Agro-pastoral		
	Calves	Lambs	Kids	Calves	Lambs	Kids
Afar	64.83	8.84	41.18	42.70	14.00	41.01
Oromia (Borana)	25.89	18.28	38.06	18.66	17.97	24.31
Somali region	16.67	3.85	19.64	9.90	1.75	17.42
SNNPR (South Omo and Bench Maji)	20.89	9.09	12.87	16.78	13.36	17.04
Total	31.55	8.73	28.06	20.08	11.65	23.51

Interestingly, lamb death rates are consistently lower than kids or calves death rates across all the regions and the livelihood zones. Lamb death rates ranged from 3.2% (Somali region) to 18.12% (Borana). In general, lamb death rates seem to be higher in agro-pastoral than in pastoral areas.

4.3 Livestock market participation: sellers

Between 11.05% (Somali region) and 84.92% (SNNPR) of households sold cattle during the survey period (Table 34). Apparently there is a wide difference in the proportion of households involved in cattle selling across the regions. About 38.78% and 64.81% of households participated in selling cattle in Afar and Borana, respectively. The proportion of households who sold cattle is significantly higher in agro-pastoral than the pastoral areas in Afar, while the reverse is true in SNNPR. There does not seem to be significant difference by livelihood zone in the proportion of households who sold cattle in Borana and the Somali region (Table 35).

Table 34. Proportion of households who sold livestock by species, 2008 Ethiopian calendar (%)

Region	Total			
	Cattle	Sheep	Goat	Camel
Afar	38.78	49.32	91.84	15.99
Oromia (Borana)	64.81	26.19	82.8	4.23
Somali region	11.05	52.83	95.42	12.13
SNNPR (South Omo and Bench Maji)	84.92	30.56	81.35	0.00

Table 35. Proportion of households who sold livestock by species and livelihood zones, in 2008 Ethiopian calendar (%)

Region	Pastoral				Agro-pastoral				P-values for mean difference			
	Cattle	Sheep	Goat	Camel	Cattle	Sheep	Goat	Camel	Cattle	Sheep	Goat	Camel
Afar	32.24	59.56	96.72	19.13	49.55	32.43	83.78	10.81	0.003	0.000	0.000	0.059
Oromia (Borana)	67.12	50.68	95.89	6.85	64.26	20.33	79.67	3.61	0.646	0.000	0.001	0.216
Somali region	10.65	52.47	95.44	14.07	12.04	53.7	95.37	7.41	0.698	0.829	0.978	0.074
SNNPR (South Omo and Bench Maji)	91.89	59.46	91.89	0.00	82.02	18.54	76.97	0.00	0.046	0.000	0.006	NA

NA: not available.

Between 4.23% (Borana) and 15.99% (Afar) of households sold camels during the survey period (Table 34). About 12.13% of households sold camels in the Somali region. Clearly the proportion of households who sold camel is significantly higher in the pastoral than in the agro-pastoral areas of Afar and the Somali region, but not in Borana (Table 35).

Apparently, selling goats is much more common than selling cattle, sheep or camel. Between 81.35% (SNNPR) and 95.42% (Somali region) of households sold goats during the survey period. About 82.80% of households in Borana and 91.84% of households in Afar also sold goats. Proportion of households who sold goats are significantly higher in pastoral than in the agro-pastoral areas, except in the Somali region where there is no significant difference (Table 35).

The proportion of households who sold sheep during the survey period ranged from 26.19% (Borana) to 52.83% (Somali region). About 30.56% and 49.32% of households sold sheep in SNNPR and Afar, respectively. The proportion of households who sold sheep during the survey period is significantly higher in pastoral than in the agro-pastoral areas, except in the Somali region, where there does not seem to be significant difference.

The survey collected information on livestock selling behaviour of households by drought and normal years to see if there is difference in household livestock selling behaviour as conditioned by the consequences of drought and shortage of feed and water. Overall, higher proportion of households sold livestock in drought than in normal years (Tables 36 and 37). The Somali region seems to be the exception, where there does not seem to be clear pattern.

Table 36. Proportion of total households who sold livestock by drought and normal years (%)

Region	Total							
	Cattle		Sheep		Goats		Camel	
	Drought	Normal	Drought	Normal	Drought	Normal	Drought	Normal
Afar	39.80	25.26	49.66	36.86	81.97	52.56	16.33	9.56
Oromia (Borana)	74.34	50.00	36.54	27.95	59.73	45.07	6.18	3.64
Somali region	12.67	8.63	49.87	60.92	58.49	73.58	13.21	7.28
SNNPR (South Omo and Bench Maji)	83.73	71.43	34.92	31.75	76.19	70.24	0.00	0.00

The proportions of households who sold cattle during drought period seem to be significantly higher in agro-pastoral than in the pastoral areas in Afar, while the reverse is true in Borana. There is no significant difference in the proportion of households who sold cattle during drought period by livelihood zone in the Somali region and SNNPR (Table 38). During drought year, significantly higher proportions of households sell goats and sheep in pastoral than in agro-pastoral areas in Afar, Borana and SNNPR (Tables 39 and 40). There is no significant difference in the Somali region. It seems that higher proportion of households sold camel during drought in pastoral than in agro-pastoral areas only in Afar, while there is no difference in Borana and the Somali region (Table 41).

Table 37. Proportion of households who sold livestock in drought and normal years by livelihood zone (%)

Region	Pastoral								Agro-pastoral							
	Cattle		Sheep		Goats		Camel		Cattle		Sheep		Goats		Camel	
	Drought	Normal	Drought	Normal	Drought	Normal	Drought	Normal	Drought	Normal	Drought	Normal	Drought	Normal	Drought	Normal
Afar	32.79	23.08	59.56	43.41	89.62	55.49	19.67	13.19	51.35	28.83	33.33	26.13	69.37	47.75	10.81	3.60
Oromia (Borana)	83.56	72.60	60.27	56.16	80.82	73.97	8.33	5.56	72.13	44.59	30.58	20.89	54.64	38.08	5.63	3.16
Somali region	11.79	6.46	50.57	60.84	60.46	74.52	13.69	7.60	14.81	13.89	48.15	61.11	53.70	71.30	12.04	6.48
SNNPR (South Omo and Bench Maji)	87.84	81.08	58.11	55.41	86.49	81.08	0.00	0.00	82.02	67.42	25.28	21.91	71.91	65.73	0.00	0.00

Table 38. Proportion of households who sold cattle in drought and normal years by livelihood zone (%)

Region	Pastoral		Agro-pastoral		P-values for mean difference	
	Drought	Normal	Drought	Normal	Drought	Normal
Afar	32.79	23.08	51.35	28.83	0.002	0.272
Oromia (Borana)	83.56	72.60	72.13	44.59	0.045	0.000
Somali region	11.79	6.46	14.81	13.89	0.426	0.021
SNNPR (South Omo and Bench Maji)	87.84	81.08	82.02	67.42	0.255	0.029

Table 39. Proportion of households who sold sheep in drought and normal years by livelihood zone (%)

Region	Pastoral		Agro-pastoral		P-values for mean difference	
	Drought	Normal	Drought	Normal	Drought	Normal
Afar	59.56	43.41	33.33	26.13	0.000	0.003
Oromia (Borana)	60.27	56.16	30.58	20.89	0.000	0.000
Somali region	50.57	60.84	48.15	61.11	0.672	0.961
SNNPR (South Omo and Bench Maji)	58.11	55.41	25.28	21.91	0.000	0.000

Table 40. Proportion of households who sold goats in drought and normal years by livelihood zone (%)

Region	Pastoral		Agro-pastoral		P-values for mean difference	
	Drought	Normal	Drought	Normal	Drought	Normal
Afar	89.62	55.49	69.37	47.75	0.000	0.198
Oromia (Borana)	80.82	73.97	54.64	38.08	0.000	0.000
Somali region	60.46	74.52	53.7	71.3	0.230	0.522
SNNPR (South Omo and Bench Maji)	86.49	81.08	71.91	65.73	0.013	0.015

Table 41. Proportion of households who sold camels in drought and normal years by livelihood zone (%)

Region	Pastoral		Agro-pastoral		P-values for mean difference	
	Drought	Normal	Drought	Normal	Drought	Normal
Afar	19.67	13.19	10.81	3.60	0.046	0.007
Oromia (Borana)	8.33	5.56	5.63	3.16	0.396	0.332
Somali region	13.69	7.60	12.04	6.48	0.670	0.705
SNNPR (South Omo and Bench Maji)	0.00	0.00	0.00	0.00	NA	NA

NA: not available.

As in drought years, the proportion of households who sold cattle during normal years seems to be higher in pastoral than in the agro-pastoral areas in Borana and SNNPR, while the opposite seems to be the case in Afar and the Somali region. Similar to drought years, higher proportion of households sell camel in pastoral than in agro-pastoral areas during normal years. Similarly, as in drought years, significantly higher proportions of households sell sheep and goats in pastoral than in agro-pastoral areas during normal years. These results clearly show that the differences in selling behaviour of households by livelihood system are not influenced significantly by the condition of the season (drought or normal years).

Comparisons by drought and normal years (ignoring effect of livelihood system) show that, in general, higher proportion of households sell livestock during drought years than during normal years. Exception is observed in the Somali region for sheep and goats, where proportion of households selling is significantly higher in normal years than in drought years.

4.4 Livestock market participation: buyers

Market participation of pastoral and agro-pastoral households as buyers seems to be very low. Between 1.35% (Somali region) and 11.51% (SNNPR) of households reported buying cattle during the survey period (Table 42). About 3.74% of households in Afar and 9.79% of households in Borana also bought cattle during the year. Clearly, significantly higher proportion of households in agro-pastoral than pastoral areas bought cattle, except in the Somali region (Table 43).

Between 2% (Afar) and 4.8% (SNNPR) of households bought goats. There is no significant difference in the proportion of households who bought goats or sheep by livelihood zone. Only between 1.70% (Afar) and 4.58% (Somali region) of households bought sheep during the survey year. It is interesting to note that market participation of households as buyers is higher for cattle than for other species in Afar, Borana and SNNPR, while in the Somali region, market participation as buyer is higher for sheep and goats than for cattle. Only between 0.54% and 1.36% of households bought camel during the year.

Table 42. Proportion of households who bought livestock by species in 2008 Ethiopian calendar (%)

Region	Total			
	Cattle	Sheep	Goats	Camels
Afar	3.74	1.7	2	1.36
Oromia (Borana)	9.79	3.97	3.7	1.32
Somali region	1.35	4.58	4	0.54
SNNPR (South Omo and Bench Maji)	11.51	2.38	4.8	0.00

Table 43. Proportion of households who bought livestock by species and livelihood zones in 2008 Ethiopian calendar (%)

Region	Pastoral				Agro-pastoral				P-values for mean difference			
	Cattle	Sheep	Goat	Camel	Cattle	Sheep	Goat	Camel	Cattle	Sheep	Goat	Camel
Afar	2.19	1.64	1.1	0	6.31	1.8	3.6	3.6	0.071	0.917	0.140	0.010
Oromia (Borana)	0	1.37	2.7	1.37	12.13	4.59	3.9	1.31	0.002	0.205	0.627	0.969
Somali region	0.76	4.56	4.2	0.76	2.78	4.63	3.7	0	0.126	0.978	0.832	0.364
SNNPR (South Omo and Bench Maji)	4.05	4.05	2.7	0	14.61	1.06	5.6	0	0.017	0.608	0.322	NA

NA: not available.

4.5 Household cash income

There does not seem to be significant difference in mean total household cash income across the regions. However, the large standard deviations indicate that there is a wide difference in cash income across households. Total household cash income ranged from ETB23,179 (Somali region) to 25,694 (SNNPR) (Table 44). While there are high numerical differences in average household income by livelihood zone across all regions, there is statistically significant difference only in the Somali region, where pastoralists have higher average household cash income.

Table 44. Average total household cash income (ETB)

Region	Pastoral	Agro-pastoral	P-values for mean difference	Total
	Mean (st. dev.)	Mean (st. dev.)		Mean (st. dev.)
Afar	28,431.60 (86,184.77)	17,949.58 (15,208.75)	0.2056	24,474.10 (68,750.36)
Oromia (Borana)	30,961.67 (82,902.11)	22,779.36 (31,608.35)	0.1738	24,359.54 (46,137.41)
Somali region	25,464.53 (41,343.52)	17,616.01 (18,263.91)	0.0586	23,179.78 (36,325.90)
SNNPR (South Omo and Bench Maji)	25,896.04 (20,514.56)	25,611.00 (23,910.39)	0.9286	25,694.70 (22,925.32)

As would be expected, cash income from the sale of livestock is the most important contributor to household cash income (Table 45). Average cash income from livestock sales ranged from ETB14,436 (Somali region) to ETB18,671 (Afar). Cash income from livestock sales is clearly numerically higher in pastoral than agro-pastoral areas, as would be expected, but there is statistical difference only in Borana (Table 48). In Afar and Borana, livestock sales cash income in pastoral areas is more than twice as much as in the agro-pastoral areas.

The second most important source of cash income varies from region to region. While crop farming is second most important source of cash income in Borana and SNNPR, businesses are second most important source of cash income in the Somali region. In Afar, miscellaneous cash income sources such as PSNP and transfers are second most important source of cash income.

While crop farming is third important cash source in Afar, miscellaneous income (PSNP, transfers) are third important cash source in the Somali region and SNNPR. In Borana, wage employment and businesses stand out as third important cash sources. Livestock product and service sales are the fourth most important sources of cash income in Afar, the Somali region and SNNPR. Wage employment is fifth important source of income in Afar, the Somali region and SNNPR. Interestingly, livestock product and service sales is least important cash sources in Borana, while businesses are least important cash sources in Afar and SNNPR and crop farming is least important source of cash income in the Somali region.

Table 45. Cash income structure of households (ETB)

Region	Total					
	Livestock sales	Livestock products and services	Other on-farm activities (non-livestock)	Wage employment	Business activities	Other income sources
	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)
Afar	18,671.70 (67,281.73)	965.98 (4,764.63)	1,267.13 (4,106.47)	887.38 (3,384.83)	464.83 (2,245.97)	2,217.07 (2,850.74)
Oromia (Borana)	16,305.59 (45,241.64)	959.71 (1,911.12)	3,572.74 (6,961.98)	1,276.31 (5,429.41)	1,235.71 (4,809.65)	1,009.47 (1,590.02)
Somali region	14,436.14 (29,405.58)	1,020.38 (10,760.00)	186.86 (1,318.00)	453.10 (4,238.23)	4,122.27 (11,852.74)	2,961.03 (3,735.62)
SNNPR (South Omo and Bench Maji)	16,253.11 (16,335.44)	2,287.32 (5,541.86)	4,180.74 (7,559.34)	305.40 (2,263.29)	260.52 (1,134.22)	2,407.62 (2,626.82)

The importance of the non-livestock sales cash income sources vary significantly by livelihood zones (Tables 46 and 47). While crop farming is second most important source of cash income in agro-pastoral areas of Afar, Borana and SNNPR, miscellaneous income sources (PSNP, transfers) are second most important sources of cash income in the pastoral areas of these regions. Livestock product and service sales are also more important sources of cash income in pastoral than in agro-pastoral areas. Crop farming income is least important in both the pastoral and agro-pastoral areas of the Somali region. Businesses seem to be important sources of cash income in both the pastoral and agro-pastoral areas of the Somali region and in agro-pastoral areas of Borana. On the other hand, businesses are not important sources of cash income in Afar and SNNPR, both in the pastoral and agro-pastoral areas.

Table 46. Cash income structure in pastoral households (ETB)

Region	Pastoral					
	Livestock sales	Livestock products and services	Other on-farm activities (not livestock)	Wage employment	Business activities	Other income sources
	Mean (st.dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)
Afar	23,363.66 (84,524.15)	1,206.34 (5,488.45)	538.81 (2,962.28)	762.08 (3,531.87)	473.55 (2,274.43)	2,087.16 (2,385.52)
Oromia (Borana)	28,236.30 (83,299.66)	491.78 (711.56)	0.03 (0.23)	917.81 (3,187.45)	164.38 (1,190.40)	1,151.37 (1,653.15)
Somali region	15,951.44 (33,230.11)	1,224.11 (12,713.01)	102.75 (1,383.83)	217.11 (1,722.47)	4,857.12 (13,540.55)	3,112.00 (4,207.73)
SNNPR (South Omo and Bench Maji)	19,119.19 (15,901.70)	2,207.36 (4,423.53)	194.62 (851.73)	0.00 (0.00)	47.30 (406.87)	4,327.57 (2,737.19)

Table 47. Cash income structure in agro-pastoral households (ETB)

Region	Agro-pastoral					
	Livestock sales	Livestock products and services	Other on-farm activities (not livestock)	Wage employment	Business activities	Other income sources
	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)
Afar	10,936.31 (11,840.83)	569.71 (3,220.94)	2,467.88 (5,297.26)	1,093.96 (3,131.97)	450.45 (2,208.41)	2,431.26 (3,486.64)
Oromia (Borana)	13,450.05 (29,198.27)	1,071.70 (2,084.31)	4,427.85 (7,503.96)	1,362.12 (5,840.60)	1,492.13 (5,292.49)	975.51 (1,575.44)
Somali region	10,746.10 (16,334.49)	524.28 (2,063.53)	391.70 (1,121.66)	1,027.78 (7,374.19)	2,332.77 ()5,682.99	2,593.38 (2,170.31)
SNNPR (South Omo and Bench Maji)	15,061.59 (16,409.11)	2,320.56 (5,956.37)	5,837.89 (8,445.73)	432.36 (2,684.94)	349.16 (1,314.96)	1,609.44 (2,124.42)

Table 48. Cash income of livestock sales by livelihoods (ETB)

Region	Pastoral	Agro-pastoral	P-values for mean difference
	Mean (st. dev.)	Mean (st. dev.)	
Afar	23,363.66 (84,524.15)	10,936.31 (11,840.83)	0.1249
Oromia (Borana)	28,236.30 (83,299.66)	13,450.05 (29,198.27)	0.0119
Somali region	15,951.44 (33,230.11)	10,746.10 (16,334.49)	0.1216
SNNPR (South Omo and Bench Maji)	19,119.19 (15,901.70)	15,061.59 (16,409.11)	0.0725

Cash income from the sale of livestock products and services did not show statistical difference by livelihood zone, except in Borana where agro-pastoral households get significantly higher income from the sale of livestock products and services (Table49). Although small in amount, cash income from non-livestock on-farm activities are significantly higher in agro-pastoral areas, perhaps because of cash income from crop sales (Table 50). Pastoral and agro-pastoral households also earn some income from wage employment.

As shown in Table 51, despite sizeable numerical differences, wage income is statistically different between pastoral and agro-pastoral areas only in the Somali region. Business income is significantly higher in agro-pastoral than in pastoral areas, except in Afar where there is no significant difference (Table 52). Another source of cash income to pastoral and agro-pastoral households are transfers, which did not differ significantly between pastoral and agro-pastoral areas in all regions but SNNPR.

Table 49. Cash income of livestock products and services by livelihoods (ETB)

Region	Pastoral	Agro-pastoral	P-values for mean difference
	Mean (st. dev.)	Mean (st. dev.)	
Afar	1,206.34 (5,488.45)	569.71 (3,220.94)	0.2675
Oromia (Borana)	491.78 (711.56)	1,071.70 (2,084.31)	0.0197
Somali region	1,224.11 (12,713.01)	524.28 (2,063.53)	0.5700
SNNPR (South Omo and Bench Maji)	2,207.36 (4,423.53)	2,320.56 (5,956.37)	0.8698

Table 50. Cash income of other on-farm activities (not livestock) by livelihoods (ETB)

Region	Pastoral	Agro-pastoral	P-values for mean difference
	Mean (st.dev.)	Mean (st.dev.)	
Afar	538.81 (2,962.28)	2,467.88 (5,297.26)	0.0001
Oromia (Borana)	0.03 (0.23)	4,427.85 (7,503.96)	0.0000
Somali region	102.75 (1,383.83)	391.70 (1,121.66)	0.0550
SNNPR (South Omo and Bench Maji)	194.62 (851.73)	5,837.89 (8,445.73)	0.0000

Table 51. Cash income of wage employment by livelihoods (ETB)

Region	Pastoral	Agro-pastoral	P-values for mean difference
	Mean (st. dev.)	Mean (st. dev.)	
Afar	762.08 (3,531.87)	1,093.96 (3,131.97)	0.4160
Oromia (Borana)	917.81 (3,187.45)	1,362.12 (5,840.60)	0.5307
Somali region	217.11 (1,722.47)	1,027.78 (7,374.19)	0.0942
SNNPR (South Omo and Bench Maji)	0.00 (0.00)	432.36 (2,684.94)	0.1677

Table 52. Cash income of business activities by livelihoods (ETB)

Region	Pastoral	Agro-pastoral	P-values for mean difference
	Mean (st. dev.)	Mean (st. dev.)	
Afar	473.55 (2,274.43)	450.45 (2,208.41)	0.9320
Oromia (Borana)	164.38 (1,190.40)	1,492.13 (5,292.49)	0.0339
Somali region	4,857.12 (13,540.55)	2,332.77 (5,682.99)	0.0623
SNNPR (South Omo and Bench Maji)	47.30 (406.87)	349.16 (1,314.96)	0.0542

Table 53. Cash income of other income sources by livelihoods (ETB)

Region	Pastoral	Agro-pastoral	P-values for mean difference
	Mean (st. dev.)	Mean (st. dev.)	
Afar	2,087.16 (2,385.52)	2,431.26 (3,486.64)	0.3165
Oromia (Borana)	1,151.37 (1,653.15)	975.51 (1,575.44)	0.3967
Somali region	3,112.00 (4,207.73)	2,593.38 (2,170.31)	0.2249
SNNPR (South Omo and Bench Maji)	4,327.57 (2,737.19)	1,609.44 (2,124.42)	0.0000

4.6 Savings and loans

Our data show that pastoral and agro-pastoral households save and take loans (Table 54). Between 3.23% (Somali region) and 37.7% (SNNPR) of households saved money during the survey period. About 13.61% in Afar and 30.95% in Borana also saved money in the year. In general, the proportion of households who saved money seem to be higher in agro-pastoral than in pastoral areas. Among those who saved money, the average saving amount ranges from ETB6,605 (Borana) to 22,920 (Somali region). The average saving amount is higher in pastoral areas than in the agro-pastoral areas of Borana and the Somali region, while the reverse seems to be the case in SNNPR. No significant difference was observed in amount of saving between pastoral and agro-pastoral areas of Afar.

Table 54. Saving behaviour of households (% of households who saved)

Region	Saving behaviour of households								
	Pastoral			Agro-pastoral			Total		
	Proportion that saved (%)	Mean (st. dev.)	Mode	Proportion that saved (%)	Mean (st. dev.)	Mode	Proportion that saved (%)	Mean (st. dev.)	Mode
Afar	10.38	10,763.16 (7,204.10)	5,000	18.9	11,728.57 (8,067.04)	10,000	13.61	11,270.00 (7,587.14)	10,000
Oromia (Borana)	27.40	11,665.00 (23,721.32)	2,000	31.8	5,562.85 (9,957.05)	500	30.95	6,605.95 (13,399.19)	500
Somali region	3.04	28,355.00 (36,733.24)	340	3.7	12,050.00 (18,790.33)	200	3.23	22,920.00 (31,928.17)	200
SNNPR (South Omo and Bench Maji)	33.78	6,572.00 (3,874.65)	8,000	39.3	10,320.07 (13,612.12)	3,000	37.70	9,333.74 (11,941.38)	3,000
Total	12.1	11,513.06 (18,508.40)	5,000	27.4	8,106.78 (11,660.96)	10,000	20.39	9,035.76 (13,911.89)	10,000

Table 55. Saving behaviour of households (mean saved, ETB)

Region	Pastoral	Agro-pastoral	P-values for mean difference
	Mean (st. dev.)	Mean (st. dev.)	
Afar	10,763.16 (7,204.10)	11,728.57 (8,067.04)	0.6932
Oromia (Borana)	11,665.00 (23,721.32)	5,562.85 (9,957.05)	0.0634
Somali region	28,355.00 (36,733.24)	12,050.00 (18,790.33)	0.4305
SNNPR (South Omo and Bench Maji)	6,572.00 (3,874.65)	10,320.07 (13,612.12)	0.1793

Our data suggest that while various ways of savings are used, most saving is made at home, except in Borana. About 82.5% of savers in Afar, 75% of savers in the Somali region and 73.68% of savers in SNNPR reported saving at home. Only about 21.37% of savers in Borana saved at home. Use of savings and credit groups to save money is very low in Afar (only 2.5% of savers used it) and the Somali region (only 8.33% of savers used it).

More than a quarter of the savers in Borana used saving and credit groups, while about 19% of savers in SNNPR used this means. The use of saving and credit associations/cooperatives is very low in Afar and the Somali region. While only 2.44% of savers used this means in Afar, none used it in the Somali region. Saving and credit associations/cooperatives are important in Borana, where about 36.75% of savers reported using it, followed by 13.68% of savers using it in SNNPR. Interestingly, banks seem to be important as means of saving in the pastoral and agro-pastoral communities. About 85% of savers in Afar saved in banks. Between 16.67% and 30.77% of savers also used banks in the Somali region, Borana and SNNPR.

Our data also suggest that the pastoral and agro-pastoral communities take loans for various reasons (Table 56). Between 14.63% (Afar) and 66.31% (Somali region) of households took loans during the survey period. About 17.72% of households in Borana and 18.65% of households in SNNPR also took loans during the year. In general, the proportion of households who took loans seems to be higher in pastoral than in agro-pastoral areas of Afar, Borana and SNNPR, while no significant difference was observed in the Somali region. Among those who took loans, the average amount of loan taken is small ranging from ETB2,359 (SNNPR) to 9,016 (Borana).

Table 56. Borrowing behaviour of households (% of households who borrowed)

Region	Livelihood type					
	Pastoral		Agro-pastoral		Total	
	Proportion who took loans (%)	Mean (st. dev.) ETB	Proportion who took loans (%)	Mean (st. dev.) ETB	Proportion who took loans (%)	Mean (st. dev.) ETB
Afar	16.39	1,623 (3,085)	11.71	11,746 (11,923)	14.63	4,684 (8,325)
Oromia (Borana)	19.18	26,871 (78,832)	17.38	4,300 (3,894)	17.72	9,016 (36,353)
Somali	66.16	8,076 (10,021)	66.67	4,960 (4687)	66.31	7,164 (8,905)
SNNPR (South Omo and Bench Maji)	24.32	1,700 (870)	16.29	2,769 (2,770)	18.65	2,360 (2,286)
Total	39.80	7,884 (21,175)	23.79	4,898 (5,504)	31.12	6,647 (16,637)

Table 57. Borrowing behaviour of households (mean borrowed), ETB

Region	Pastoral	Agro-pastoral	P-values for mean difference
	Mean (st. dev.)	Mean (st. dev.)	
Afar	1,623 (3,085)	11,746 (11,923)	0.0001
Oromia (Borana)	26,871 (78,832)	4,300 (3,894)	0.0378
Somali region	8,076 (10,021)	4,960 (4,687)	0.0122
SNNPR (South Omo and Bench Maji)	1,700 (870)	2,769 (2,770)	0.1203

Small proportion of households also gave out loans during the year. Between 3.57% (SNNPR) and 10.51% (Somali region) of households gave out loans in the year. The amount of loans given out by households was also very small ranging from ETB1,166 (SNNPR) to 4,951 (Somali region).

5. Animal health, diseases and animal health services

5.1. Livestock mortality

Since it was nearly impossible to get reliable estimates of population for more than one year, a variable representing the best estimate of the susceptible population during the year was calculated and used to compare mortality rates between regions and production systems. The number of susceptible animals was calculated by the number of animals available at the time of interview, plus the animals sold and animals died during the year to account for exit. Although certain bias might have been introduced, it was the best approximation possible and considers the animals born and bought during the year.

Figure 1 illustrates the variations in mortality across production systems and regions, with highest mortalities seen in Afar for most species in both pastoralist and agro-pastoralist production systems. Details on herd-level mortality rates for different livestock categories are shown in Table 58. Figure 2 shows differences at *woreda* level.

Figure 1. Livestock mortality rates by species and livelihood zones.

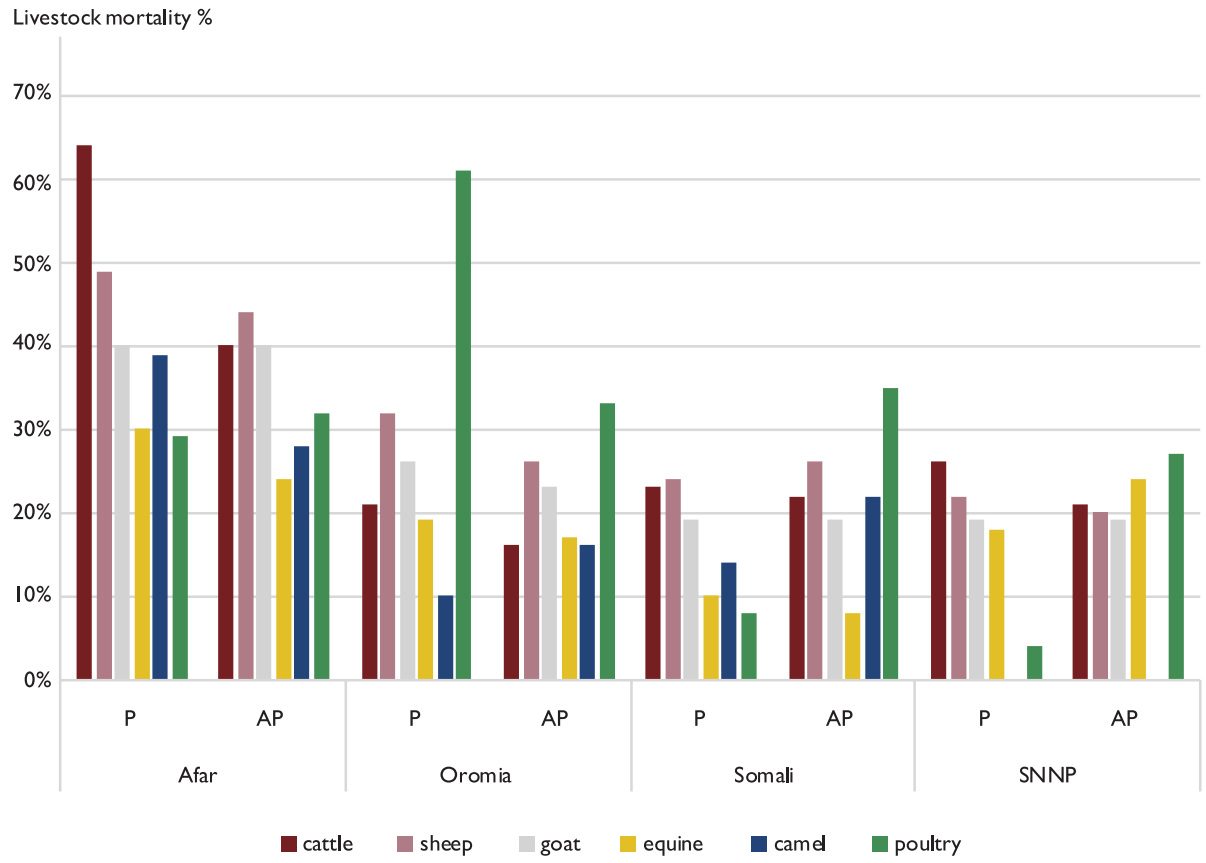
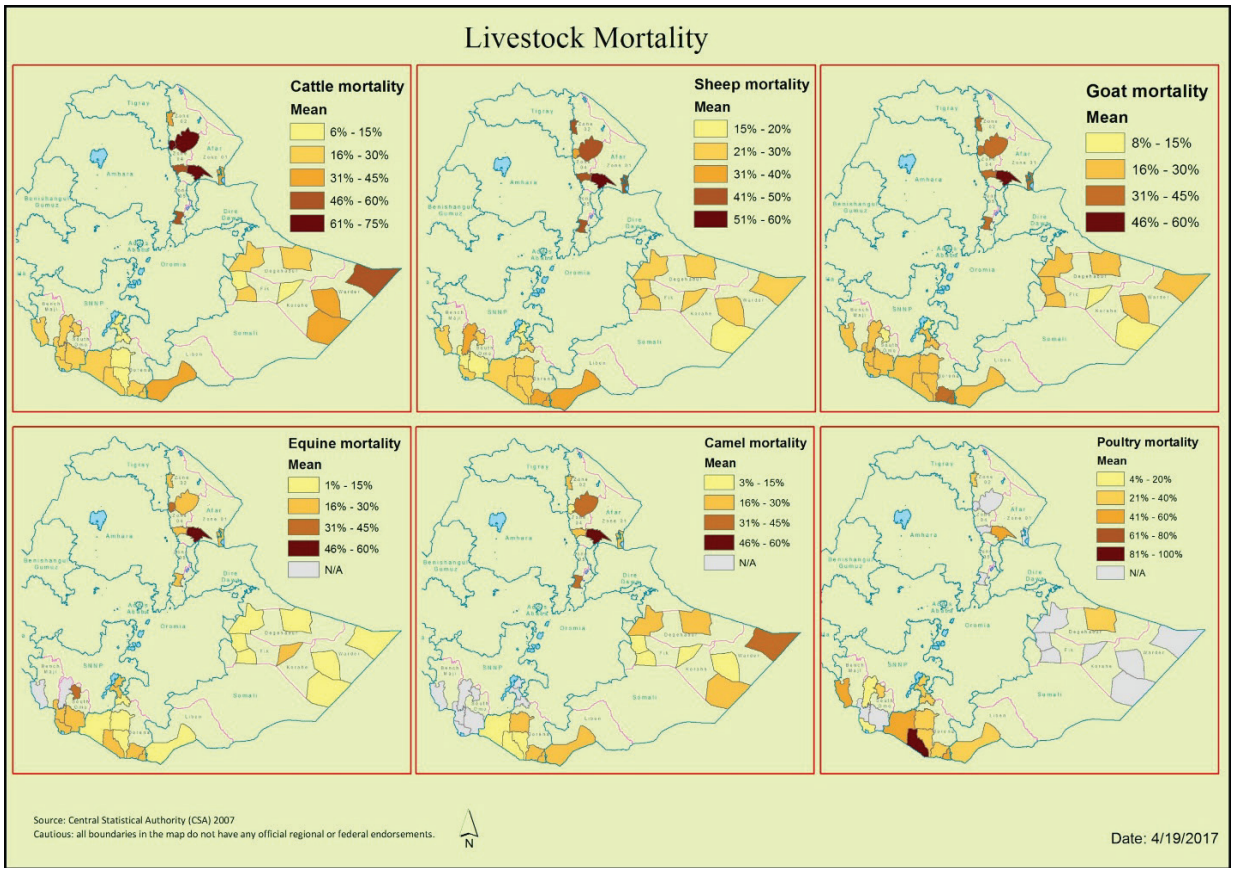


Table 58. Details of mortality estimates (based on current population size, corrected for sold and died animals) (%) (2008 Ethiopian calendar)

Livestock category	Afar Mean	Oromia (Borana) Mean	Somali region Mean	SNNPR Mean
Oxen/bulls	49	17	31	25
Local cows	50	15	21	22
Crossbred cows	81	5	NA	15
Local calves/heifers	52	17	11	17
Crossbred calves/heifers	NA	7	58	60
Sheep female > 1 year	45	25	22	20
Lambs < 1 year	41	29	18	11
Goats male > 1 year	43	22	20	21
Goats female > 1 year	37	22	17	18
Kids < 1 year	35	24	17	13
Donkeys	28	17	9	16
Horses	NA	17	17	NA
Mules	NA	9	33	81
Young camels < 1 year	41	16	11	NA
Adult camels > 1 year	32	13	15	NA
Poultry	31	35	23	25
Beehives	25	11	33	1

Figure 2. Map of mortality rates in different livestock species per *woreda*.



Young stock mortality and milk yield are important productivity indicators. High calf mortalities above 50% were reported in five *woredas*: three in Afar and two in the Somali region. Milk yield per day were low in dry and wet seasons in all regions. Milk yields ranges from as low as 0.15 litre/day to just about 1 litre/day (Table 59).

Table 59. Productivity indicators of cattle per *woreda* (%)

Region	*Woreda*	Calf mortality	Milk yield dry season (litre/day)	Milk yield wet season (litre/day)	Goat kid mortality	Lamb mortality
		Mean	Mean	Mean	Mean	Mean
Afar	Afambo	37.4	0.82	1.89	47.7	27.0
	Abala	30.6	0.67	2.02	41.7	25.0
	Teru	63.0	0.39	1.27	37.3	0.0
	Yallo	75.0	0.34	0.95	35.4	3.5
	Semurobi Gelalo	75.0	0.63	1.71	24.5	19.4
	Mille	47.1	0.68	1.25	42.4	12.4
	Chifera	34.6	0.59	1.51	24.7	14.3
Oromia (Borana)	Dilo	22.5	0.27	1.41	33.8	22.5
	Dire	7.0	0.25	1.48	23.9	17.6
	Teltele	17.1	0.59	1.57	17.4	24.8
	Moyale	18.7	0.25	1.36	28.5	25.4
	Yabello	9.3	0.31	1.45	13.5	14.3
	Miyo	19.4	0.21	1.46	20.6	14.7
	Bule Hora	16.5	0.57	1.61	19.5	19.0
	Abaya	7.3	0.76	1.90	9.1	0.0
	Gelana	13.6	0.71	1.94	9.0	0.0
Somali region	Moyale	18.5	0.43	0.95	19.2	11.2
	Shilabo	30.5	0.05	0.10	9.1	0.7
	Shekosh	6.7	0.84	1.81	17.0	5.0
	Aware	50.0	0.15	0.28	27.0	0.0
	Warder	0.0	0.20	0.38	21.9	0.9
	Dhuxun	7.4	0.56	1.10	9.4	2.6
	Hamero	3.6	0.40	0.57	14.0	2.0
	Boh	100.0	0.15	0.34	20.6	0.0
	Fik	14.3	0.42	0.76	21.1	0.0
SNNPR (South Omo and Bench Maji)	Dasenech	22.1	0.76	1.56	20.8	16.9
	Niyangatom	19.3	0.80	1.69	13.5	9.5
	Hammer	9.5	0.83	1.65	14.3	9.4
	Surma	11.7	0.94	1.70	10.6	31.7
	South Ari	17.2	0.73	1.25	13.9	4.2
	Selamago	15.3	1.04	1.85	13.6	NA

Mortality and diseases in cattle

Diseases and starvation were reported most frequently as the most important causes for livestock death (Figure 3). There was, however, a significant difference between production systems, with starvation being more important in pastoral areas and disease responsible for the majority of mortality in agro-pastoral areas. This was true for all species. In cattle, marked differences were noted between regions (Figure 3).

The survey results clearly show that in areas less frequently affected by drought, disease is the most important mortality reason. Natural reasons of death, such as old age or predators were largely uncommon. To investigate disease priorities, which could be related to mortality or loss in productivity, respondents were asked to name up to three key diseases. In total 1,559 responses were received. Either the disease name was recorded or if disease was unclear, the clinical sign was reported. The diseases and/or clinical signs were assigned to disease categories; however, none of these reports were based on laboratory confirmation but reflect the perception of the livestock producers.

It clearly emerged that respiratory and 'systemic diseases'[4] were considered most important, followed by skin diseases (Table 60). Pasteurellosis and CBPP were classified under respiratory diseases. Skin diseases comprise LSD and dermatorphilosis. There were marked regional differences. For example, in Afar, respiratory diseases were hugely important with 53% of households ranking them among the top three diseases, whereas in SNNPR systemic diseases were the most important.

4. The category 'systemic diseases' summarized conditions such as FMD, anthrax, black leg and trypanosomiasis.

Figure 3. Reasons of livestock deaths by region.

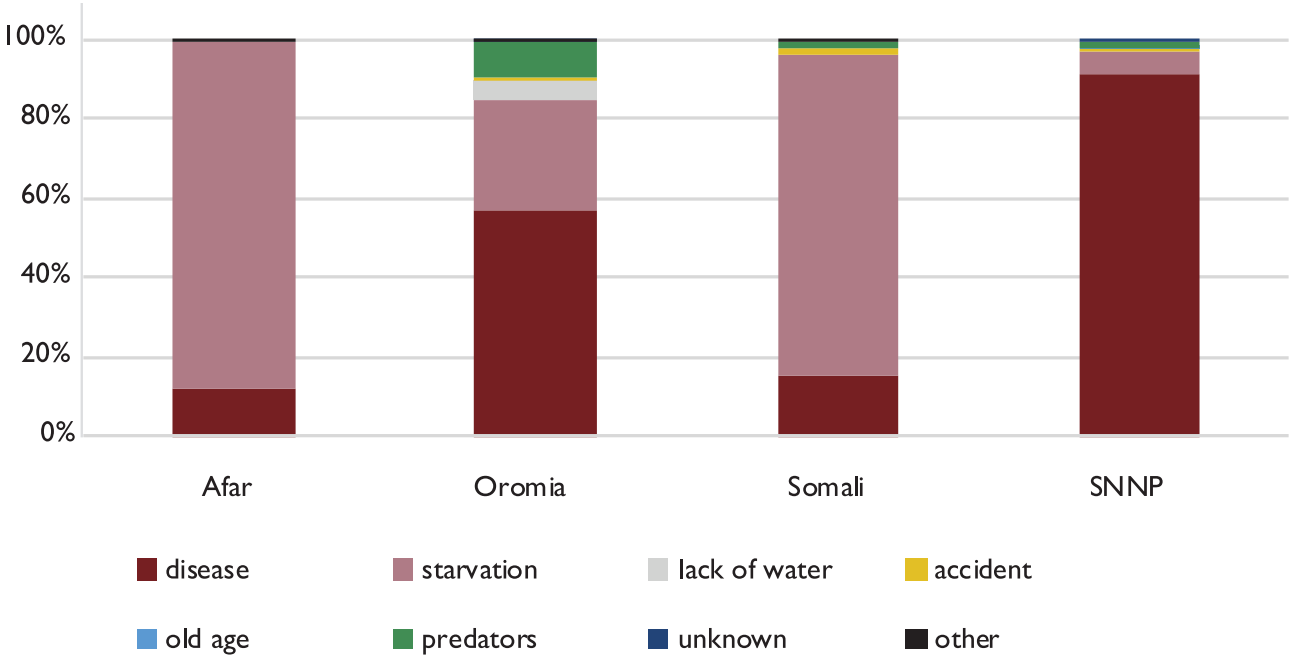


Table 60. Priority disease categories in cattle per region (%) of households interviewed reporting disease categories, up to three diseases per household)

Disease category	Oromia (Borana)	Somali region	SNNPR (South Omo and Bench Maji)	Afar	Total
Number of households interviewed	294	378	371	252	1,295
Respiratory disease (%)	72	11	24	53	37
Neurological disease (%)	4	1	0	3	2
Skin disease (%)	56	5	9	28	22
GIT* parasite (%)	30	0	9	3	10
External parasite (%)	7	4	6	13	7
Systemic disease (%)	78	2	80	2	42
Others (%)	0	0	0	1	0

*GIT: gastro-intestinal tract

The most common diseases in cattle were CBPP (281 households), followed by LSD (190 households) and FMD and trypanosomiasis (140 households), which is in line with diseases prioritized at national level. Disease priorities in SNNPR differed from other regions with anthrax being the most often referred, followed by blackleg and CBPP, in both pastoralist and agro-pastoralist systems. Much less diseases were mentioned in Afar and Somali regions, probably reflecting the fact that starvation was a much more important problem in the past 12 months.

The disease priorities affected the herds in different ways (Figure 4). The lowest proportions of animals affected within a herd were reported in Oromia with 82.7% of disease priorities affecting 0–15% of the herd. These proportions were considerably higher in the other regions, where more households reported that 16–50% or 51–75% of their cattle herd was affected.

Three cattle diseases were of particular interest for RPLRP: FMD, CBPP and LSD. Either households mentioned them among the top three disease priorities or they were prompted to provide details if they had the disease and how it affected their households.

Figure 4. Proportion of cattle herd affected by priority diseases.

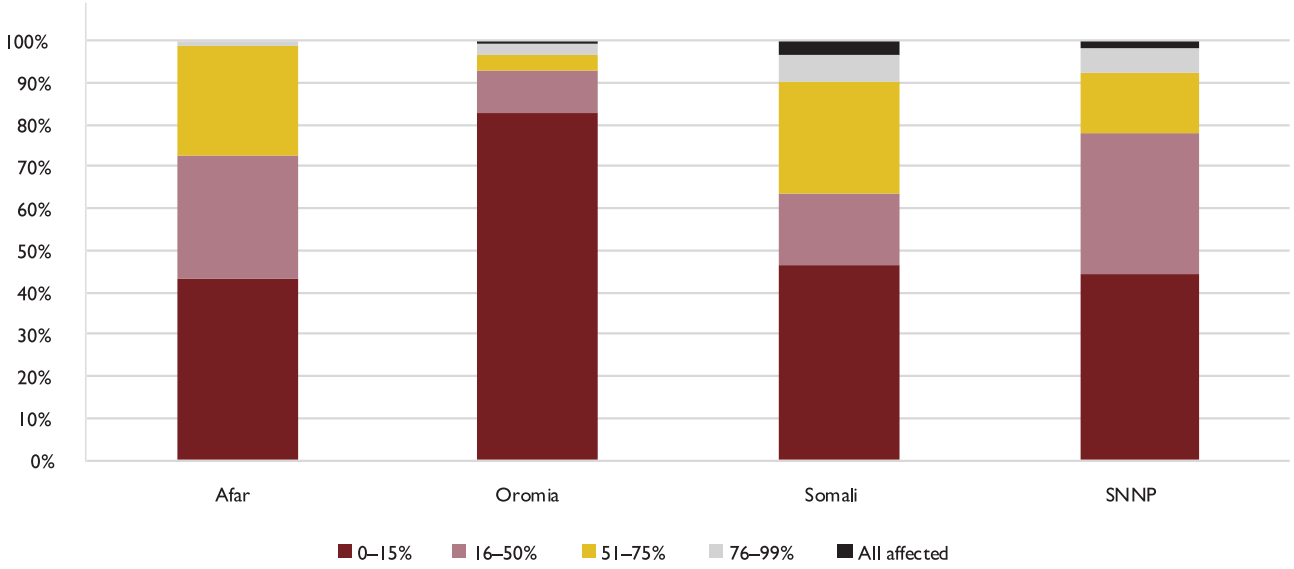
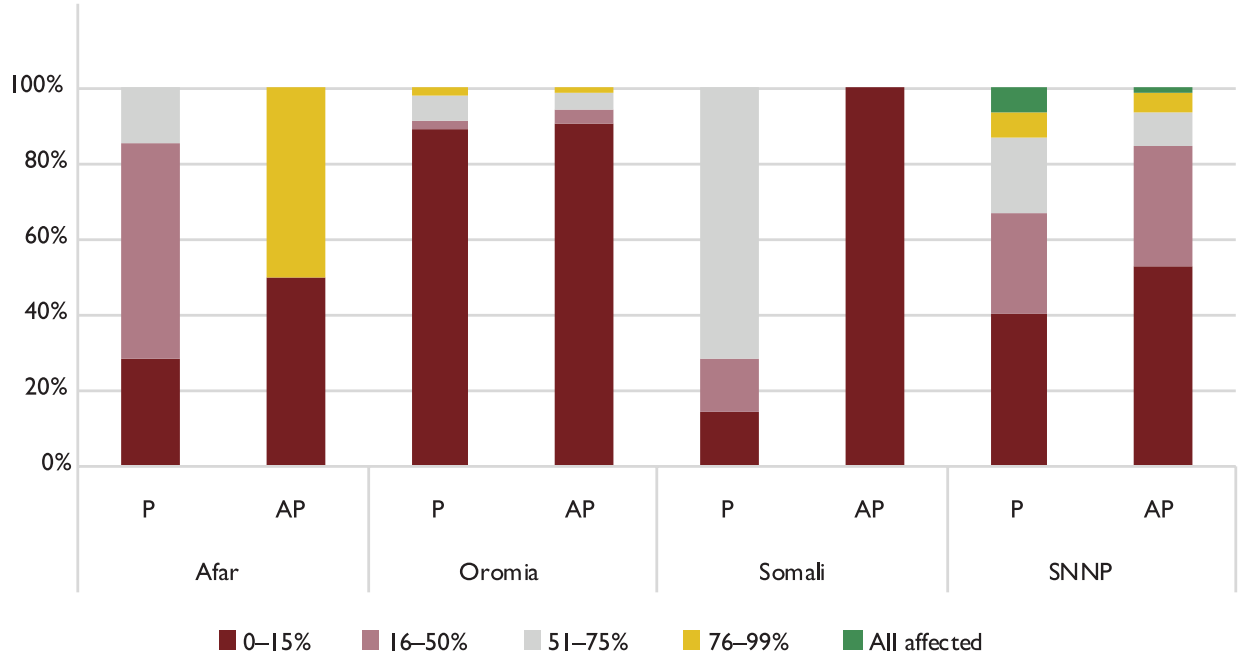


Figure 5. Proportion of cattle affected by FMD.

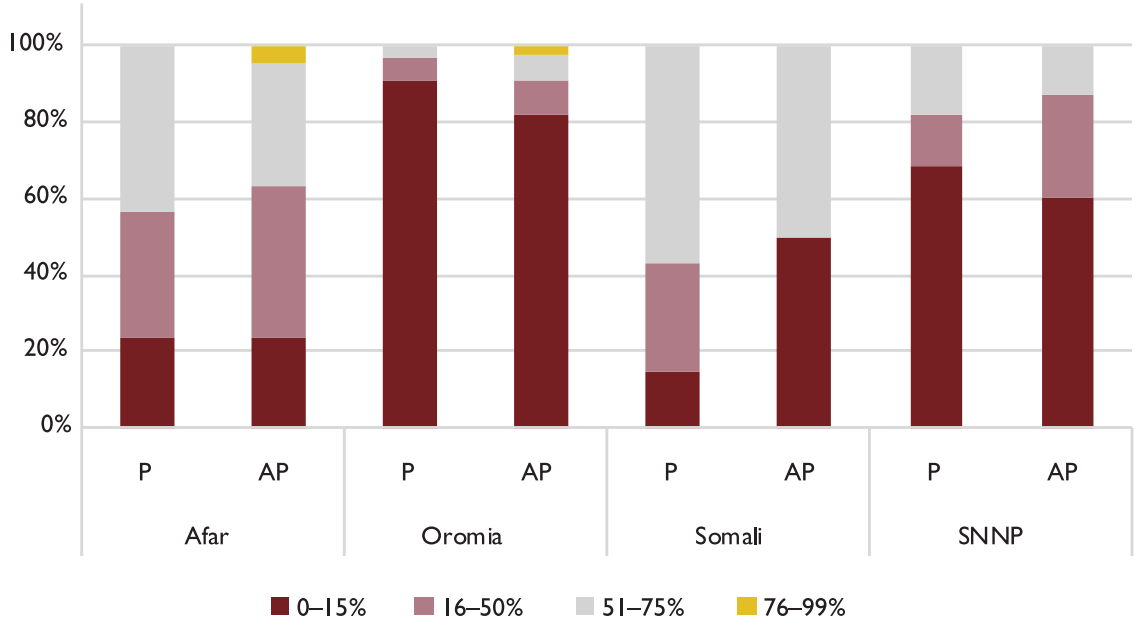


Of the 1,295 interviewed households, 23% (302 households) reported to have experienced FMD during the previous 12 months, with significant differences between regions. In total, 563 cattle were suspected to have died of FMD.

In Afar and Somali regions, FMD affected only 1–4% of households, whereas in Oromia and SNNP regions, 39–63% of households were affected (Figure 5). About 70% of affected households reported that less than 15% of their livestock was affected.

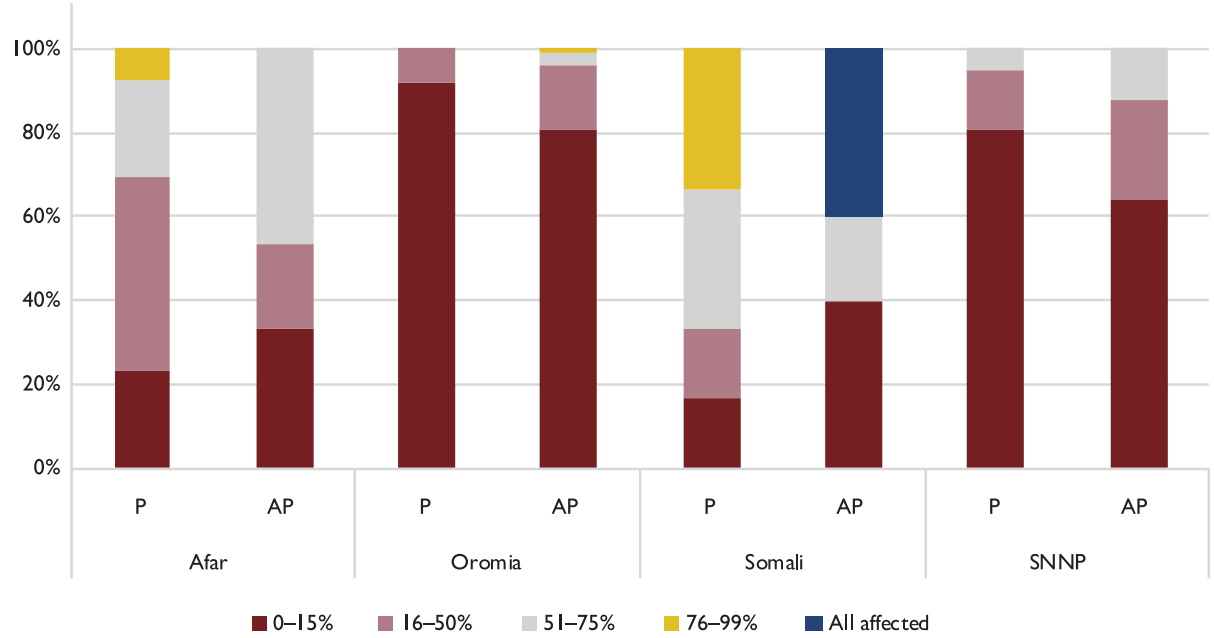
Similarly, CBPP affected 24% (313) of households, although the severity was higher compared to FMD. It was estimated that among households interviewed, CBPP was responsible for 784 cattle deaths. Affected households experienced higher impact of the disease in Afar and Somali regions.

Figure 6. Proportion of cattle affected by CBPP.



The prevalence of households reporting CBPP ranged between 37–45% in Afar, Oromia and SNNPR (Figure 6). Only in the Somali region, the prevalence was much lower with 3% of pastoralist and 4% of agro-pastoralist households confirming having been affected by CBPP (Figure 6).

Figure 7. Proportion affected by LSD.



LSD was reported by 25% of households that led to 596 animal deaths. Similar to FMD and CBPP, households in Afar and Somali region reported higher proportion of cattle affected.

However, more households were affected in SNNPR (55% and 42% of pastoralist and agro-pastoralist households, respectively) and Borana (33% and 41% of pastoralist and agro-pastoralist households, respectively) (Figure 7). Fourteen per cent reported LSD in Afar, whereas 2% of pastoralist and 5% of agro-pastoralists households reported LSD in the Somali region.

To identify knowledge gaps of livestock keepers on these diseases and identify possible bottlenecks in service provision, each household indicated three common actions taken in response to a disease outbreak. For FMD the most common response differed between regions. Findings highlight the use of traditional treatment approaches and a relatively low involvement of veterinary services and low vaccination rates in response to an outbreak. Interestingly, culling infected animals was the only option mentioned in the Somali region (Table 61).

Table 61. Response to FMD outbreaks (% of FMD affected households reporting specific actions, up to three actions per household)

	Afar		Oromia (Borana)		Somali region		SNNPR (South Omo and Bench Maji)		Total
	P	AP	P	AP	P	AP	P	AP	
Number of households affected by FMD	7	2	46	120	7	1	30	89	302
Sell animals (%)	0.0	0.0	28.3	25.0	0.0	0.0	26.7	3.4	17.9
Traditional treatment (%)	57.1	50.0	52.2	54.2	0.0	0.0	13.3	22.5	39.1
Consult traditional healer (%)	42.9	50.0	15.2	11.7	0.0	0.0	33.3	7.9	13.9
Call CAHW* (%)	14.3	50.0	10.9	15.0	0.0	0.0	16.7	18.0	15.2
Call government veterinarian (%)	28.6	0.0	8.7	12.5	0.0	0.0	0.0	11.2	10.3
Buy drugs and administer myself (%)	57.1	50.0	39.1	44.2	0.0	0.0	56.7	50.6	45.7
Vaccinate (%)	0.0	0.0	26.1	15.8	0.0	0.0	10.0	39.3	22.8
Discuss with neighbours (%)	0.0	0.0	32.6	10.8	0.0	0.0	23.3	23.6	18.5
Cull/destroy infected animals (%)	14.3	0.0	19.6	12.5	100.0	100.0	36.7	21.3	20.9
Nothing (%)	14.3	0.0	26.1	33.3	0.0	0.0	40.0	27.0	29.5
Other (%)	0.0	0.0	2.2	12.5	0.0	0.0	0.0	0.0	5.3

P: pastoral; AP: agro-pastoral

*CAHW = community animal health workers

For CBPP vaccination was more common, but again involving veterinary services in any form was rare compared to other responses. Also noteworthy is the fact that in response to CBPP, 35% of households mentioned not to take any action at all (Table 62).

Table 62. Response to CBPP outbreaks (% of CBPP affected households reporting actions, up to three actions per household)

	Afar		Oromia (Borana)		Somali region		SNNPR (South Omo and Bench Maji)		Total
	P	AP	P	AP	P	AP	P	AP	
Number of households with CBPP	51	46	33	102	7	4	22	48	313
Sell animals (%)	10	2	33	23	0	0	0	0	9
Traditional treatment (%)	76	41	42	30	0	0	5	13	35
Consult traditional healer (%)	22	24	9	9	0	0	0	8	12
Call CAHW* (%)	4	17	0	11	0	0	41	15	12
Call government veterinarian (%)	8	33	30	31	0	0	0	10	21
Call private veterinarian (%)	2	0	3	3	0	0	5	6	3
Buy drugs and administer myself (%)	55	37	70	56	86	50	68	46	54
Discuss with neighbours (%)	4	4	15	13	0	0	86	65	23
Cull/destroy infected animals (%)	0	0	6	3	0	0	23	21	6
Nothing (%)	67	33	12	23	71	75	18	42	35
Other (%)	0	0	0	0	0	0	9	0	1

P: pastoral; AP: agro-pastoral

*CAHW = community animal health workers

For LSD, self-administered drugs stand out as most frequent action, followed by calling CAHW, selling animals and traditional treatment (Table 63). Traditional treatments were more important in Afar and SNNPR.

Table 63. Response to LSD outbreaks (% of LSD affected households reporting actions, up to three responses per household)

	Afar		Oromia (Borana)		Somali region		SNNPR (South Omo and Bench Maji)		Total
	P	AP	P	AP	P	AP	P	AP	
Households affected by LSD	26	15	24	126	6	5	41	75	318
Sell animals (%)	4	0	46	39	0	0	15	4	22
Traditional treatment (%)	42	40	17	15	17	0	22	28	22
Consult traditional healer (%)	35	33	13	10	17	40	29	24	19
Call CAHW* (%)	27	20	29	41	0	0	15	5	25
Call government veterinarian (%)	19	33	25	27	0	0	2	11	19
Call private veterinarian (%)	23	7	4	6	0	0	5	21	11%
Buy drugs and administer myself (%)	46	53	50	51	0	40	39	53	48
Cull/destroy infected animals (%)	0	7	4	4	67	20	39	11	11
Nothing (%)	35	33	13	17	33	20	22	27	22
Other (%)	0	0	0	0	0	0	0	0	0

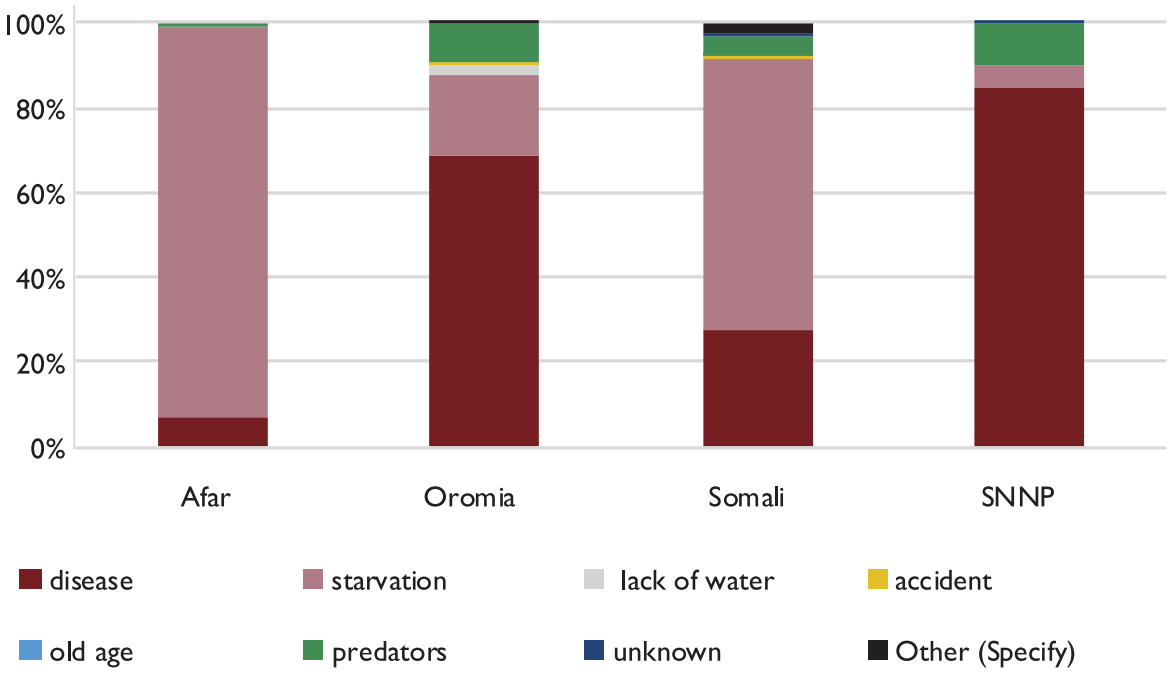
P: pastoral; AP: agro-pastoral

*CAHW: community animal health workers

Mortality and disease in sheep

In sheep, marked differences were observed between regions as causes of death. Disease was the most important cause of death in Oromia and SNNPR with 69% and 84% reporting, respectively, while starvation was the most important cause of death in Afar and the Somali region (Figure 8).

Figure 8. Causes of sheep deaths.



To investigate disease priorities, which could be related to mortality or loss in productivity, respondents were asked to name three key diseases. In total 924 responses were obtained, with all responding households only indicating one disease. Either the disease name was recorded or if disease was unclear, the clinical sign. The diseases and/or clinical signs were assigned to disease categories (Table 64).

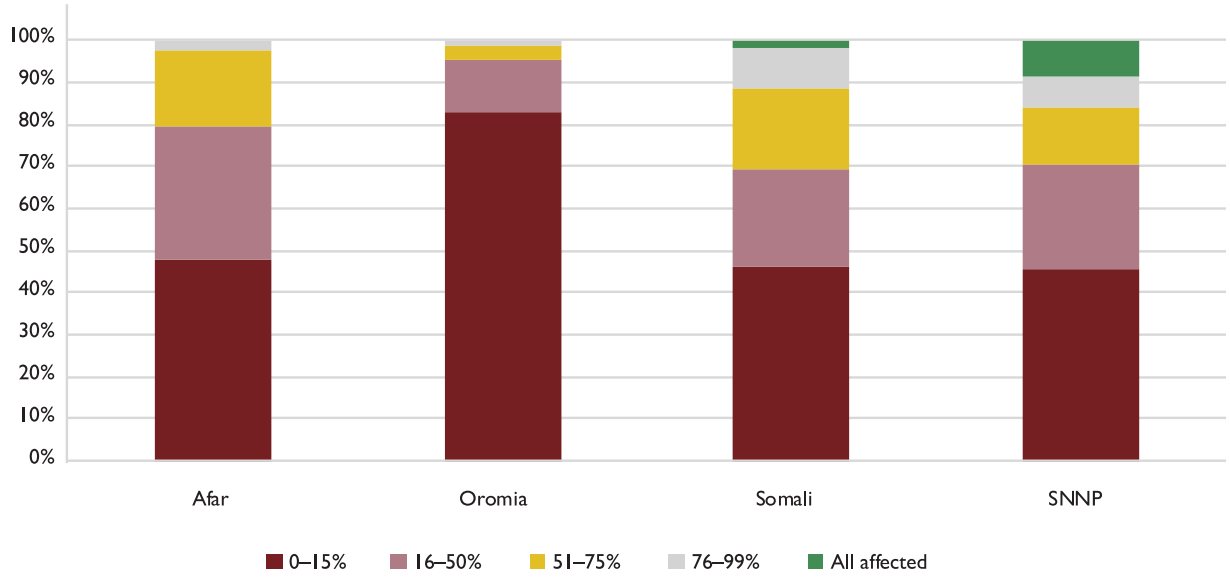
Table 64. Priority disease categories in sheep per region (% of households reporting disease category, up to three diseases mentioned per household)

	Afar	Oromia (Borana)	Somali region	SNNPR (South Omo and Bench Maji)	Total
Number of households interviewed	294	378	371	252	1,295
Respiratory disease (%)	28	40	27	21	30
Neurological disease (%)	6	28	3	7	12
Skin disease (%)	16	12	8	7	11
GIT parasite (%)	3	13	1	21	9
External parasite (%)	12	1	11	4	7
Systemic disease (%)	1	1	8	0	3
Others (%)	1	0	0	0	0

Respiratory diseases were reported as the top priority in all regions. In Afar and Oromia, most households described the disease seen as CCPP, whereas in the Somali and SNNP regions, the priorities diseases were mainly given as clinical signs. In Afar, also of high importance were sheep and goat pox and external parasites, especially ticks. In Oromia, coenuruses, classified as a neurological disease, was of importance, while in SNNPR, liver fluke, categorized in GIT parasites, obtained high scores. These results highlight the importance the livestock keepers give to endemic production diseases, which may not necessarily be in line with national priorities since these production diseases do not affect trade. However, for livestock keepers they are significant production constraints.

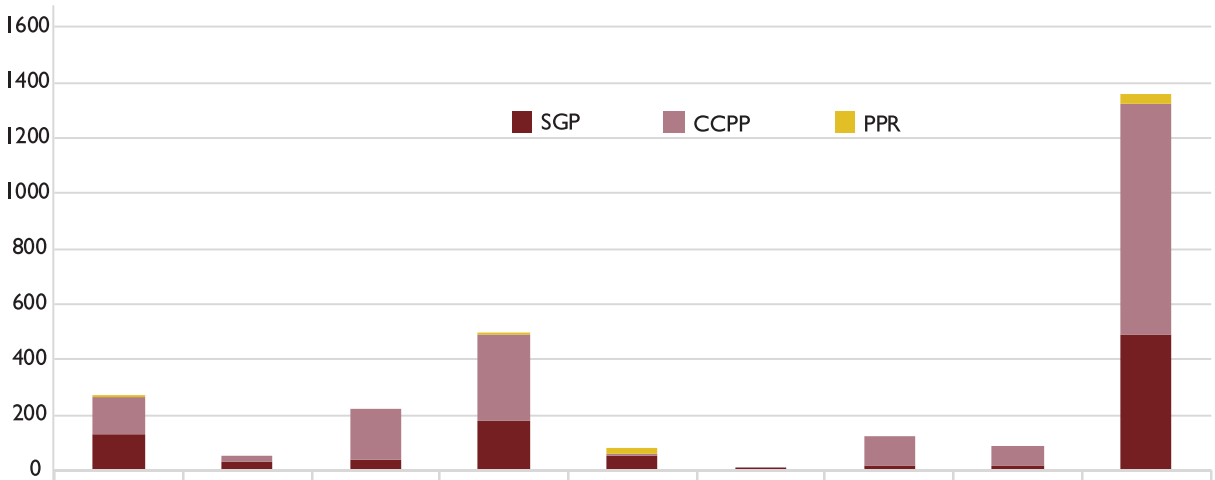
Interesting to note is the reported proportion of the sheep flock affected by diseases. Figure 9 shows that overall the distribution of proportions affected are similar across regions, with the exception of Oromia, where for more than 80% of households, 0–15% of the flock was affected by the priority disease. Within the regions, no distinct differences between production systems was noted.

Figure 9. Proportion of sheep flock affected by priority diseases.



Three sheep diseases were of particular interest for RPLRP: PPR, CCPP and sheep and goat pox (SGP). Households either mentioned them among the top three priority diseases or they were prompted to provide details as to how their households had been impacted if they had been affected the disease. Of the three diseases, CCPP was the most commonly reported (Figure 10), which is surprising, given that CCPP often is subclinical in sheep. It might thus be that some of these cases were due to other pathogens, such as pasteurella. But the results nevertheless show the significant importance of respiratory diseases and the need to be able to diagnose these correctly.

Figure 10. Number of death in sheep attributed to SGP, CCPP and PPR.

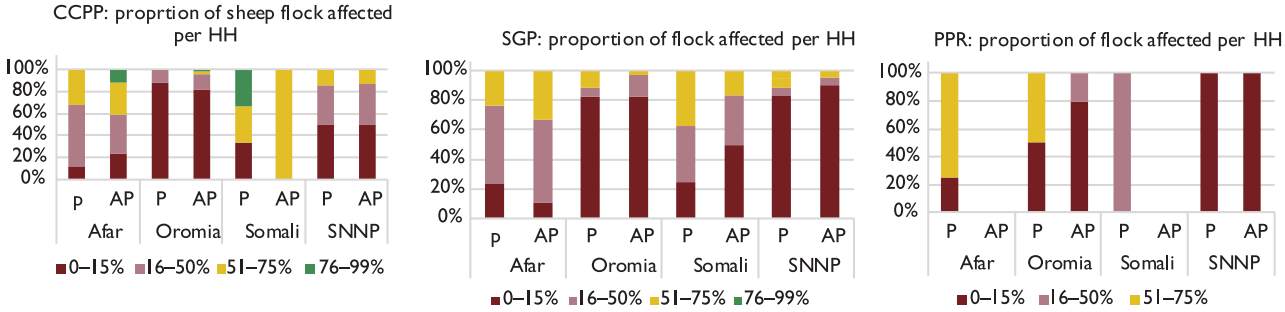


	P	AP	P	AP	P	AP	P	AP	
	Afar		Oromia		Somali		SNNP		Total
PPR	6		0	5	20		0	0	31
CCPP	135	22	178	313	7	0	106	74	835
SGP	133	35	43	180	55	11	16	17	490

Of the 1,295 households interviewed, 229 households (17.7%) reported to have experienced CCPP during the previous 12 months, with significant differences between regions. In total 835 sheep were suspected to have died of CCPP, most of them in Oromia. The Somali region, where there is also a large sheep population, however, attributed no death to CCPP, which may indicate better knowledge of diseases.

SGP was reported by 179 households (13.8%) and has caused 490 deaths of sheep, with cases reported in all regions. PPR, however, was reported only by 30 households (2.3%) and was linked to few deaths of sheep only, with 20 cases in the Somali region and 5 and 6 in Oromia and Afar, respectively. Proportion of sheep flock affected varied between regions as illustrated in Figure 11.

Figure 11. Proportion of sheep flock affected by CCPP, SGP and PPR.



To identify knowledge gaps of livestock keepers on these diseases and identify possible bottlenecks in service provision, each household indicated up to three common actions in response to a disease outbreak. Table 65 shows results for CCPP. For CCPP most reported response was buying modern drugs, followed by traditional treatment and vaccination. It is noteworthy that about 44% of respondents reported doing nothing.

Table 65. Outbreak response to CCPP in sheep (% of CCPP affected households reporting specific actions in response to CCPP outbreaks, up to three actions per household)

	Afar		Oromia (Borana)		Somali region		SNNPR (South Omo and Bench Maji)		Total
	P	AP	P	AP	P	AP	P	AP	
Number of households reporting CCPP* in sheep	43	17	44	91	3	1	14	16	229
Sell animals (%)	14	0	45	34	33	0	43	0	28
Traditional treatment (%)	84	82	30	35	0	0	0	0	41
Call CAHW** (%)	21	18	30	32	0	0	79	31	31
Call government veterinarian (%)	7	24	30	32	0	0	0	6	22
Call private veterinarian (%)	0	0	0	0	0	0	0	6	0
Buy modern drugs (%)	63	53	59	63	67	100	79	69	63
Vaccinate (%)	19	18	59	46	33	0	14	44	39
Discuss with neighbours (%)	7	0	11	10	0	0	21	69	14
Cull/destroy infected animals (%)	0	0	0	0	0	0	21	0	1
Nothing (%)	67	76	23	31	100	100	36	75	44
Other (%)	0	0	5	7	67	100	7	0	5

P: pastoral; AP: agro-pastoral

*CCPP: contagious caprine pleuropneumonia

**CAHW: community animal health worker

Outbreak responses to SGP are similar to that of CCPP. Most reported response was buying modern drugs, followed by traditional treatment and vaccination (Table 66). It is interesting to note that 43% of households interviewed reported doing nothing to the outbreak.

Table 66. Outbreak response to SGP in sheep (% of SGP affected households reporting specific actions in response to SGP outbreaks, up to three actions per household)

	Afar		Oromia (Borana)		Somali region		SNNPR (South Omo and Bench Maji)		Total
	P	AP	P	AP	P	AP	P	AP	
Number of households reporting SGP*	25	9	17	74	8	6	18	21	178
Sell animals (%)	20	11	47	50	0	0	0	0	29
Traditional treatment (%)	68	56	59	50	25	0	28	10	44
Consult traditional healer (%)	64	78	12	1	0	0	0	14	16
Call CAHW** (%)	36	22	41	36	13	0	28	43	34
Call government veterinarian (%)	4	11	0	19	0	17	0	10	11
Call private veterinarian (%)	8	0	0	0	0	17	0	5	2
Buy modern drugs (%)	28	22	53	53	88	50	100	43	53
Vaccinate (%)	36	56	35	42	25	33	6	19	34
Discuss with neighbours (%)	4	11	18	12	38	100	22	76	24
Cull/destroy infected animals (%)	0	0	0	0	0	0	44	19	7
Nothing (%)	32	33	35	30	88	83	72	57	43
Other (%)	0	0	0	7	25	0	0	5	4

P: pastoral; AP: agro-pastoral

*SGP: sheep and goat pox

**CAHW: community animal health worker

Responses to PPR outbreak are given in Table 67. Most reported responses are similar to those of CCPP and SGP. About 50% of respondents reported doing nothing with PPR outbreak.

Vaccination practices varied between regions for the three diseases of interest. But there were also variations for other diseases. Of the four regions, Borana had the highest vaccination coverage. Also noteworthy is that a large proportion of households did not know what disease animals were vaccinated for.

Table 67. Outbreak response to PPR in sheep (% of PPR affected households reporting specific actions in response to PPR outbreaks, up to three actions per household)

	Afar		Oromia (Borana)		Somali region		SNNPR (South Omo and Bench Maji)		Total
	P	AP	P	AP	P	AP	P	AP	
Number of households affected by PPR*	4	0	2	10	3	0	6	5	30
Sell animals (%)	50	na	50	40	0	na	0	0	23
Traditional treatment (%)	75	na	50	60	0	na	17	40	43
Consult traditional healer (%)	75	na	0	20	0	na	0	20	20
Call CAHW** (%)	25	na	0	30	67	na	17	60	33
Call government veterinarian (%)	0	na	50	0	67	na	0	0	10
Call private veterinarian (%)	0	na	0	10	0	na	0	0	3
Buy modern drugs (%)	50	na	100	50	0	na	67	60	53
Vaccinate (%)	0	na	50	50	0	na	0	0	20
Discuss with neighbours (%)	0	na	0	0	33	na	67	40	23
Cull/destroy infected animals (%)	0	na	0	0	0	na	33	0	7
Nothing (%)	25	na	0	30	100	na	67	80	50
Other (%)	0	na	0	10	33	na	33	0	13

P: pastoral; AP: agro-pastoral

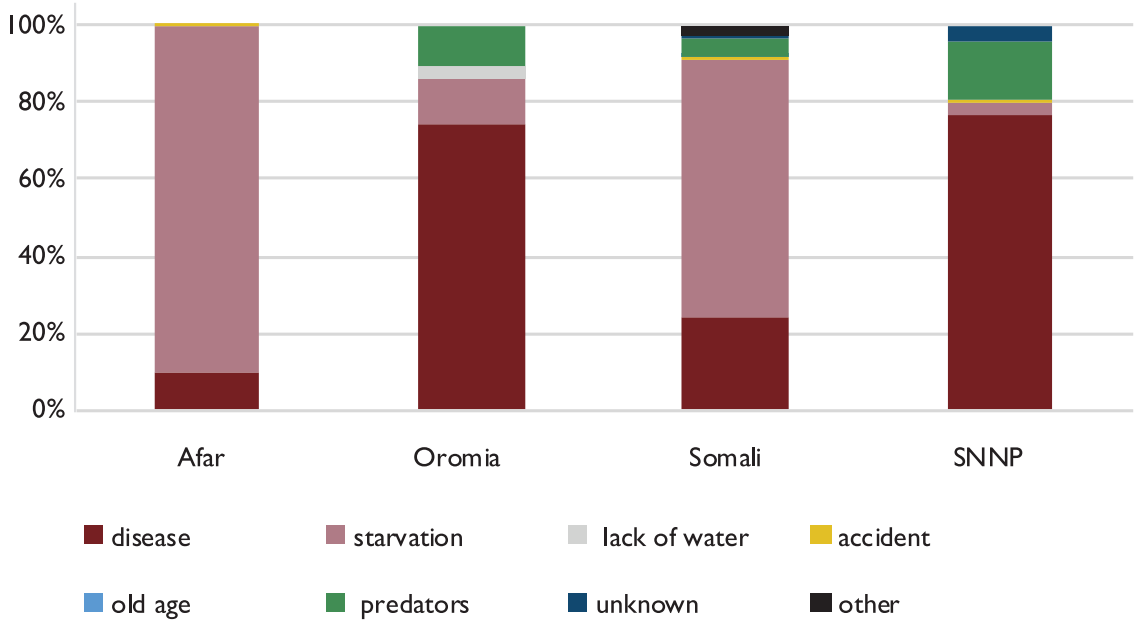
* PPR: peste des petits ruminants

**CAHW: community animal health worker

Mortality and diseases in goats

The reasons for the deaths of goats were similar to those for cattle and sheep starvation being the most important in Afar and Somali regions, whereas diseases were top in Oromia and SNNPR (Figure 12). Compared to other species, predators were linked to more deaths of goats.

Figure 12. Causes of mortality in goats.



To investigate disease priorities, which could be related to mortality or loss in productivity, respondents were asked to name up to three key diseases. In total 1,402 responses were received. Either the disease name was recorded or if the disease was unclear, the clinical sign. The diseases and/or clinical signs were assigned to disease categories, however, none of these reports were based on laboratory confirmation but reflect the perception of the livestock producers.

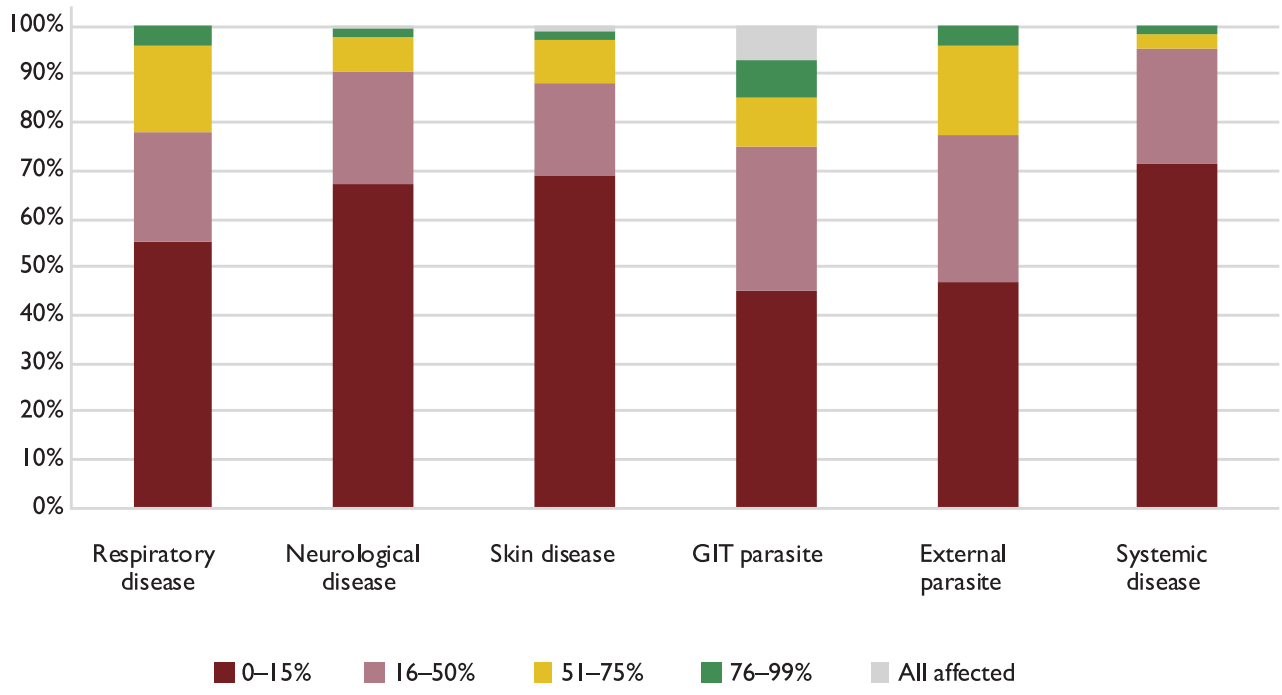
There were significant differences in reporting disease priorities between regions (Table 68). Respiratory diseases were highly important in all regions, ranking first or second. Other diseases mentioned were CCPP and Pasteurella and non-specified pneumonia in the region and coughing in SNNPR. In SNNPR, the most important disease for livestock producers were diseases of the gastro-intestinal tract, such as parasites (liver fluke) or other non-specified diarrhoea, whereas in Oromia, neurological diseases, especially coenurosis, ranked high. In Afar, skin diseases (sheep and goat pox) and external parasites, mainly ticks, were equally important, the second being respiratory diseases. In the Somali region, respiratory diseases were clearly the most common problem, reported by 40% of households, while external parasites were reported by 22% of households. Across the four regions, the priority diseases together accounted for 5,295 deaths of goats.

Table 68. Disease category priorities in goats (% of households reporting disease category up to three diseases per household)

	Afar	Oromia (Borana)	Somali region	SNNPR (South Omo and Bench Maji)	Total
Number of households interviewed	294	378	371	252	1,295
Respiratory disease (%)	34.0	54.2	27.8	30.2	37.4
Neurological disease (%)	6.8	54.8	6.2	19.0	23.0
Skin disease (%)	21.1	22.0	8.1	15.5	16.5
GIT parasite (%)	6.5	19.8	1.1	39.3	15.2
External parasite (%)	20.7	2.1	15.4	4.8	10.7
Systemic disease (%)	1.0	2.9	9.4	5.6	4.9
Others (%)	1.7	0.3	0.5	0.0	0.6

It is noteworthy that the different diseases affected households differently. GIT diseases and external parasites were more of a whole herd problem compared to other diseases (Figure 13).

Figure 13. Proportion of goats affected by different diseases, by disease category.



CCPP, PPR and SGP were diseases of particular interest for RPLRP. Respondents who had not mentioned these three diseases among their priorities were asked if they had experienced the diseases (Table 69).

Table 69. Overview of number of households experiencing CCPP, SGP and PPR in goats

	Afar		Oromia (Borana)		Somali region		SNNPR (South Omo and Bench Maji)		Total
	P	AP	P	AP	P	AP	P	AP	
Number of households interviewed	183	111	73	305	263	108	74	178	1,295
Number of households experiencing CCPP*	52	23	44	111	6	3	19	34	292
Total goats died of CCPP	124	82	210	348	121	0	148	165	1198
Number of households experiencing SGP**	34	15	28	110	12	10	20	34	263
Number of households experiencing PPR***	2	1	3	22	3	1	5	16	53
Total goats died of PPR	5	4	0	24	15	0	3	0	51

P: pastoral; AP: agro-pastoral

* CCPP: contagious caprine pleuropneumonia

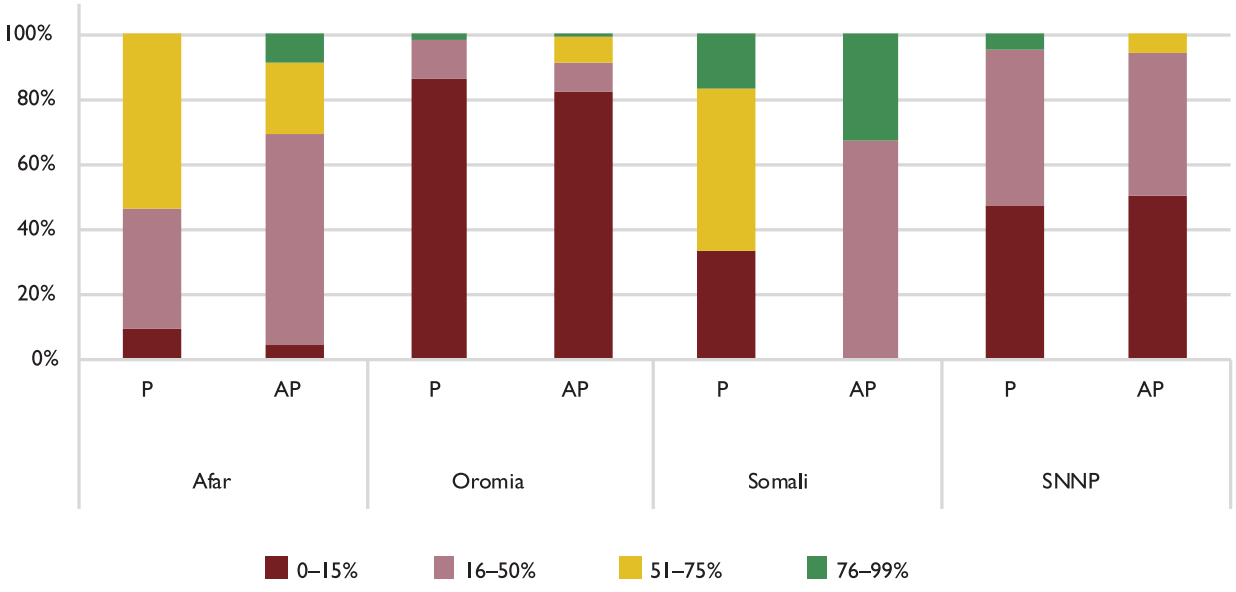
**SGP: sheep and goat pox

*** PPR: *peste des petits ruminants*

Across the four regions, 292 households (23%) reported to have experienced CCPP during the past 12 months, resulting in a total of 1,198 deaths in goats. Oromia, especially the pastoralist households, had the highest proportion of households experiencing CCPP with 60% of pastoralist households interviewed and 36% of agro-pastoralist households.

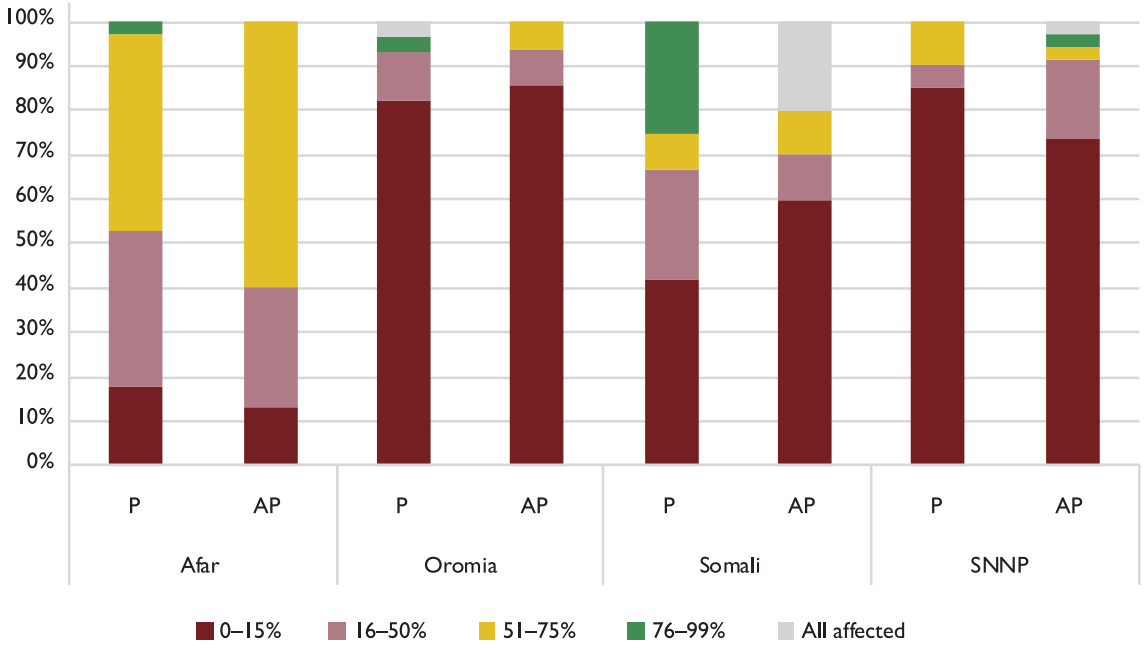
In other regions these proportions were much lower. There were marked regional differences on proportion of goats affected within a flock, with pastoral households in Afar and the Somali region experiencing CCPP much more severely (Figure 14). However, agro-pastoralists reported the largest number of deaths due to CCPP.

Figure 14. Proportion of goats affected by CCPP per household.



SGP was most often reported from households in Oromia with 36% and 38% of agro-pastoralist and pastoralist households, respectively. SGP caused the biggest problems in Afar with large proportions of animals diseased per flock (households) (Figure 15). The lowest proportion of households affected was reported in the Somali region, but some of these households were severely affected. Among the 263 households reporting SGP, an estimated 623 goats died of the disease, with the largest numbers in Afar.

Figure 15. Proportion of goats affected by SGP per household.



Of the 1,295 interviewed households, only 53 (4%) experienced PPR with the highest proportion of households affected in SNNPR (9%). Fifty-one goat deaths were attributed to PPR.

Common outbreak responses to these three diseases showed similar patterns with considerable importance of traditional treatments and comparably low importance of veterinary services. Buying any sort of modern drugs seems popular, but vaccination was rare (Tables 70–72).

However, some livestock keepers may not really understand the difference between vaccine and treatment. Nevertheless, apparently reliable data on what vaccinations were performed over the past 12 months were obtained for some households, whereas others did not know what disease they received vaccination for. For example, 55% of pastoralists did not know for which diseases the vaccines were for.

Table 70. Outbreak response to CCPP in goats (% of CCPP affected households reporting specific actions in response to CCPP outbreak, up to three actions per household)

	Afar		Oromia (Borana)		Somali region		SNNPR (South Omo and Bench Maji)		Total
	P	AP	P	AP	P	AP	P	AP	
Number of households reporting CCPP*	52	23	44	111	6	3	19	34	292
Sell animals (%)	2	4	50	30	0	0	32	6	22
Administer traditional treatment (%)	73	78	36	33	0	0	0	9	38
Consult traditional healer (%)	29	30	5	10	0	0	0	3	12
Call CAHW** (%)	15	4	32	31	0	0	84	21	27
Call government veterinarian (%)	12	13	23	21	0	0	5	24	17
Call private veterinarian (%)	2	0	0	0	0	0	0	0	0
Vaccinate (%)	19	26	55	54	17	0	37	53	43
Discuss with neighbours (%)	10	9	18	14	33	0	47	44	20
Cull/destroy infected animals (%)	0	0	0	2	0	0	0	6	1
Nothing (%)	77	74	27	39	100	133	26	68	51
Other (%)	0	0	0	5	83	100	5	0	5

*CCPP: contagious caprine pleuropneumonia

**CAHW: community animal health worker

Table 71. Outbreak response to SGP in goats (% of SGP affected households reporting specific actions in response to SGP outbreaks in goats, up to three actions per household)

	Afar		Oromia (Borana)		Somali region		SNNPR (South Omo and Bench Maji)		Total
	P	AP	P	AP	P	AP	P	AP	
Number of households affected by SGP*	34	15	28	110	12	10	20	34	263
Sell animals (%)	9	13	43	44	8	0	0	3	25
Administer traditional treatment (%)	62	53	50	44	8	30	35	35	43
Consult traditional healer (%)	68	93	21	7	0	10	0	9	21
Call CAHW** (%)	24	53	25	47	0	20	45	41	38
Call government veterinarian (%)	12	13	18	15	0	30	0	18	14
Call private veterinarian (%)	0	7	0	1	0	0	0	6	2
Buy drugs and administer myself (%)	47	13	50	44	75	50	80	41	47
Vaccinate (%)	32	47	29	48	8	30	15	18	35
Discuss with neighbours (%)	9	0	29	15	50	40	50	56	25
Cull/destroy infected animals (%)	0	0	0	1	17	0	20	15	5
Other (%)	0	0	0	3	50	40	0	0	5

*SGP: sheep and goat pox

**CAHW: community animal health worker

Table 72. Outbreak response to PPR in goats (% of PPR affected households reporting specific actions in response to PPR outbreaks in goats, up to three actions per household)

	Afar		Oromia (Borana)		Somali region		SNNPR (South Omo and Bench Maji)		Total
	P	AP	P	AP	P	AP	P	AP	
Number of households reporting PPR*	2	1	3	22	3	1	5	16	53
Sell animals (%)	50.0	0.0	0.0	45.5	0.0	0.0	0.0	0.0	20.8
Administer traditional treatment (%)	50.0	0.0	33.3	36.4	0.0	0.0	0.0	25.0	26.4
Consult traditional healer (%)	50.0	100.0	0.0	4.5	0.0	0.0	0.0	12.5	9.4
Call CAHW** (%)	0.0	0.0	0.0	54.5	66.7	0.0	20.0	43.8	41.5
Call government veterinarian (%)	0.0	100.0	66.7	9.1	100.0	0.0	0.0	6.3	17.0
Call private veterinarian (%)	50.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0	3.8
Buy drugs and administer myself (%)	50.0	0.0	66.7	72.7	0.0	100.0	60.0	50.0	58.5
Vaccinate (%)	0.0	0.0	33.3	54.5	0.0	0.0	40.0	6.3	30.2
Discuss with neighbours (%)	0.0	100.0	33.3	0.0	0.0	0.0	100.0	62.5	32.1
Cull/destroy infected animals (%)	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	1.9
Other (%)	0.0	0.0	0.0	0.0	33.3	100.0	0.0	6.3	5.7

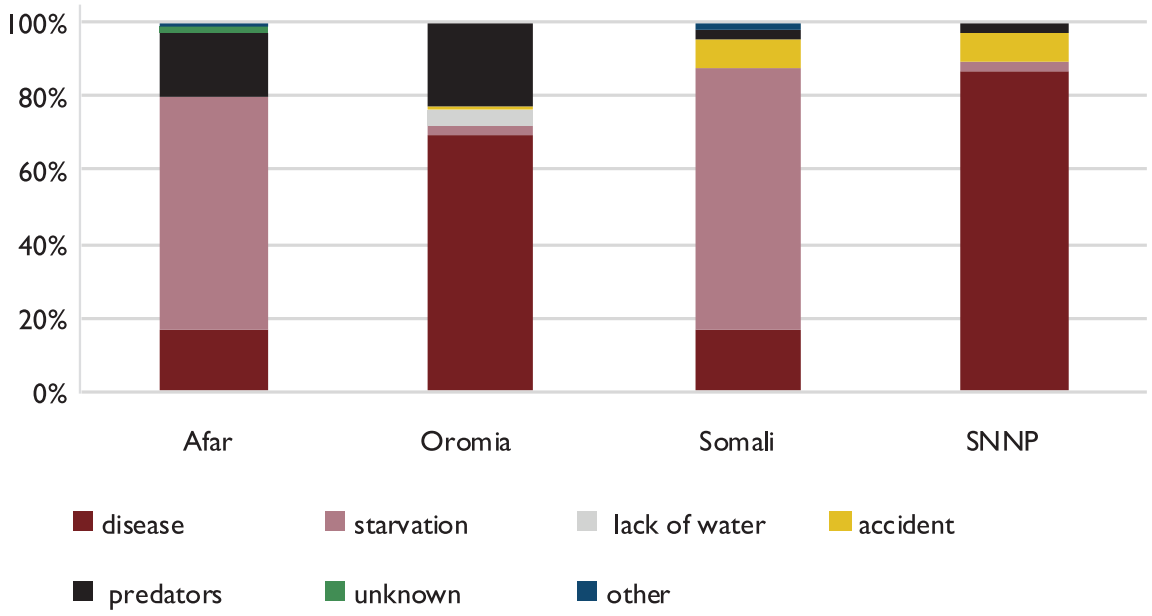
* PPR: peste des petits ruminants

**CAHW: community animal health worker

Mortality and diseases in equines and camels

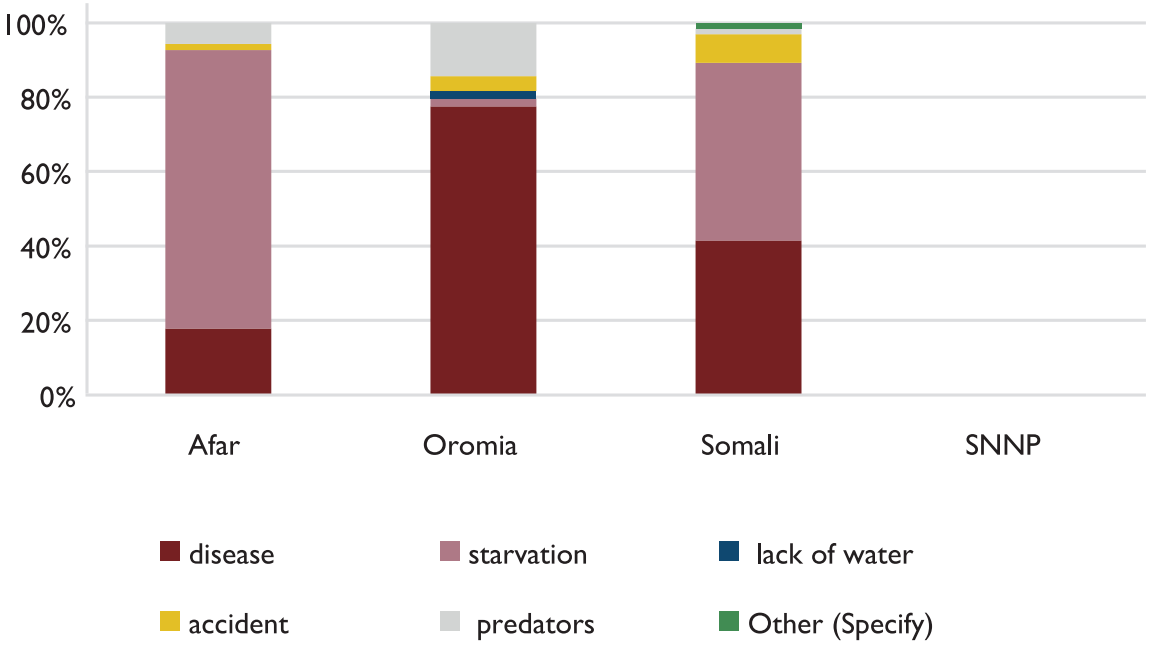
The households interviewed owned very few equines, indicating the low importance of these species in the project area. In equines (horses and mules) starvation was the main death reason in Afar and Somali regions (Figure 16). Similar to other livestock species, in Oromia and SNNPR, diseases were the main cause.

Figure 16. Causes of deaths in equines.



Camels were also prone to starvation, especially in Afar. In Oromia, mortality was mainly attributed to diseases (Figure 17). Disease constraints mentioned belonged mainly to the respiratory disease complex. But reproductive diseases, sudden death and gastro-intestinal tract disease as second most important constraints, also came up regularly.

Figure 17. Causes of deaths in camels.



Mortality and diseases in poultry

Chicken keeping is relatively rare in the project area with only 210 households (16.2%) reporting keeping chicken. Wide differences in egg production per year indicated differences in poultry husbandry systems. Newcastle diseases (ND) was the most commonly suspected disease, followed by avian influenza and Gumboro. In response to outbreaks common actions taken include selling animals (especially in Oromia), administer traditional treatment or buying drugs.

5.2 Livestock health services

Focus group discussions in all regions across *woredas* identified a clear gap in veterinary service delivery. While several *woredas* report that veterinary clinics are available, they nevertheless report a lack of veterinary drugs and services delivery. They blame the lack of efficient veterinary services for ongoing disease problems.

In Afar, respondents indicated that they largely rely on CAHWs and livestock extension agents (LEA), whereas they lack access to private or official veterinarians or veterinary drug stores (Table 73). A similar picture was seen in the Somali region, but with better access to drug stores. Relatively high coverage of veterinary drug stores were reported in Oromia and SNNPR with more than 50% of households reporting access. Good access to official veterinarians was reported in Oromia with 76.7 and 64.3% in pastoralist and agro-pastoralist households, respectively. Access to private veterinarians was low across systems and regions. Table 76 shows details on access and satisfaction to different services.

Table 73. Per cent of households with access to different animal health services

	Afar		Oromia (Borana)		Somali region		SNNPR (South Omo and Bench Maji)		Total
	P	AP	P	AP	P	AP	P	AP	
CAHW*	17.49	40.54	30.14	37.05	20.91	22.22	36.49	33.71	29.19
LEA**	8.00	22.43	12.33	19.67	13.69	1.85	6.76	25.84	15.28
Traditional healer	2.29	0.00	28.77	19.34	0.38	4.63	2.70	24.16	10.52
Veterinary drug store	1.14	0.00	52.05	52.79	17.49	13.89	64.86	53.93	31.64
Private veterinarian	0.00	0.00	2.74	7.54	4.56	7.41	8.11	5.06	4.68
Official veterinarian	0.00	0.00	76.71	64.26	1.52	3.70	1.35	16.85	22.68

*CAHW: community animal health worker

** LEA: livestock extension agent

Use of different animal health services was rather low across regions with ranges from 0 to 4 visits per year. Only for drug stores higher frequencies of access were reported in some *woredas*. There was also a considerable variability in amount spent on different services (Table 74). The least is spent in Afar, whereas some livestock keepers invest more in livestock health in Oromia and Somali regions.

Table 74. Amount spent (ETB) on animal health services by region

	Afar		Oromia (Borana)		Somali region		SNNPR (South Omo and Bench Maji)	
	Mean	Maximum	Mean	Maximum	Mean	Maximum	Mean	Maximum
CAHW*	15	100	33	500	203	2,000	32	400
LEA**	10	120	80	1,400	97	900	31	200
Traditional healer	45	99	52	1,000	48	150	25	150
Veterinary drug store	48	55	385	3,000	337	1,500	144	400
Private veterinarian	Na	Na	164	2,500	539	2,000	46	88
Official veterinarian	Na	Na	78	3,500	263	1,500	117	1,000

*CAHW: community animal health worker

** LEA: livestock extension agent

Na: not applicable

As expected, the purpose of using the different service providers differed. The 378 households with access to CAHW services were asked to name up to 3 types of services they receive from CAHWs. They reported to use CAHWs mainly for vaccination, to get modern treatment and to have access to trainings and disease information. Pastoralists used CAHWs more often with a mean of 2.27 compared to 1.99 times per year in agro-pastoralists ($p = 0.052$). Use of LEA was less common with only 196 households having access (15.3%). The services they provided mainly include vaccination and modern treatment, but they seem to play a minor role in providing trainings and as a source of disease information.

Traditional healers were popular in Oromia and were involved in most animal services to provide traditional treatment and acting as a source of disease information. Veterinary drug stores were mainly of relevance in Oromia and SNNPR. Besides being used to get modern treatment, they also acted as a source for herd health advice and a source for disease information.

Access to private veterinarians was limited (4.68% of households) in all regions and none in Afar. If present, private veterinarians mainly provided vaccination services and modern treatment. Similar to private veterinarians, official veterinarians are reported to mainly deliver vaccination and modern treatment services. The results into access to animal health services clearly highlighted the need to strengthen these services.

Table 75. Proportion of non-satisfied households (% of respondents)

		Afar	Oromia (Borana)	Somali region	SNNPR (South Omo and Bench Maji)
CAHW*	Accessibility	90.7	40.7	11.1	19.8
	Affordability	76.3	24.4	8.6	18.6
	Quality	81.6	6.7	7.4	16.1
	Timeliness	82.9	18.7	10	23
LEA**	Accessibility	13.2	7.7	2.6	27.5
	Affordability	10.5	0	0	23.5
	Quality	13.2	2.7	5.1	21.6
	Timeliness	13.2	12	2.6	31.4
Traditional healer	Accessibility	25	16	0	28.9
	Affordability	50	17.3	0	24.4
	Quality	25	34.6	14.3	42.2
	Timeliness	50	4.9	0	35.6
Veterinary drug store	Accessibility	50	11.2	19.6	31.3
	Affordability	0	34.2	23.2	27.8
	Quality	50	6.5	17.9	20.8
	Timeliness	50	22.6	23.2	32.6
Private veterinarian	Accessibility	nac	28	21.1	6.7
	Affordability	nac	20	11.1	6.7
	Quality	nac	8	5.3	6.7
	Timeliness	nac	12	0	6.7
Official veterinarian	Accessibility	nac	11.5	0	25.8
	Affordability	nac	13	0	12.9

*CAHW: community animal health workers

** LEA: livestock extension agents

nac: No access to the services

To inform eventual interventions in this area, those households with access to the services were asked about satisfaction, which was made up of four dimensions: accessibility, affordability, quality and timeliness. In some regions there were high proportions of respondents with satisfaction score four or lower, indicating clearly not being satisfied with the services received. The proportions of non-satisfied respondents per region are summarized in Table 75.

Total mean satisfaction scores (sum of the scores for the four dimensions) for the different service providers differed per region (Table 76). Highest scores were given in Oromia and Somali regions.

Table 76. Total mean satisfaction scores

	Afar	Oromia (Borana)	Somali region	SNNPR (South Omo and Bench Maji)
CAHWs*	13.68	24.35	26.01	22.09
LEA**	23.92	28.13	27.59	23.57
Traditional healer	21.25	26.53	27.50	20.40
Veterinary drug store	20.50	24.07	23.00	21.95
Private veterinarian	Nac	25.32	29.89	21.40
Official veterinarian	Nac	26.41	25.00	21.35

* CAHWs: community animal health workers

** LEA: livestock extension agent

nac: No access to the services

6. Water resources and water infrastructure

6.1 Water resources and supplies

Water for livestock

Watering frequency of different classes and types of livestock

Finding water of consumable quality for livestock is one of the major occupations of pastoralists and agro-pastoralists and one of the key determinants of pastoral movement and migration. Furthermore, the distribution and type of water facilities can influence the frequency with which animals are watered. In general, the further producers live from the water source, the more likely they will be forced to practice alternative day watering of their animals.

Conjugant to these facts, the responses of the sampled households regarding watering frequencies for milking and dry cows, heifers/calves, bulls/oxen and sheep/goats showed once per day to be the most frequent watering frequency in Afar, Somali and SNNP regions, while in Oromia, the most frequent watering frequency for these classes and type of livestock was once every two days. The watering frequencies by production systems, pastoral and agro-pastoral, also followed a similar pattern to that of the regional realities.

Closer examination of the results at the *woreda* level in the different regions, however, revealed some exceptions. For instance, the most common watering frequency in Abaya and Gelana *woredas* of Oromia for milking and dry cows, heifers/calves, oxen/bulls and sheep/goats was found to be once/day as they are located in the uplands where rivers and springs are the sources of water.

Similarly, in Afambo *woreda* of Afar, the most frequent watering frequency of milking and dry cows, heifers/calves, oxen/bulls and sheep/goats is twice/day. In Mille and Chifra *woredas* also sheep/goat are watered twice/day. In the Somali *woreda* of Moyale, milking cows, heifers/calves and in Dhuxun *woreda* heifers and calves are watered once/day. In Moyale, Aware and Fik *woredas* of the Somali region, sheep and goats are watered once per three days.

The most frequent watering frequency for equine (donkey, mule and horse) was once per day in all regions and by production systems. Camels are mostly watered once a week in Afar, Oromia and the Somali region. The overall mean frequency of watering (Table 77) showed to be in the range of 2–2.5 days for the different classes and kinds of livestock except for camel where the mean was about four days.

Table 77. Mean watering frequency by region and production system (by days)

			Milking cows	Dry cows	Heifers/ calves	Oxen/ bulls	Camels	Goats/ sheep	Horses, donkeys, mules
Afar	Pastoral	Mean	1.85	1.89	1.89	1.87	3.27	1.62	1.86
		Std. deviation	0.561	0.548	0.544	0.554	1.571	0.648	0.528
	Agro-pastoral	Mean	1.64	1.67	1.63	1.67	2.85	1.42	1.76
		Std. deviation	0.563	0.596	0.555	0.592	1.514	0.555	0.518

			Milking cows	Dry cows	Heifers/ calves	Oxen/ bulls	Camels	Goats/ sheep	Horses, donkeys, mules
Oromia (Borana)	Pastoral	Mean	2.90	2.93	2.70	2.91	4.56	3.36	2.51
		Std. deviation	0.675	0.657	0.962	0.668	0.884	1.356	0.954
	Agro-pastoral	Mean	2.53	2.59	2.38	2.60	4.57	2.90	2.33
		Std. deviation	0.551	0.563	0.762	0.596	0.770	1.228	0.669
Somali region	Pastoral	Mean	2.38	2.35	2.04	2.52	4.40	3.01	2.29
		Std. deviation	0.663	0.748	0.849	0.749	0.939	0.910	0.871
	Agro-pastoral	Mean	2.40	2.33	2.32	2.71	4.75	3.21	2.35
		Std. deviation	0.593	0.564	0.683	0.843	0.762	0.890	0.765
SNNPR (South Omo and Bench Maji)	Pastoral	Mean	1.52	1.56	1.54	1.54		1.55	1.57
		Std. deviation	0.503	0.528	0.530	0.529		0.530	0.544
	Agro-pastoral	Mean	1.76	1.75	1.75	1.77	2.00	1.72	1.74
		Std. deviation	0.445	0.452	0.447	0.438	0.000	0.465	0.541
	Total	Mean	2.16	2.18	2.07	2.20	3.93	2.45	2.14
		Std. deviation	0.704	0.721	0.765	0.753	1.387	1.161	0.756

Types of water points

Different watering point types are used as source of drinking water for livestock in the different regions (Table 78). The most common sources of water for livestock in Afar are rivers or permanent springs. A similar scenario is presented in the FGDs. In some *woredas* such as Chifra there is no other water source than the river and thus humans also use the river water. However, in most cases there is a separate water source for humans. This is also the case in SNNPR where the majority of the communities rely on rivers for livestock watering.

Though in many *woredas* in SNNPR piped water has been supplied, this is generally not used for livestock not only because it requires payment (between ETB2–10 per month) but because the community say that if the livestock drink from it, it makes them 'thin'. As such, livestock are often moved to other places when local rivers dry up.

According to the survey, the most frequent water point types used for livestock in Oromia are shallow community wells (traditional). In Oromia, permanent ponds (Teltele and Moyale *woredas*), rainfed non-permanent ponds (Miyo *woreda*) and river or springs (permanent) (Bule Hora, Abaya and Gelana *woredas*) are the frequent watering points reported by the respondents to be the source of water for livestock. Similarly in FGDs, ponds are most commonly mentioned as a source of water for livestock, as well as rivers and motorized water sources (wells).

Here it was revealed that between 2,500 and 4,000 cattle per day commonly use water sources in a *kebele* and in Sororo *kebele* in Bule Hora (Surro Barguda) the FGD revealed that 10,000 cattle use the water points (ponds and natural springs) in the *kebele* every day. Where water is drawn up by a motor, payment can be required (in Oromia this was around 50 cents for 20 litres).

The most frequently reported watering point types in some *woredas* of the Somali region in the household survey are traditional deep community wells with pump (Shekosh), communal cisterns/storage tank (birked) (Aware and Boh); and shallow community well (Dhuxun). This is confirmed through the FGDs where generally both wells and birkeds are sources for both human and livestock consumption. The majority of birkeds are communal, with some individually owned. Though most *woredas* had large numbers of birkeds, at the time of the research in most cases more than two-thirds of these were said not to be functional due to drought. Several *woredas* complained that ella (well) water is salty (Dhuxun, Shekosh, Shilabo). Some trucking of water was taking place (Boh) where water cost ETB10 for a 20 litre jerrycan.

The sources of water in Afar (10.1%), SNNPR (13.33%) and Oromia (29.9%) are built water types. Contrary to the low percentages in the other regions, in the Somali region, about 58.06% revealed the water types to be built. These results show that the most frequent water types mentioned by Afar, Oromia, the Somali region and SNNPR pastorals and agro-pastorals were river or spring (permanent), shallow community well (traditional), deep community well (traditional) and river or spring (permanent/non-permanent), respectively.

Table 78. Watering point types by region and production systems (number of responses)

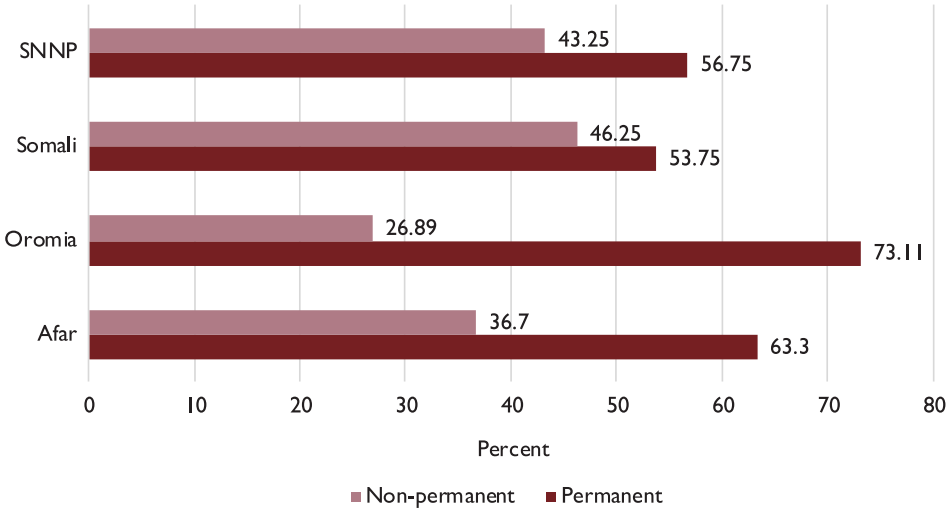
Water point types	Afar		Oromia (Borana)		Somali region		SNNPR (South Omo and Bench Maji)	
	P	AP	P	AP	P	AP	P	AP
Community tap water	18	10	24	77	19	8	1	3
Rainfed non-permanent pond	10	7	26	94	38	12	0	0
Permanent pond			8	104	18	4	0	0
Shallow community well (traditional)	27	2	43	103	25	13	0	1
Shallow community well with pump	1	0	2	12	6	8	0	0
Deep community well (traditional)	19	0	20	36	80	64	8	1
Deep community well with pump	7	6	15	18	22	4	3	51
Private well	0	1	0	0	0	0	0	0
Private well with pump	2	0	0	0	0	0	0	1
Private cistern/storage tank (birked)	0	0	0	0	45	7	0	0
Communal cistern/storage tank (birked)	7	4	0	2	40	21	0	0
River or spring (permanent)	82	69	11	127	9	2	43	192
River or spring (non-permanent)	29	18	4	12	9	1	50	81
Chaco small dam	4	1	2	1	4	1	0	0
Lake	2	1	0	13	0	0	0	0
Harvested rainwater	1	0	0	3	0	0	0	0
Other	0	0	0	9	4	3	0	0
Total	209	119	155	611	319	148	105	330

P: pastoral; AP: agro-pastoral

Permanent or non-permanent water points and year-round usage

Households indicated that 63.5% of water points in the different regions are permanent although the percentage varied among the different regions (Figure 18). Furthermore, the instances of non-permanent water points were higher than permanent in Teru and Yallo *woredas* of Afar; Aware, Boh and Fik *woredas* of the Somali region; and Nyangatom and Hammer *woredas* of SNNPR.

Figure 18. Households who indicated the water points were permanent or non-permanent (%).



The water points are used for different number of months but the common usage was year round (Table 79). The mean months of usage of the watering point by region and production system is shown in Table 80. The mean months of usage varied from 8.77 months (Afar) to 9.7 months (SNNPR). The duration of usage by production system in each region was more or less comparable (Table 80). Different water types are used year round (12 months) in the 4 regions (Figure 19).

Table 79. Responses of the sampled households to duration of usage of watering points

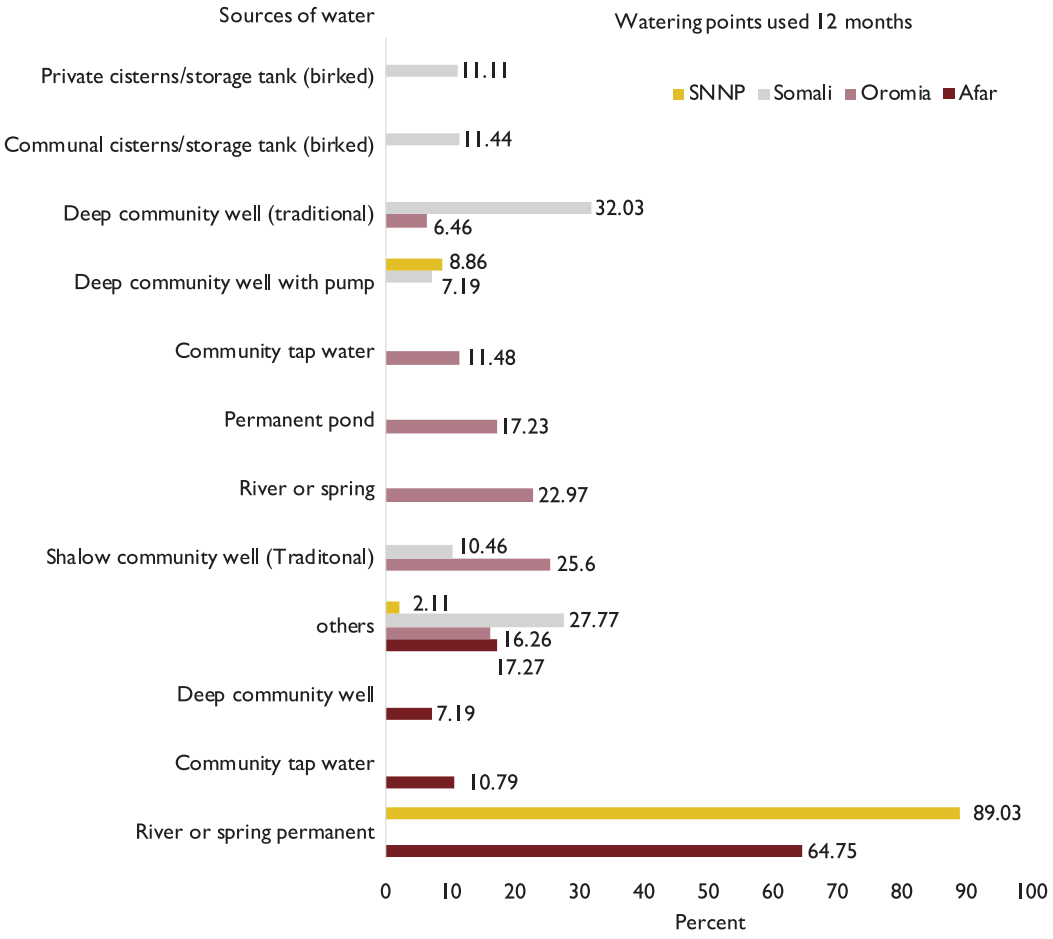
Region	Livelihood	Frequency of months of usage											
		1	2	3	4	5	6	7	8	9	10	11	12
Afar	Pastoral	0	2	8	14	8	33	33	20	7	4	0	80
	Agro-pastoral	0	0	3	6	5	15	11	15	4	1	0	59
	Total	0	2	11	20	13	48	44	35	11	5	0	139
Oromia (Borana)	Pastoral	5	16	4	17	6	9	3	10	0	3	2	80
	Agro-pastoral	7	33	38	42	28	45	19	38	5	16	2	338
	Total	12	49	42	59	34	54	22	48	5	19	4	418
Somali region	Pastoral	1	5	17	9	8	29	4	10	8	6	2	219
	Agro-pastoral	2	2	6	5	3	23	5	7	4	2	1	87
	Total	3	7	23	14	11	52	9	17	12	8	3	306
SNNPR (South Omo and Bench Maji)	Pastoral	0	0	0	4	8	13	11	13	5	8	1	42
	Agro-pastoral	1	1	1	13	20	29	17	23	11	18	1	195
	Total	1	1	1	17	28	42	28	36	16	26	2	237
Total	Pastoral	6	23	29	44	30	84	51	53	20	21	5	421
	Agro-pastoral	10	36	48	66	56	112	52	83	24	37	4	679
	Total	16	59	77	110	86	196	103	136	44	58	9	1,100

Table 80. Mean months of usage of watering point by region and production systems.

Region	Livelihood type	Mean	Std. dev.
Afar	Pastoral	8.50	3.089
	Agro-pastoral	9.24	2.994
	Total	8.77	3.070
Oromia (Borana)	Pastoral	8.48	4.078
	Agro-pastoral	8.98	3.736
	Total	8.88	3.810
Somali region	Pastoral	10.07	3.168
	Agro-pastoral	9.52	3.309
	Total	9.89	3.220
SNNPR (South Omo and Bench Maji)	Pastoral	9.10	2.758
	Agro-pastoral	9.89	2.843
	Total	9.70	2.840
Total	Pastoral	9.21	3.373
	Agro-pastoral	9.32	3.409
	Total	9.28	3.395

The FGDs revealed a similar picture. In general, people confirmed that the water was not sufficient for the livestock in the regions. During the survey period the Somali region was particularly water-stressed due to drought. In the Somali region only four *kebeles* said that they had sufficient water in normal years for humans and livestock. The majority said that there was not sufficient water with 3–4 months deficit in normal years and significantly more in drought years. When water is not available the most common reaction is to move livestock to another *kebele*.

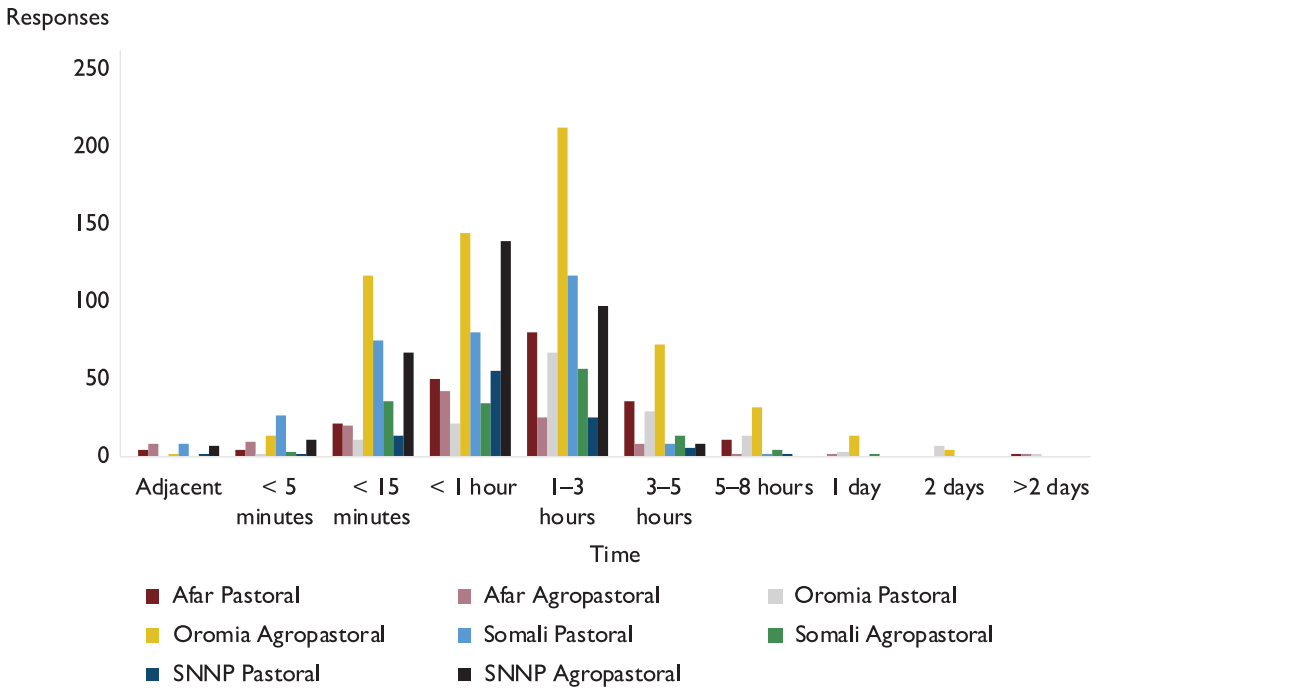
Figure 19. Watering point types used for 12 months for livestock in the four regions.



Time taken to water points

The most common time it took to livestock watering points from residence in Afar, Oromia and the Somali region was within 1 to 3 hours while it was less than 1 hour in SNNPR (Figure 20). The figures indicate that the communities can reach the watering points in a relatively shorter period.

Figure 20. Walking time from residence to the watering points in the different regions.



Managing water points and conflicts

In Afar, the majority (68.6%) of household members said that the water point for livestock is not managed. This reflects the fact that most water in Afar is obtained from permanent rivers or springs. This was confirmed in the FGD, where management was only mentioned in terms of new water points mainly for human consumption. A similar situation exists in SNNPR.

In Oromia, household surveys revealed that 48.17% of survey respondents said that water points are not managed (Bule Hora, Abaya, Gelana—mainly agro-pastoral *woredas* of Dire, Teltele and Moyale) and in others are partly managed by water management committee (Dillo, Dire, Moyale and Miyo *woredas*). None of the *woreda* household surveys indicate that customary institutions are the main manager of water points suggesting that there has been a decline in traditional systems of water management, while at the same time new water points have been constructed that have established new ways of management (i.e. committee).

In Oromia, However, FGDs revealed a different picture where the following were mentioned as 'managers' of water points such as:

- customary institutions or elders (Teltelle, Dillo, Dire, Bule Hora [Surro Barguda], Gelana);
- committees (Miyo, Abaya, Dillo); and
- government (Dire).

None of the *kebeles* indicated the lack of water management as a challenge.

In the Somali region, the household survey indicated that the water points are managed by local government (most common) and otherwise are said to be 'not managed'. In the FGD, the role of traditional leaders was also mentioned as well as the establishment of committees (Aware, Duhun, Hemero, Moyale, Shilabo, Fiq and Shekosh). These committees can punish a person that misuses the water (Aware, Fiq).

In SNNPR, the water points, being mainly rivers, are managed by the whole community or are 'not managed'. In general, according to the FGD, people do not pay for providing water to livestock unless water is being tankered in (e.g. ETB10 for 20 litres) or the water comes from private sources such as birked—charge of ETB3 for 20 litres, as in the Somali region.

In all regions, there was little mention of conflicts between local users over water sources, which highlights the strong feelings of reciprocity and collective management that still exists. Sometimes, there is conflict between those who bring cattle and those wanting to use the same source for domestic use (water left unclean) (Oromia). In SNNPR, there was conflict due to different pricing mechanisms in neighbouring *kebeles* for piped water. And in the Somali and Afar regions, there is sometimes conflict when moving to other *kebele* to find water. Generally, elders resolve such conflicts in all regions.

More serious conflicts mentioned were the conflict between Guji and Burji over water (Bule Hora [Surro Barguda] *woreda*). In SNNPR, conflicts reported with pastoralists that have come from South Sudan (Surma *woreda*) and Kenya (Nyangatom and Dasenech *woredas*) in search of water and grazing. In the case of international and cross-regional conflicts it is usually the government that intervenes.

Investment in water

Of the total households interviewed (1,295) in the different regions, only 23 (1.77%) replied that they had made an investment in water development in lands they use for their livestock. Those who made investment were: eight pastoral and one agro-pastoral in Afar, five agro-pastoral in Oromia, three pastoral and two agro-pastoral in the Somali region and four agro-pastoral in SNNPR.

According to the responses of the sampled households, a limited number of organizations in 13 instances in the four regions supported investment in water and water supply. The support was consolidated in seven *woredas* (Borana = Teltele, Yabello; Afar = Yallo, Semurobi Gelalo; SNNPR = Salamgo and South Ari; Somali region = Aware). At Selamago and South Ari, government supported the activities while the NGO support was given at Teltele, Yabello, South Ari and Aware *woredas*. Community self-support activities were undertaken in Yabello (Oromia), Yallo and Semurobi Gelalo (Afar). Support was also provided by a religious group at Semurobi Gelalo (Afar).

In FGDs, however, community members listed a number of investments made at a *kebele* level involving community members. Here there were examples in Dire, Miyo, Gelana and Bule Hora (Surro Barguda), with four ponds having built by the community in Girincho and Miyo. In SNNPR, two *kebeles* mentioned investing in water points through the provision of labour including clearing of river areas to separate livestock/human collection points and building of a water point. In the Somali region, communities in Dega, Hardaghee and Jerly in Fik *woreda*, in Selahkelifo (in Hemero) and Ardawalie and Bede in Moyale had invested in clearing and fencing water catchment areas.

According to respondents the main challenge to develop more water points in Afar is lack of capacity; in SNNPR it is manpower, materials, machines and budget; and in the Somali region it is budget. Others mentioned included lack of awareness (Afar), lack of materials (Afar), low groundwater level (Afar; Oromia) and distraction by floods (Oromia).

Challenges in accessing water

According to the household survey, the three most important challenges in accessing water are low quantity and quality of water (Afar and the Somali region) and too many animals for the available water points (Oromia and SNNPR). A similar result was described through the FGDs with quantity of water being the most commonly cited problem in Oromia and SNNPR, quality of water in Afar and the Somali region (with water-borne diseases highlighted in the Somali region). Other challenges mentioned were quality (Oromia), saltiness and pollution (SNNPR), accessibility (Afar), distance from home (Oromia, SNNPR), lack of ground water (Oromia), payment (Afar), animal diseases and broken pipes (SNNPR).

Water for human consumption

The most frequent sources of water for human consumption according to the household survey are tap water (Afar and Oromia), permanent river or spring (SNNPR) and deep community well with pump and traditional community well in the Somali region. In the FGD, respondents in SNNPR mentioned that in many *woredas*, piped water was being provided. However, a number of problems were mentioned with this including pipes being broken, a long queue, the pipes run dry or 'non-functional' and piped water is not suitable for livestock as it makes them 'thin'. In addition, the water needs to be paid for, between ETB3 to 10 per month.

Table 81 shows the number of responses regarding the time it takes from the respondents' houses to the water source by region and production system. For Afar, the most frequent response revealed that the household can reach a water point in less than 15 minutes, but for households in Oromia, the Somali region and SNNPR it takes one to three hours.

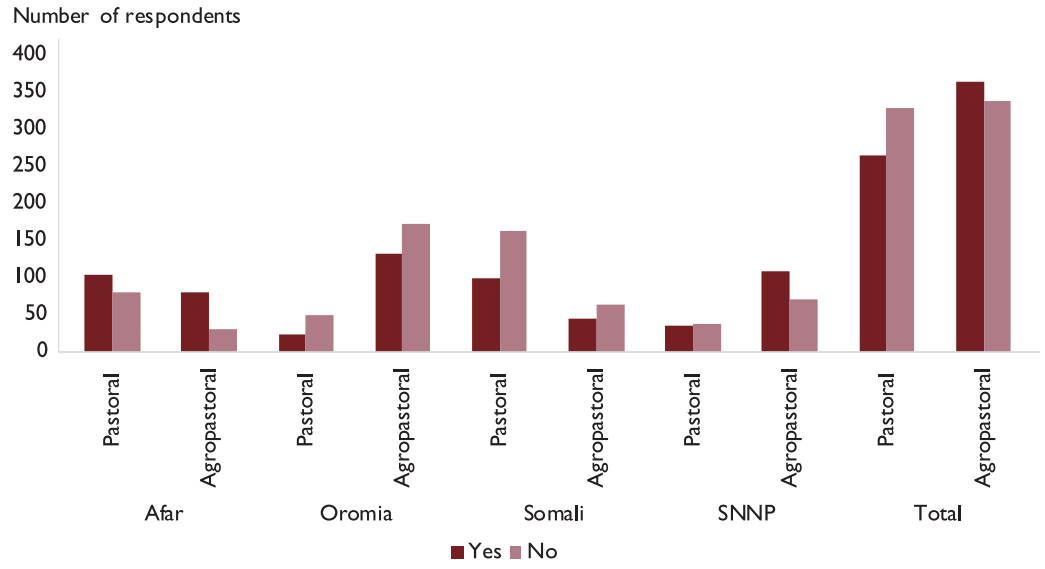
Table 81. Responses to distance of water point from residence (number of responses)

Region	Livelihood	Adjacent	<5 minutes	< 15 minutes	1–3 hours	3–5 hours	5–8 hours
Afar	Pastoral	8	14	74	55	23	9
	Agro-pastoral	24	12	50	23	2	0
Oromia (Borana)	Pastoral	3	6	9	40	12	3
	Agro-pastoral	12	22	104	132	28	7
Somali region	Pastoral	9	24	90	131	8	1
	Agro-pastoral	2	5	42	45	12	2

Region	Livelihood	Adjacent	< 5 minutes	< 15 minutes	1–3 hours	3–5 hours	5–8 hours
SNNPR (South Omo and Bench Maji)	Pastoral	1	1	22	47	1	2
	Agro-pastoral	7	4	69	87	10	0
Total	Pastoral	21	45	195	273	44	15
	Agro-pastoral	45	43	265	287	52	9
	Total	66	88	460	560	96	24

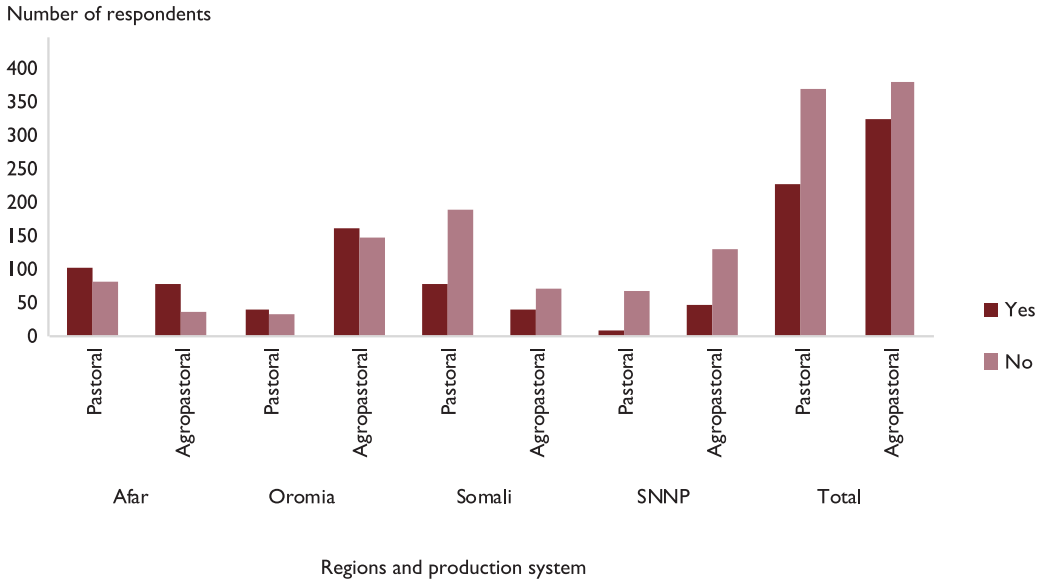
Regarding the quantity of water, about 51.51% of the sampled households replied that it was not adequate. However, there is variability among the regions regarding the responses on the quantity of water. While 62.6% of respondents in Afar and 57.14% of households in SNNPR said it was adequate, 58.73% of households in Oromia and 61.19% of households in Somali region replied it was not adequate (Figure 21).

Figure 21. Household responses to the water quantity.



Regarding the quality of water, the majority of survey respondents from Afar (61.22%) and Oromia (52.91%) replied that the quality was adequate; while in Somali and SNNPR, 69% and 78.57%, respectively, said that the quality was inadequate (Figure 22). Concerning seasonality of the water supply, most respondents (71.7%) in the four regions replied the water sources for human consumption are year round and the pattern by production system, pastoral and agro-pastoral, in all the regions was similar.

Figure 22. Household responses to whether water quality was adequate.



In Oromia, the FGD revealed that it is common for livestock and humans to share the same water source, such as ponds or wells. Where birked are used in Somali region these also tend to be shared. In Oromia, several *kebeles* said that they receive tankered water during the dry season, as was also in Somali region. In Afar, the FGD revealed that there have been a number of investments in water for human consumption including in Afambo, Mille and Teru.

However, in general, the quantity of water is lacking across all *woredas* and in many instances the quality, too. In Afambo, the FGD said they add chemicals to the water to improve the quality. Excluding the households from Ethiopia Somali, more than 50% of the sampled households had experienced water borne-diseases in the water supply. In Somali region this was only 20%, though this was revealed as a concern in the FGD.

The opinion of the sampled households in the four regions varied in regards to the management system of domestic water supply scheme. About 51.89% of the sampled households reported the domestic water supply scheme was not well managed while the remaining indicated it to be well managed. Breaking this down into regions more respondents in Afar and Oromia said that the schemes were well-managed than in Somali and SNNP regions.

In all regions when a new water point is established usually a committee is set up to manage the water point. In Afar and Oromia, it was said that women do participate in these committees but their participation might be low. In SNNPR, though there was a significant amount of new piped water sources established, few seemed to have functioning committees. According to the survey data, only three *woredas* (South Ari, Selemgo and Hammer) have a well-functioning water committes established.

6.2. Use of irrigation

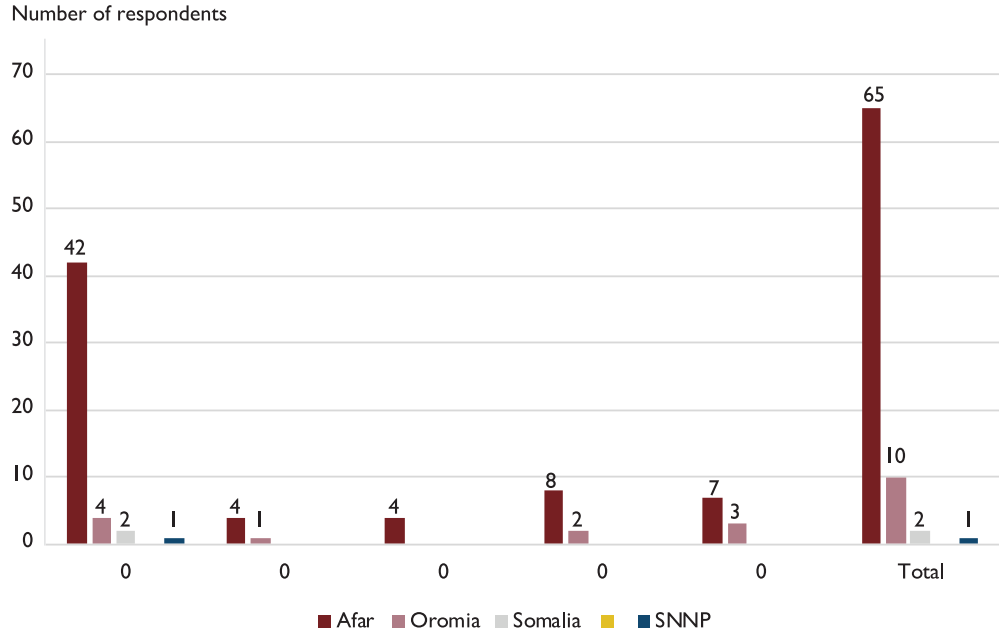
The sampled households in the different regions were interviewed about the use of irrigation to produce crops, vegetables, fruits or fodder. Of the total sampled households (1,295), only 78 (6.02%) used irrigation to produce crops. The largest response was from Afar (65 households), followed by Oromia (10 households), the Somali region (2 households) and SNNPR (1 household).

Looking at the result by production system, 6 pastoralists and 59 agro-pastoralists in Afar, 10 agro-pastoralists in Oromia, 1 pastoralist and 1 agro-pastoralist from the Somali region and 1 agro-pastoralist from SNNPR use irrigation water to produce crops. Of the *woredas* the largest number of households using irrigation water (39 households) was in Afambo of Afar region.

Of those who replied yes, the largest number of sampled households indicated the source of the water to be from river or permanent spring (74 households), 2 households reported from rainfed non-permanent pond and the remaining 2 from permanent pond. Similar results were revealed in FGDs with irrigation mentioned only in Bule Hora (Surro Barguda) and Abaya (Oromia); Afambo (Afar); none in SNNPR or the Somali region.

Regarding who built the irrigation, 42 households from Afar replied that they built themselves (Figure 23). For those who did not use irrigation, the primary reason was the absence of water resources in their PA/village.

Figure 23. Response of the sample households as to who built the irrigation.

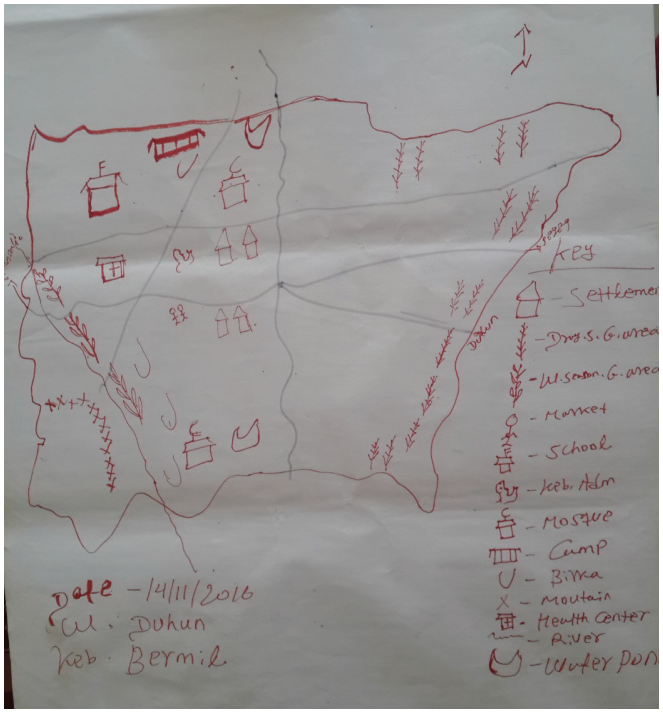


7. Land use and sustainable land management investments

7.1 Land use and sustainable land management

Information on land use and SLM was collected through household survey, FGDs and KIIs. In addition, during FGDs a participatory rangeland resource map was drawn for each *kebele*. An example of this is found in Figure 24. All maps are available.

Figure 24. Example of a rangeland resource map from Bermil *kebele* in Dihun *woreda*.



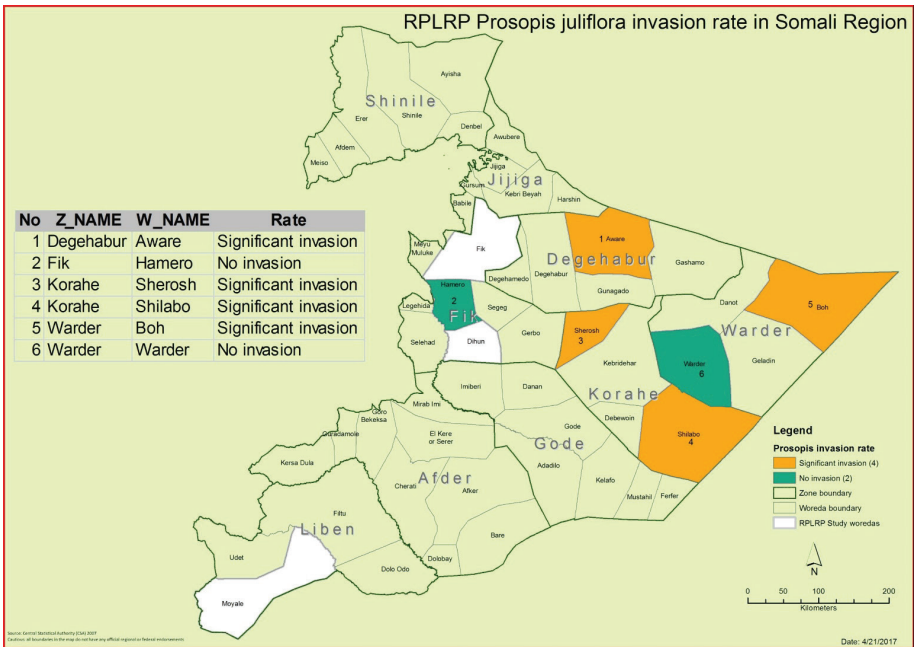
The main land use change mentioned by FGDs over the last five years was loss of grazing areas (particularly in Somali region) and increased crop growing (SNNPR). The loss of grazing was also emphasised in the other regions, for example, Samurobi *woreda* in Afar (Deleti), said there were no grazing areas in the *kebele* and they moved outside the *kebele*/*woreda* to find grazing.

Large-scale infrastructure developments were also mentioned as a cause of loss of grazing land. The loss of forests in SNNPR and the Somali region was also mentioned. It should be noted that in Afar region, in particular, significant numbers of community members are being supported by the PSNP and food-for-work, for keeping soil, water and other SLM investments in those areas. PSNP was also mentioned in other regions but less frequently.

FGD responses on land use planning responsibilities varied across *woredas* and across regions with 'community' (elders, customary institutions, general community) mentioned most, but also 'government' including *kebele* and *woreda* mentioned in some areas. In SNNPR, FGDs said that they planned for many activities including enclosure of land, taking care of trees, water harvesting, planting crops, irrigation and water development. Such land use planning was not mentioned in detail in other regions.

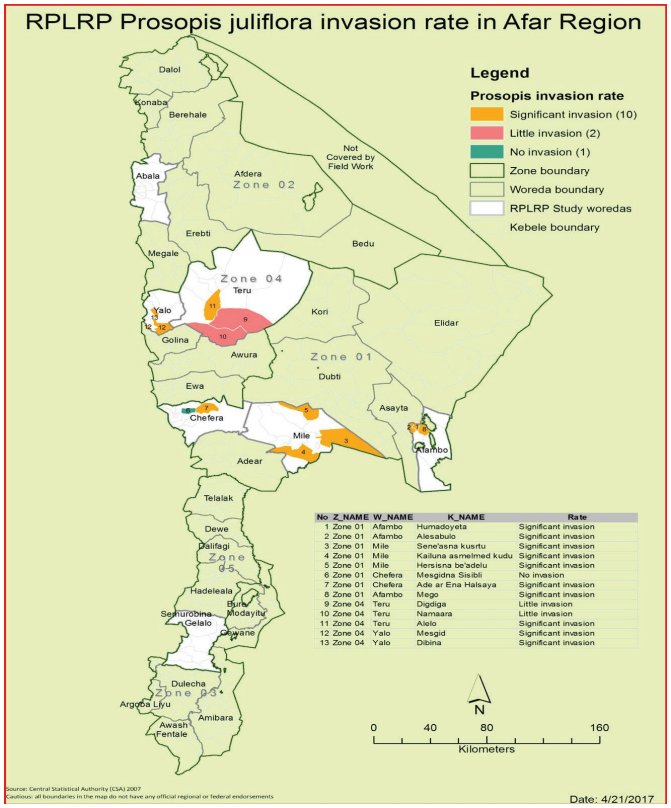
Significant problems were mentioned with bush encroachment in Oromia and invasive species in Afar and the Somali region. In the latter, a range of invasive species (with local names) was mentioned, but in Afar *Prosopis juliflora* dominates. The mention of Prosopis by FGDs is mapped in Figure 25 (Somali region) and Figure 26 (Afar region).

Figure 25. Severity of *P. juliflora* invasion in the Somali region.



No	Z_NAME	W_NAME	Rate
1	Degehabur	Aware	Significant invasion
2	Fik	Hamero	No invasion
3	Korahe	Sherosh	Significant invasion
4	Korahe	Shilabo	Significant invasion
5	Warder	Boh	Significant invasion
6	Warder	Warder	No invasion

Figure 26. Severity of *P. juliflora* invasion in Afar.



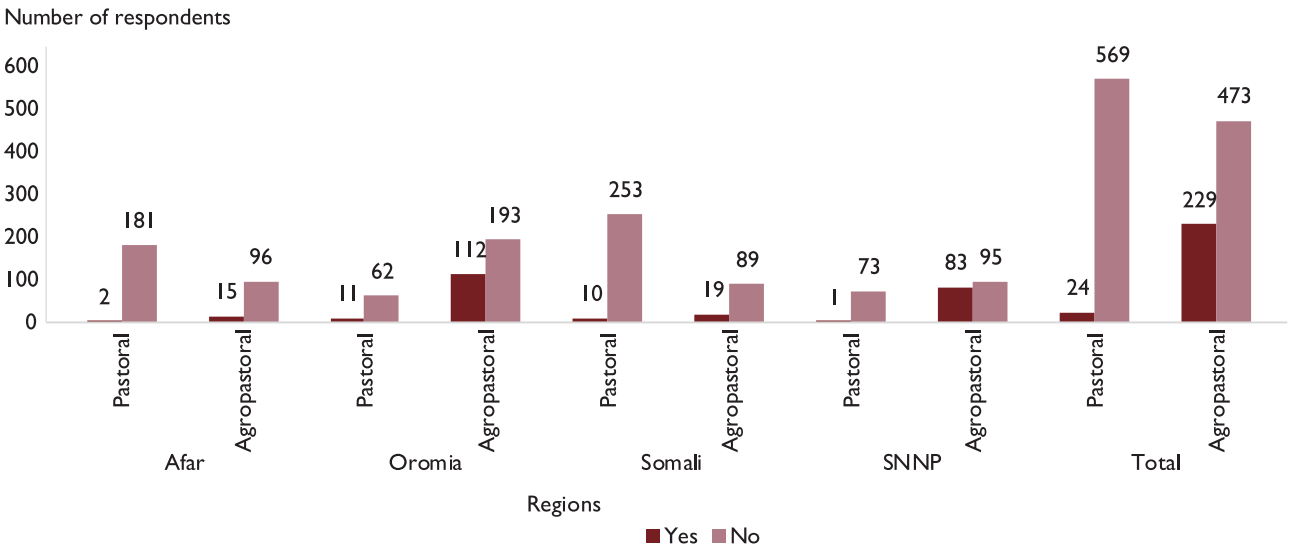
No	Z_NAME	W_NAME	K_NAME	Rate
1	Zone 01	Afambo	Humadoyeta	Significant invasion
2	Zone 01	Afambo	Alesabulo	Significant invasion
3	Zone 01	Mile	Sene'asna kusrtu	Significant invasion
4	Zone 01	Mile	Kailuna asmelmed kudu	Significant invasion
5	Zone 01	Mile	Hersisna be'adelu	Significant invasion
6	Zone 01	Chefera	Mesgidna Sisibli	No invasion
7	Zone 01	Chefera	Ade ar Ena Halsaya	Significant invasion
8	Zone 01	Afambo	Mego	Significant invasion
9	Zone 04	Teru	Digdiga	Little invasion
10	Zone 04	Teru	Namaara	Little invasion
11	Zone 04	Teru	Alelo	Significant invasion
12	Zone 04	Yalo	Mesgid	Significant invasion
13	Zone 04	Yalo	Dibina	Significant invasion

7.2 Individual/household private land for livestock

Distribution of and access to individual/household land for livestock

Of the 1,295 households interviewed through the survey in the four regions, 253 (19.54%) reported to have an enclosure or other individual/household landholding they use for household livestock, while 1,042 (80%) households replied that they did not have any. In all the regions the number of agro-pastoral 'owning' private land for livestock was higher than that of the pastorals (Figure 27). Of those having an enclosure or individual landholding used for livestock, the largest (48.62%) response came from households in Oromia region. Of those having enclosures, 17 are female-headed households (12 from Oromia, 2 from the Somali region and 3 from SNNPR) and none from Afar.

Figure 27. Responses of sampled households by region as to whether they have an enclosure or other private landholding region.



FGDs gave a different result—in the Somali region it was said that there were no individual grazing lands, no enclosures and all grazing lands were managed communally. In SNNPR, responses were mixed with individual grazing lands concentrated in a few *woredas* such as South Ari. In Afar, it was said that 'most' resources are managed communally. In Oromia, individual grazing areas were mainly concentrated in Guji zone.

Investments in individual/household land for livestock

Only 20 households—7.91% of the 253 households that had individual/household grazing land (or 1.54% of the total 1,295) replied that SLM (land improvement) investments had been made in these areas over the survey period. This indicates that despite land being operated privately by individuals/households the investment in SLM in grazing areas remains negligible. Similar to the response indicated above, of the 20 households that mentioned having invested in SLM, 13 were from Oromia, 6 from Afar, 1 from SNNPR and none from Somali region. Of these 6 were agro-pastoral households in Afar, 12 agro-pastoral and 1 pastoral in Oromia and 1 agro-pastoral in SNNPR showing that the occurrence of investment is higher in agro-pastoral system than in pastoral ones. Of the 20 households, only 1 female-headed household from Oromia undertook SLM (improvement) on individual/household land for livestock and the rest were male-headed households.

Supplementary feeding of livestock was mentioned most commonly in SNNPR and in two *woredas* in particular (South Ari and Selamago) where a variety of feeds were provided to livestock including cut grass, enset residue, banana residue, elephant grass (said to be grown), crop residues and 'vernoni mycroephela'. In a very few *woredas* (including Mille-Afar) livestock keepers are purchasing livestock feed in times of need. However, the most common response to the question 'what do you do if there is not enough grazing?' was 'we move elsewhere'.

Types of investments

The types of investments made in individual/household land for livestock vary and are listed below. It should be noted, however, that several of the 20 individuals/households were involved in different sets of activities. A number of SLM investments were also mentioned in the FGDs, particularly in SNNPR where the community works together providing labour for activities such as bush clearing, water harvesting, planting trees, terracing, clearing stones and soil conservation, some of which is supported by government and/or PSNP. The type of investments made on privately operated lands include bush clearing, well-irrigation digging, levelling, stone clearing, dam checking, ditch drainage, live fence/barrier construction and water harvesting.

In general, as observed from the data, one household could be involved in different land improvement activities. For instance, a household from Afar (zone 1, Afambo *woreda*, Mego peasant association/*kebele*) was involved in well and canal irrigation, grass stripping, fence construction, water harvesting, and bush/invasive species clearing by cutting and fire. There are also other households involved in three to five activities in Afar region.

A household from SNNPR (South Omo, South Ari *woreda*, Ayanale PA/*kebele*) was involved in five activities (tree planting, stone clearing, stone terrace construction, coil bund and bush/invasive species clearing by cutting). The maximum number of activities a household was involved in Oromia was three. This highlights the fact that individuals/households are prepared to make significant investments in land management.

7.3 Communal land for livestock

Distribution of and access to communal land for livestock

The vast majority of survey respondents (1,083 households) said that they had access to communal lands (Table 82). Some of the 'no' responses required clarification but could be related to drought or increase of cropping. In SNNPR, it is clear that the responses reflect more intensive mixed cropping systems are found in some agro-pastoral *woredas* (Selamago and South Ari).

Table 82. Do you have access to communal land for livestock?

Region	Yes	No	Total
Afar	242	52	294
Oromia (Borana)	338	40	378
Somali region	332	39	371
SNNPR (South Omo and Bench Maji)	171	81	252
Total	1,083	212	1,295

Unsurprisingly the priority use of these communal lands is for grazing (92% in Afar, 96% in Oromia, 97% in Somali and about 98% in SNNPR) (Table 83).

Table 83. Priority uses of communal lands by household

	Growing crops	Growing vegetables	Grazing land	Growing fodder for livestock	Making hay	Drought grazing reserve
Afar	15	1	222	1	0	3
Oromia (Borana)	8	O	324	0	4	2
Somali region	2	3	321	0	0	6
SNNPR (South Omo and Bench Maji)	3	0	168	0	0	0

Table 84 highlights the multiple uses by communities of grazing areas, including for wet and dry season grazing. Drought season grazing reserves were found only in Oromia (7 responses) together with the majority of communal grazing enclosures (18 of the 20 mentioned) as well as 1 communal livestock fattening enclosure.

Table 84. Use of different communal grazing areas in the four regions (number of responses) by season

Region	Wet season grazing area	Dry season grazing area	Year round grazing area	Drought reserve	Forest land	Mineral lick	Communal grazing enclosure	Communal livestock fattening enclosure	Other	Total
Afar	223	264	11	0	2	0	1	0	0	501
Oromia (Borana)	149	246	228	7	1	1	18	1	2	653
Somali region	173	149	203	0	0	0	0	0	101	626
SNNPR (South Omo and Bench Maji)	83	122	184	0	0	0	1	0	0	390
Total	628	781	626	7	3	1	20	1	103	2,170

Note: The large number of responses for 'other' in Somali region used for fire wood and charcoal making.

A significant number of grazing areas (626 households) are used all year round. This suggests that traditional patterns of movement and use of wet and dry season grazing areas is being reduced to four and three months, respectively. Only one respondent mentioned using a mineral lick—in Oromia.

According to the survey findings and the large number of grazing areas across *kebele* and *woreda,* it is clear that many grazing areas are shared. FGDs confirmed this with the majority of respondents saying that grazing areas were shared across *kebeles* and often across *woredas*, too. In Afar, it was mentioned that the livestock keepers from Amhara also share grazing (Samurabi); and pastoralists from Abala *woreda* go to Tigray.

A small number of respondents said that payment is made for using the communal grazing lands (1.29% of total responses). Of this percentage, the largest number of responses was from Oromia (46.43%), followed by Afar (39.33%) and Somali region (14.3%). It is anticipated that this is due to communal enclosures being established in these areas—but requires further investigation.

In the FGDs, communities in Oromia confirmed that there are a number of grazing areas in all the *woredas* in this study, excluding those found in Guji zone, where it was said that there was no communal grazing areas in Didole (Bule Hora [Surro Barguda]), Giwwee Badiyaa (Gelana), Samaoo and Wadomike (Abaya). In the Afar and Somali regions, none of the *kebele* respondents said that they did not have grazing areas, with the majority managed communally.

In SNNPR, some grazing areas are managed communally and some individually—individual grazing areas are found only in Nyangatom, Selamago and South Ari. Though FGD respondents said that some community members go outside the *kebele*/*woreda* to graze on communal lands. In South Ari, grazing lands have been privatized for many years now and it was also mentioned that the *kebele* has started processing landholding certificates for these individual grazing areas.

Management of communal lands

The responses regarding the management of the communal grazing lands in the four regions revealed the absence of management to be the most frequent response across all regions—more than 50% in each region (Table 85). In Oromia and SNNPR, the greatest number of responses for local management (customary head, customary rangeland leader, livestock cooperative, community or 'I manage') were obtained, with the largest number in Somali region (n = 275) responding that the local government managed the communal grazing land.

Table 85. Responses of the sampled households regarding who manages the communal grazing lands

Region	C-head	CR-leader	RMC	Livestock cooperative	Local government	All community	I manage the land	Not managed	Other	Total
Afar	4	2	0	2	2	79	14	398	0	501
Oromia (Borana)	28	25	18	0	31	106	51	391	2	652
Somali region	2	0	0	1	275	37	0	310	0	625
SNNPR (South Omo and Bench Maji)	27	12	4	0	0	131	2	213	0	389
Total	61	39	22	3	308	353	67	1,312	2	2,167

C-head = Customary head

CR-leader = Customary rangeland leader

RMC = Rangeland management committee

Answers to another question, asking 'who gives permission to use this communal lands', revealed that in most cases it is a household decision. A second question, asking 'who makes decisions about use of these communal lands?' reveals a majority response of 'I do'. All these results indicate that customary institutions and leaders are playing a decreasing role in decisions about communal lands—with individuals and/or government making decisions in most cases.

The FGDs revealed mixed responses to questions on management. In Oromia, mention was made of customary leaders, grazing committee, elders (Teltele, Bule Hora [Surro Barguda], Yabello, Gelana; Dillo; Dirre). In other *kebeles* the administration or other local government was said to be the manager of grazing lands (Abaya). In Dire it was mentioned that penalty money may have to be paid for overgrazing. No certification of grazing areas was mentioned (in all *kebeles*). However, in all instances the FGD revealed that communities felt the land belongs to them. No payment of use was mentioned by any *kebele* in the FGD.

In Afar, the managers of grazing areas were said to be 'community grazing committees' or 'not managed'. No payment for access was mentioned. There is no certification of grazing lands and communities feel that the land belongs to them. No conflicts over grazing areas were mentioned.

In SNNPR, private grazing areas are managed by the 'owner' and it was said that communal areas are managed by community 'supervisors'. Land certification was only mentioned in South Ari. In general, communities said they felt that the land belongs to them. The exception was Nyangatom where communities had been recently settled and they complained that there was no water and they had to move elsewhere to access this—they felt that the land did not belong to them.

In Somali region, communities said that most grazing areas are shared with neighbours from other *kebeles* without problems. In general, it was said that no permission is required to access grazing. At the same time the majority of communities said that the grazing areas are 'not well-managed'. Exceptions to this were in Moyale where a 'community grazing committee' was mentioned and in Shilabo where it was said that the community managed the land well and prevented any private holdings (Lasole *kebele*).

Cross-border sharing and movements

Some *woredas* in Oromia (Moyale, Dire and Dillo) described how they share grazing with neighbours from Kenya. This is done peacefully without conflict. Sometimes they themselves travel to Kenya more than 200 km to access grazing there (Dire). No cross-border sharing of grazing areas was mentioned in Afar. In SNNPR, communities mentioned that grazing is shared with both Sudanese and Kenyans (Dasenech and Nyangatom); and in Somali region sharing of grazing occurs with pastoralists from Puntland (Boh *woreda*).

Conflicts and conflict resolution

In general, considering the stresses that pastoralists and agro-pastoralists face on a daily basis, conflicts are minimal. In FGDs, some small conflicts between neighbouring *kebeles* and between livestock herders and crop farmers were mentioned in Oromia, Afar (Afambo *woreda*), in SNNPR (South Ari) and once in the Somali region over grazing (Duhun). Additionally, conflicts over people cutting trees in SNNPR (South Ari) were mentioned.

More serious conflicts were described between:

- pastoralists in Borana and in SNNPR (Teltele and Hamer); and
- Oromia and Somali pastoralists in the regional border areas including Moyale.

Conflicts reported included between Guji and Burji (Bule Hora [Surro Barguda]); Selamago and Konso; Dasenech and Nyangatom with Kenyan pastoralists in SNNPR; and between in-coming pastoralists from Sudan in SNNPR. No serious conflicts were mentioned in the Somali region.

In Oromia, community leaders take a central role in conflict resolution, with government support if required. In Afar, it is clan leaders (Afambo). In SNNPR, small conflicts are resolved locally but cross-border conflicts involve Kenyan and Ethiopian governments. In SNNPR, it was said that there was a peace-building platform established to resolve conflicts between Ethiopian and Kenyan pastoralists in order to share grazing areas (as mentioned in both Nyangatom and Dasanech *woredas*).

Challenges of communal grazing lands

Different challenges were reported by the sample households in the four regions as described below (Table 86).

Table 86. Three greatest challenges of the communal grazing land in the different regions

Region	Challenges		
	First	Second	Third
Afar	Low quantity of grass	Low quality of grass	Low quality of grass and wild animals
Oromia (Borana)	Too many livestock for the available resource	Low quality of grass	Low quality of grass
Somali region	Wild animals	Low quality of grass	Wild animals
SNNPR (South Omo and Bench Maji)	Too many livestock for the available resource	Conflict with other clan	Conflict with other clan

In FGDs, the challenges to sustainable management of livestock and land resources included:

- drought or lack of rainfall (Oromia, Afar, Somali),
- lack of water or far distance to water point (Oromia),
- lack of grass or grazing land (Oromia, SNNPR, Somali),
- distance to grazing area (SNNPR),
- the place we move to during drought can be unclean and make livestock sick,
- people bring in sick livestock (Oromia, Somali),
- cattle/animal disease (Oromia, Afar),
- inadequate and insufficient veterinary services (Afar),
- land invaded by bush (Oromia, SNNPR),
- invasion by *P. juliflora* (Afar, Oromia, Somali),
- wind (Oromia),
- less economic power than in the past (Oromia), and
- wild animal attack on livestock (Afar, Somali).

In the Somali region nearly all *woredas* complained of wild animal attack.

Sustainable land management (investment) in communal grazing lands

Only 2.47% of the 1,295 households interviewed had made investments in the communal grazing land (Table 87)—32 households compared to 20 who undertook investment in individual grazing lands as reported earlier. However, if the percentage of those that had access to both is compared, the percentage of those with access to individual/household lands and making investments in them, is greater than those with access to and investing in communal lands.

Table 87. Have any sustainable land management (land improvement) investments been made in the communal lands used for livestock?

Region	Yes	No	Total
Afar	3	291	294
Oromia (Borana)	11	367	378
Somali region	16	355	371
SNNPR (South Omo and Bench Maji)	2	250	252
Total	32	1,263	1,295

Considering production systems, a greater total number of agro-pastoral households made investments on communal lands than pastoral households (Table 88). However, there is variation across regions—in Afar more pastoralists made investments and in the Somali region an equal amount of agro-pastoral and pastoral households made investments.

Of the total female households that have access to communal grazing areas (116), 4 (3.4%) had made investments in the communal lands—2 from Oromia and 2 from the Somali region.

Table 88. Number of households who made land investments on communal lands

Region	Livelihood	Yes	No	Total
Afar	Pastoral	3	180	183
	Agro-pastoral	0	111	111
	Total	3	291	294
Oromia (Borana)	Pastoral	2	71	73
	Agro-pastoral	9	296	305
	Total	11	367	378
Somali region	Pastoral	8	255	263
	Agro-pastoral	8	100	108
	Total	16	355	371
SNNPR (South Omo and Bench Maji)	Pastoral	0	74	74
	Agro-pastoral	2	176	178
	Total	2	250	252
Total	Pastoral	13	580	593
	Agro-pastoral	19	683	702
	Total	32	1,263	1,295

The type of investment made on communal lands used for livestock include ponds, wells, stone clearing, soil bunds, check dams, drainage ditches, live fences/barriers and constructed fences. Again, it should be noted that several of the 32 individual/households were involved in different sets of activities. For example, one household from Shilabo, the Somali region (Danbaad PA) undertook four activities (live fence/barrier construction, fence construction, and bush/invasive species clearance by cutting and fire.

Two other households (Yabello *woreda*, Dharito PA/*kebele*) undertook pond/well construction, stone clearance, and stone terrace construction (one household) and the other household undertook stone terrace construction, and bush/invasive species clearance by cutting and fire.

Seventeen households (1 in Afar, 2 in Oromia, 14 in the Somali and none in SNNP regions) reported that they got support from outside organizations for the investment. Of those who made investment, 53.13% got support from outside organizations.

7.4 Individual/household land for crop farming

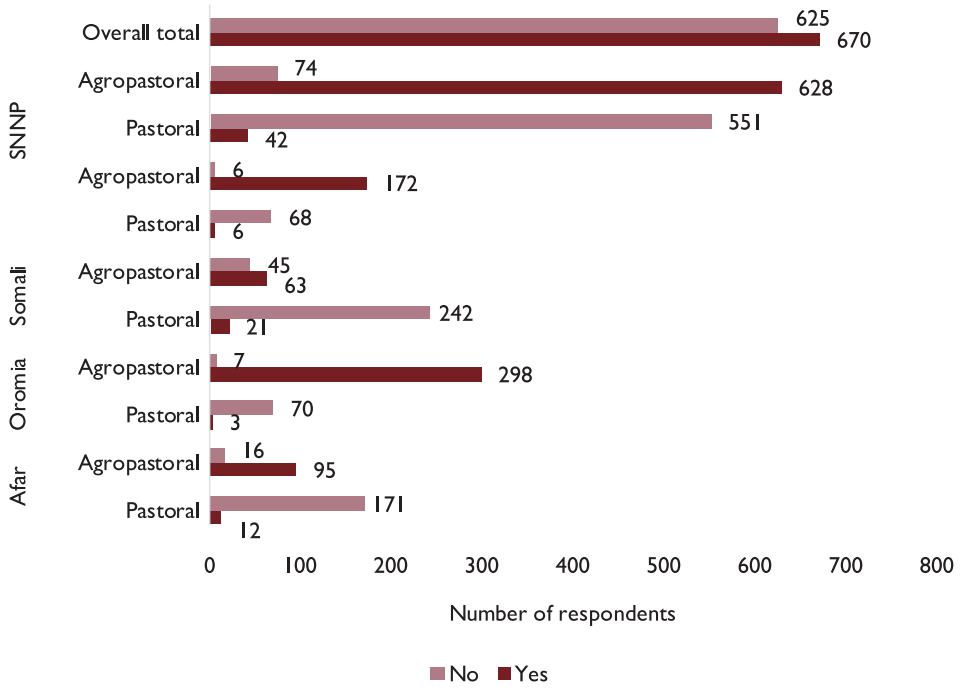
Distribution of land for crop farming

Of the total sampled households, 51.74% have private land for cropping although the extent of ownership varied among the regions (Figure 28). The highest instance of private land for cropping is found in Oromia and SNNPR, where 79.63% and 70.64% operated private lands, respectively.

Taking livelihood production system into account, however, of the 670 households that responded positively, 42 households (6.27% of the households responding positively to the question of having private cropping land; but only 3.2% of total households) are pastoralists. The information on distribution per *woreda* shows that cropping is concentrated in certain *woredas*.

Looking at the gender responses, 53 female-headed households (7.91% of households with private land for cropping and 4% of total household respondents) have access to private land for cropping. These were: 7 from Afar, 25 from Oromia, 15 from the Somali region and 6 from SNNPR.

Figure 28. Number of households having private land for cropping.



In Oromia, cropping was mentioned in all *kebeles* excluding two in Dilo and one in Yabello. In SNNPR, all *kebeles* have some cropping with new livelihoods being mentioned such as honey production and motorcycle transport. Despite this, in all *kebeles* across all regions, livestock is the main income-generator.

The most popular crop across all regions is maize with other crops including teff, haricot bean, wheat, barley, groundnut, millet (SNNPR), sorghum (SNNPR, the Somali region), chat (Afar, Somali region) and coffee (Oromia). Furthermore, there was little mention of fertilizer being used (natural or synthetic). In the Somali region, only rainfed agriculture was mentioned across all *kebeles*.

In Afar, some *kebeles* mentioned crop growing (Chifra, Afambo, Mille) while others said that there was no crop growing (Teru, Yallo). In Afambo *woreda* in Afar, vegetable growing by irrigation has become a new livelihood in the last five years. Another crop grown under irrigation is maize. However, despite the increase in the number of crop growing, livestock remains the most important income earner. No FGD said they used fertilizer in crop growing. Crop areas are individually owned and managed. No FGD said that certificates for land had been provided. Despite this in general, communities feel that the land belongs to them.

According to FGDs, in Oromia and Afar in the majority of cases it was government authorities that managed the land used for cropping. In SNNPR, in general, individuals managed their cropping areas. In the Somali region, most cropping is managed individually, but in Shekosh *woreda,* communal cropping was mentioned. No FGD said that fertilizer was used. Only in Shekosh *woreda* was it mentioned that land certificates had been provided for cropping land. A significant problem mentioned by nearly all *kebeles* in the Somali region is loss of crops to wild animals such as warthogs.

In Oromia, some *kebeles* stated that land certificates have been provided for cropping lands. In other *kebeles* community members said that they pay tax on the cropping land even if they do not have certificates. In all *kebeles*, it was said that the community feels that the land belongs to them.

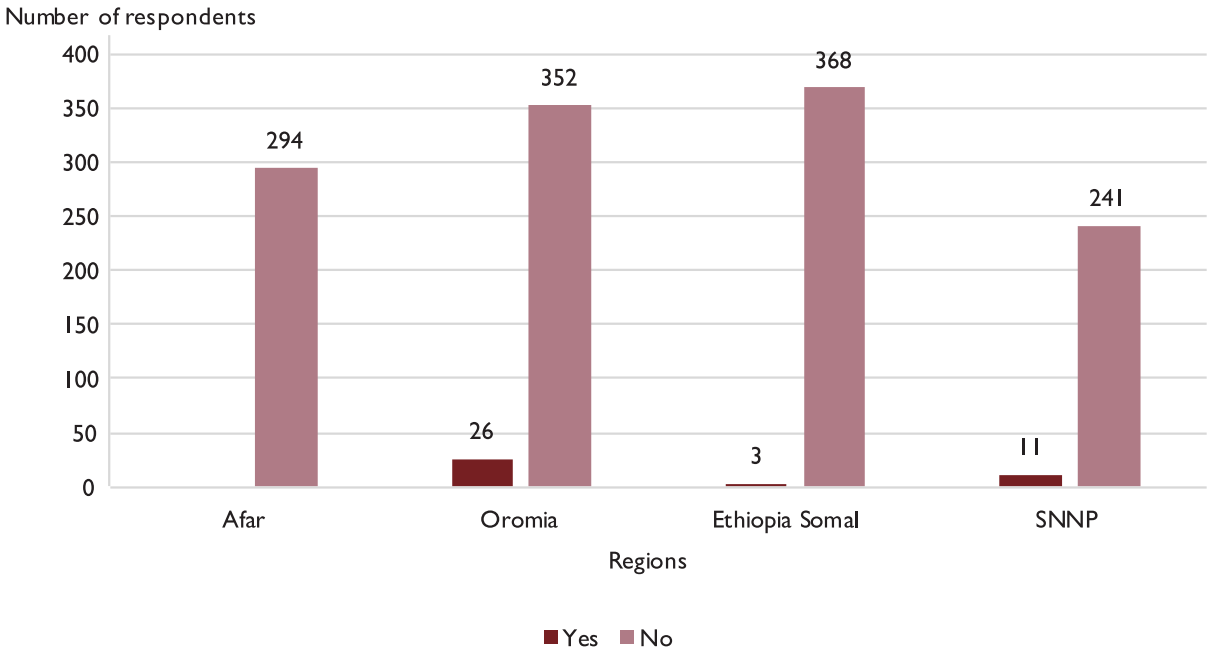
Sustainable land management (improvement) investment on private land for cropping

Of those households having private land for cropping (670 households) only 89 households (13.22%) in the four regions (Afar = 42; Oromia/Borana = 33; the Somali region = 6 and SNNPR = 9) undertook land management/land improvement in private land for cropping over the last year. The investment by production system revealed that more agro-pastoralists invested in the land than pastoralists. The most common practices exercised by the households were canal irrigation, fence construction and bush or invasive species clearance by cutting.

7.5 Livestock routes

None of the respondents from Afar moved their livestock to a neighbouring country during the survey period. Of the respondents in Oromia, the Somali region and SNNPR, only 6.88%, 0.81% and 4.37%, respectively, moved their livestock to a neighbouring country (Figure 29).

Figure 29. Livestock moblity to neighbouring country.



Regarding the country where the livestock were moved, 39 households reported to move their livestock to Kenya while 1 respondent from SNNPR indicated to move his/her livestock to Sudan.

The three most frequent months where the livestock were moved were Tikemet (October), Sene (June) and Hamle (July) but there was variability among regions. For instance, for the Somali region, the months were Thasas (December) and Tir (January). Thirty-seven households (92.5%) replied that they have returned their livestock back while the remaining seven did not.

8. Market infrastructures and market information services

8.1 Market access

Market access, as measured by distance to nearest livestock market, varies considerably across households and across regions (Tables 89 and 90). Market users travel between less than an hour to more than two days to reach market places. Between 62.8% (Afar) and 75.3% (SNNPR) of market users travel a maximum of 5 hours to get to markets. Between 20% (Somali region) and 38% (Borana) of market users travel 1–3 hours to reach the nearest market, while between 16% (Somali region) and 26% (Afar) of market users travel 3–5 hours. Interestingly, between about 4.5% (Somali region) and 7.5% (Borana) of market users travel for one day and between 4.5% (SNNPR) and 10.4% (Borana) of market users travel for two days to reach market places. About 15% of market users in Somali and 7.6% in Afar travel for more than two days. Some households use more than one market place to sell their animals.

Table 89. Market distance from home (all households)

	Adjacent	< 1 hour	1–3 hours	3–5 hours	5–8 hours	1 day	2 days	>2 days
Afar (%)	0.00	6.69	29.94	26.16	13.08	6.98	9.59	7.56
Oromia (Borana) (%)	0.00	6.84	38.27	21.17	13.19	7.49	10.42	2.61
Somali region (%)	0.00	33.65	19.91	15.64	5.92	4.50	4.98	15.40
SNNPR (South Omo and Bench Maji) (%)	0.35	21.95	28.92	24.39	12.89	6.97	4.53	0.00
Total (%)	0.06	16.20	30.29	21.36	11.28	6.54	7.86	6.42

Market access seems to be much more of a challenge in pastoral than in agro-pastoral areas in Afar, Borana and SNNPR where between 21% and 35% of market users in pastoral areas travel for a day or more, but only between 5% and 16% of market users in agro-pastoral areas travel for a day or more (Table 90). The Somali region seems to demonstrate the opposite, where 22% of market users in pastoral areas, but 31.8% of users in agro-pastoral areas travel for a day or more.

Table 90. Market distance from home by livelihood zone (pastoral and agro-pastoral)

Region	Pastoral									Agro-pastoral						
	Adjacent	<1 hour	1–3 hours	3–5 hours	5–8 hours	1 day	2 days	> 2 days	0	< 1 hour	1–3 hours	3–5 hours	5–8 hours	1 day	2 days	>2 days
Afar (%)	0.00	6.93	27.27	24.68	10.82	9.09	12.55	8.66	0.00	6.19	35.40	29.20	17.70	2.65	3.54	5.31
Oromia (Borana) (%)	0.00	0.00	31.53	18.02	17.12	6.31	15.32	11.71	0.00	8.35	39.76	21.87	12.33	7.75	9.34	0.60
Somali region (%)	0.00	39.13	21.40	12.71	4.68	3.01	4.68	14.38	0.00	20.33	16.26	22.76	8.94	8.13	5.69	17.89
SNNPR (South Omo and Bench Maji) (%)	0.00	21.57	5.88	9.80	27.45	35.29	0.00	0.00	0.42	22.03	33.90	27.54	9.75	0.85	5.51	0.00
Total (%)	0.00	20.81	23.84	17.34	10.40	7.95	8.67	10.98	0.10	12.92	34.87	24.21	11.90	5.54	7.28	3.18

8.2 Market use frequency

The most common frequency of market use in Afar, Borana and SNNPR is once a week (Tables 91 and 92). In these regions, between 61% (SNNPR) and 82% (Borana) of market users use markets once a week. In the Somali region, the most frequent use of markets are once a month (43% of users) followed by once a year (42% of users). It will be interesting and useful to find out the reasons for the low frequency of market use in the Somali region. About 9% of market users in Afar use the markets every day.

Table 91. Frequency of market usage by households by livelihood zone (%)

Region	Pastoral				Agro-pastoral			
	Every day	At least once a week	At least once a month	At least once a year	Every day	At least once a week	At least once a month	At least once a year
Afar	13.0	66.2	19.9	0.4	1.8	78.8	18.6	0.9
Oromia (Borana)	1.8	75.7	16.2	5.4	1.2	83.3	13.9	1.6
Somali region	1.3	4.7	45.5	39.1	0.0	2.4	36.6	49.6
SNNPR (South Omo and Bench Maji)	2.0	19.6	76.5	2.0	0.0	69.8	28.5	1.3
Total	5.3	37.7	34.5	18.1	0.8	69.3	20.8	7.5

Table 92. Frequency of market usage by households (total) (%)

Region	Total			
	Every day	At least once a week	At least once a month	At least once a year
Afar	9.3	70.3	19.5	0.6
Oromia (Borana)	1.3	81.9	14.3	2.3
Somali region	0.9	4.0	42.9	42.2
SNNPR (South Omo and Bench Maji)	0.3	60.8	37.1	1.4
Total	2.7	56.2	26.5	11.9

8.3 Marketing services and market fees

Marketing services

Services related to markets and marketing are very limited in the study areas. The only significant services that market users receive are veterinary drug stores and feed markets. Dipping points, transport services, vaccinations and breeding services are rarely available for market users. However, these marketing services are relatively more widely available in Borana and SNNPR and very limited in Afar and the Somali region.

According to respondents, the most important marketing challenges faced by livestock sellers are market access, lack of market infrastructure and market information, involvement of brokers and insufficient buyers. However, the importance of these marketing challenges varies from region to region, the challenges seem to be most serious in Borana, SNNPR and the Somali region, while respondents in Afar do not seem to be too concerned about these challenges.

Market fees

Cattle marketing fees are applied in some places and not in others. Overall, an average of ETB32.83 is paid as marketing fee for cattle. Average marketing fees per cattle (among those who sold livestock) ranged from ETB15.77 (SNNPR) to ETB71.72 (the Somali region) (Tables 93 and 94). There are significant differences in cattle marketing fees between pastoral and agro-pastoral areas in Afar and Borana, while there is no significant difference in SNNPR and the Somali region (Table 95).

Like cattle, market fees for shoats are applied in some places and not in others. The shoats marketing fees range from ETB5.20 (Afar) to ETB17.66 (Somali region). Marketing fees for shoats did not vary significantly between pastoral and agro-pastoral areas, except in SNNPR, where the fees are significantly higher in pastoral areas (Table 96). Camel marketing fees are also applied in some markets and not in others. Camel marketing fees ranged from ETB24.97 (Afar) to ETB109.23 (Somali region). No camels are reared in SNNPR. Marketing fees seem to show significant differences across regions, except in the Somali region.

Table 93. Market fees by species of animals total (mean in ETB)

Region	Total		
	Cattle	Shoat	Camel
Afar	17.51 (17.35)	5.02 (4.93)	24.97 (18.03)
Oromia (Borana)	28.59 (17.79)	11.48 (6.09)	49.65 (27.34)
Somali region	73.44 (45.97)	17.49 (8.98)	109.23 (41.22)
SNNPR (South Omo and Bench Maji)	15.39 (5.05)	6.78 (2.69)	NA
Total	30.19 (28.34)	10.97 (7.67)	52.20 (40.56)

NA = not available

Table 94. Market fees by species of animals by livelihood (mean in ETB)

Region	Pastoralist			Agro-pastoralist		
	Cattle	Shoats	Camel	Cattle	Shoat	Camel
Afar	19.71 (19.75)	5.20 (5.56)	27.39 (18.66)	13.90 (11.69)	4.65 (3.23)	21.17 (16.37)
Oromia (Borana)	25.04 (8.48)	11.22 (3.62)	40.62 (15.72)	29.41 (19.23)	11.55 (6.54)	52.32 (29.42)
Somali region	71.72 (47.32)	17.66 (9.55)	107.65 (40.79)	75.93 (44.27)	17.06 (7.39)	111.84 (42.21)
SNNPR (South Omo and Bench Maji)	15.77 (6.07)	8.50 (2.42)	Na	15.34 (4.94)	6.60 (2.67)	NA
Total	32.83 (33.68)	11.47 (8.83)	52.08 (42.77)	28.89 (25.20)	10.65 (6.79)	52.29 (38.82)

NA = not available

Table 95. Market fees for cattle by livelihood (mean in ETB)

Region	Pastoralist	Agro-pastoralist	P-values for mean difference
Afar	19.71 (19.75)	13.90 (11.69)	0.0107
Oromia (Borana)	25.04 (8.48)	29.41 (19.23)	0.0232
Somali region	71.72 (47.32)	75.93 (44.27)	0.6070
SNNPR (South Omo and Bench Maji)	15.77 (6.07)	15.34 (4.94)	0.7759

Table 96. Market fees for shoats by livelihood (mean in ETB)

Region	Pastoralist	Agro-pastoralist	P-values or mean difference
Afar	5.20 (5.56)	4.65 (3.23)	0.4223
Oromia (Borana)	11.22 (3.62)	11.55 (6.54)	0.6231
Somali region	17.66 (9.55)	17.06 (7.39)	0.6398
SNNPR (South Omo and Bench Maji)	8.50 (2.42)	6.60 (2.67)	0.0327

Table 97. Market fees for camel by livelihood (mean in ETB)

Region	Pastoralist	Agro-pastoralist	P-values for mean difference
Afar	27.39 (18.66)	21.17 (16.37)	0.0087
Oromia (Borana)	40.62 (15.72)	52.32 (29.42)	0.0011
Somali region	107.65 (40.79)	111.84 (42.21)	0.5770
SNNPR (South Omo and Bench Maji)	NA	NA	NA

NA = not available

8.4 Market infrastructure and market information

Market infrastructure

Livestock market infrastructure is generally limited in the study area. Livestock resting places are available for limited proportion of market users. Only between 6.1% (SNNPR) and 15.1% (Somali region) reported having access to livestock resting places. There does not seem to be significant difference in the availability of livestock resting places between pastoral and agro-pastoral areas.

Access to watering points at market places is also limited, except in SNNPR. Between 5.3% (Borana) and 9.9% (Afar) reported access to watering points in Afar, the Somali region and Borana. About 37.3% reported access in SNNPR. Access to feeding depots are even more limited, where a maximum of only 3% of users reported access to them. Dipping tanks are rarely available. Quarantine controls are rarely available expect in Afar where about 6.3% of market users reported access to. Loading ramps are also rarely available in the study area except in Afar, where about 62.1% reported access to.

Market information

Pastoral and agro-pastoral communities seem to have reasonable access to livestock price information, except in SNNPR (Table 98). Between 32.3% (Borana) and 70.9% (Somali region) reported access to livestock price information in Afar, Borana and the Somali region. Only about 14.3% of respondents reported access to livestock price information in SNNPR. However, the sources of livestock price information used are informal.

Pastoral and agro-pastoral communities depend on family members, clan members and neighbours for price information, rarely are the formal sources of price information such as extension agents, government offices, televisions, radios, newspapers, NGOs or association/cooperatives used as sources of price information. Interestingly the role of mobile phones in accessing price information has been reported by significant proportion of survey households. Between 6.8% (Afar) and 45.9% (SNNPR) of survey respondents reported mobiles as important means of accessing price information. About 21.6% in Borana and 23.6% in the Somali region reported mobile as means of accessing price information.

Table 98. Proportion of households who have access to livestock price information (%)

	Pastoral	Agro-pastoral	P-values for mean difference	Total
Afar	51.91	45.95	0.321	49.66
Oromia (Borana)	30.14	32.79	0.664	32.28
Somali region	71.86	68.52	0.519	70.89
SNNPR (South Omo and Bench Maji)	4.05	18.54	0.003	14.29
Total	52.11	36.75		43.78

Whether price information influences selling decision

In general, about 37.5% of livestock sellers reported that price information influences their decision to sell livestock (Table 99) The most influence on selling decision was reflected in Afar, where about 52.4% of sellers reported that price information influences their selling decision and the least influence seems to be in Borana, where about 22.4% of sellers reported influence. There is no difference in the proportion of households who reported influence of access to market information on selling decision by livelihood zone (Table 99). Among those who reported no influence of price information, the reasons given were unreliability of the information, untimeliness of the information and the need to sell anyways.

Table 99. Influences of price information on decision to sell (% of sellers who said yes)

	Pastoral	Agro-pastoral	P-values for mean difference	Total
Afar	48.96	58.82	0.254	52.38
Oromia (Borana)	22.73	22.33	0.968	22.40
Somali region	37.82	32.43	0.412	36.33
SNNPR (South Omo and Bench Maji)	66.67	35.29	0.283	37.84
Total	40.45	33.97		37.50

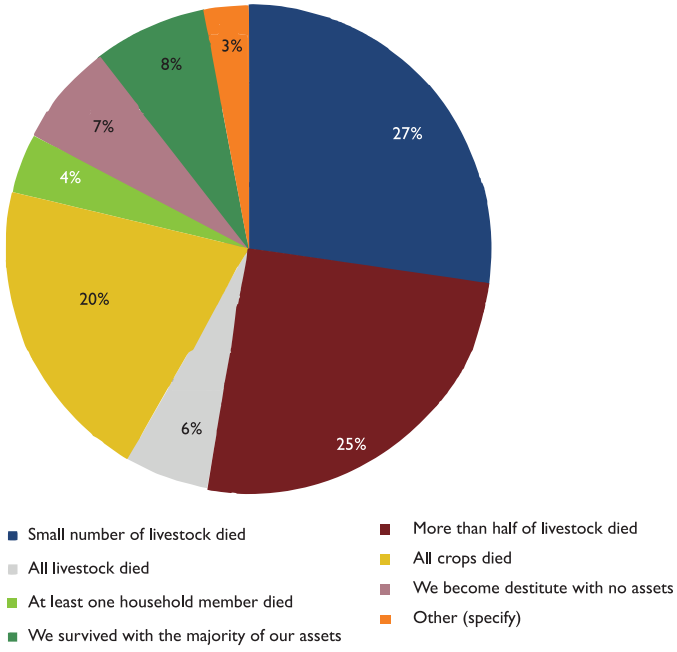
Pastoral and agro-pastoral communities also receive non-price market information such as information on disease outbreaks, number and type of buyers, transaction forms and conflict and security on route to markets. As with price information, the sources of non-price market information are predominantly informal, including family and friends, clan members and neighbours. Formal sources are not important sources of non-price market information for the pastoral and agro-pastoral communities. As with price information, mobile phones are emerging as important means of obtaining non-price market information.

9. Disaster risk management

9.1 Disaster risk

When asked to name the last disaster or major shock the household experienced, almost all disasters reported were droughts, with the majority experienced in 2016 (2008 Ethiopian calendar). Disasters affect households in many ways. Thus households were asked to give up to three effects the last disaster had on their household. In total, 2,015 answers were received, with more than half of them indicating effect on livestock, followed by crops losses (Figure 30).

Figure 30. Effects of disaster (% of responses received).



Overall, the most common response to disaster seems to be moving livestock only, or household and livestock, followed by selling livestock and dependence on food aid (Table 100). However, there were also major regional differences in how households coped with the last disaster. In Afar, most households decided to move, either livestock only or household and livestock. In SNNPR, selling livestock was more important than moving to other places and dependence on food aid. Resorting to saving and credit seem to be important in the Somali region and SNNPR.

Early warning was not in place for most households interviewed with only 0 to 22% of responding that they had received information about the disaster in advance. This is in line with findings of FGDs, where the lack of early warning was mentioned. This was in contrast to key informants at *woreda* level, who confirmed that early warning systems were in place. However, there seems to be a problem for information to reach communities in time. For those households which received information, the most important source was the traditional communication system. The relevance of any information received was demonstrated by the fact that a large majority of those who received information, used it to inform their actions to cope with the disaster.

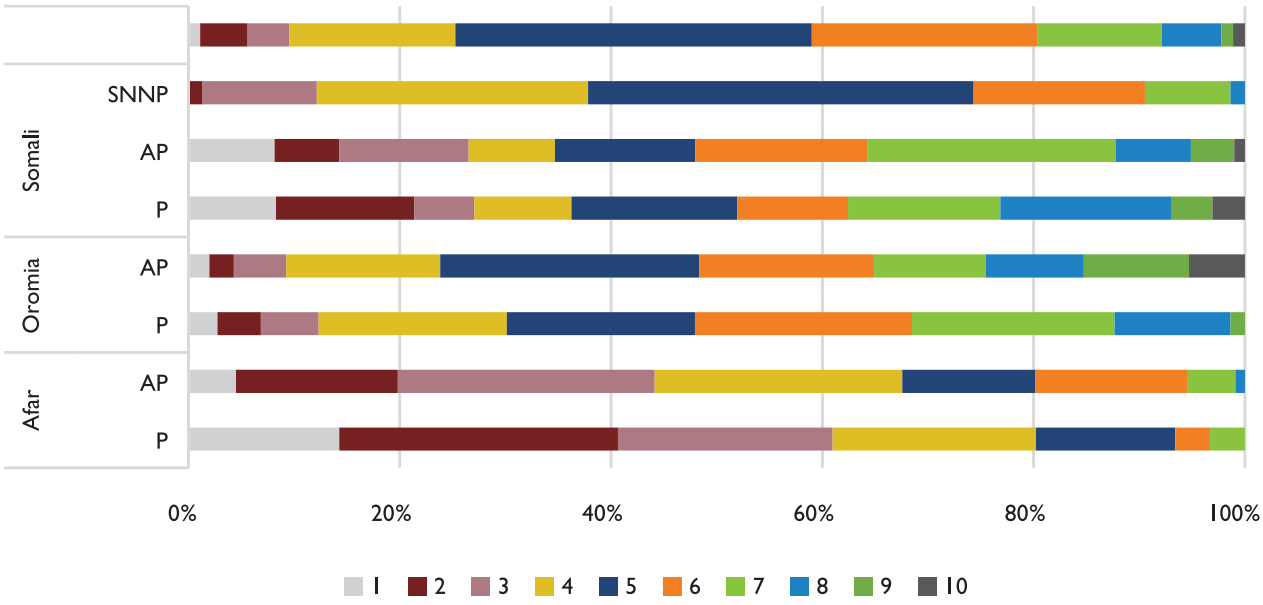
Table 100. Frequency of coping strategies in response to emergencies (by region)

	Oromia (Borana)	Somali region	Afar	SNNPR (South Omo and Bench Maji)s	Total
Move household and/or livestock	189	162	192	40	583
Moved household to neighbouring *kebele* with livestock	26	70	19	3	118
Moved household to neighbouring *woreda* with livestock	10	35	71	24	140
Moved household to neighbouring region with livestock	0	1	1	0	2
Moved household to neighbouring country with livestock	0	0	0	0	0
Moved livestock to neighbouring *kebele* and household remained	69	32	38	0	139
Moved livestock to neighbouring *woreda* and household remained	77	16	56	11	160
Moved livestock to neighbouring region and household remained	3	0	5	0	8
Moved livestock to neighbouring country and household remained	3	5	0	1	9
Moved household to neighbouring *kebele* without livestock	0	2	0	1	3
Moved household to neighbouring *woreda* without livestock	0	1	0	0	1
Moved household to neighbouring region without livestock	0	0	1	0	1
Moved household to neighbouring country without livestock	1	0	1	0	2
Sold livestock	121	52	33	91	297
Sold small number of livestock	93	39	6	81	219
Sold half of livestock	26	11	6	10	53
Sold all livestock	2	2	21	0	25
Consume less food	9	20	6	8	43
Adult ate less food	9	1	1	1	12
Children ate less food	0	11	0	1	12
Whole household ate less food	0	8	5	6	19
Depended on food aid/PSNP	24	34	30	65	153
Took food relief-distribution	0	29	6	11	46
Joined PSNP food/cash-for-work	22	0	8	9	39
Received food aid handouts	2	5	15	45	67
Received insurance	0	0	1	0	1
Savings/credit	19	49	5	40	113
Used savings	11	0	4	34	49
Borrowed money from family member	0	9	1	0	10
Borrowed money from friend	5	39	0	3	47
Borrowed money from community credit scheme	3	1	0	2	6
Borrowed money from bank	0	0	0	1	1
Diversification	4	10	3	4	21
Sold firewood or charcoal	0	3	1	1	5
At least one household member got a job earning cash	4	5	2	0	11
At least one household member joined the fighting	0	2	0	3	5
Other	12	44	25	4	85

9.2 Recovery

Recovery seemed to be especially difficult in Afar where over 90% of households estimated their level of recovery at 5 or below out of 10. Oromia and Somali regions had the highest recovery score (Figure 31)

Figure 31. Level of recovery after last disaster/shock.



Similarly, households in Afar had the longest time to recover, with more than 40% reporting that they were still recovering and more than 20% indicating that they would never fully recover (Figure 32).

In all regions, the majority of households mentioned that it has become more difficult to recover from shocks (65–92% of households per region). Amongst the reasons for difficulties to recover, loss of grazing land, climate change and lack of government assistance were the most prevalent reasons (Table 101).

Figure 32. Time to recover from disaster/shock.

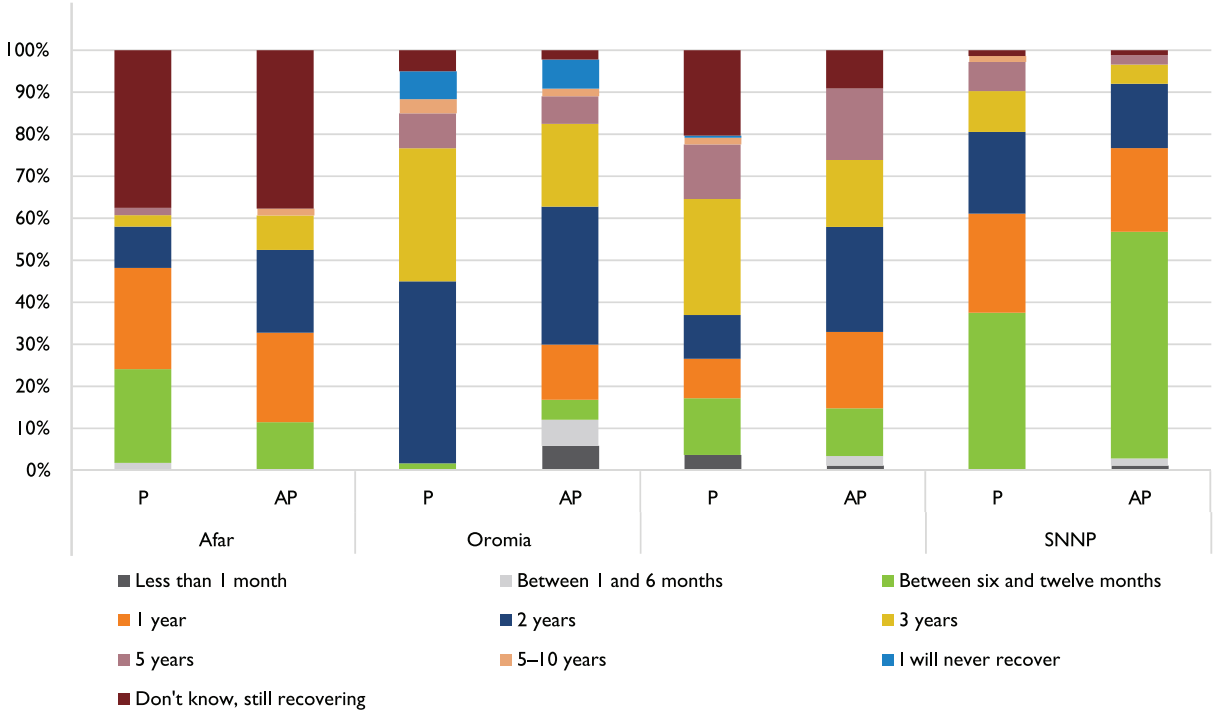
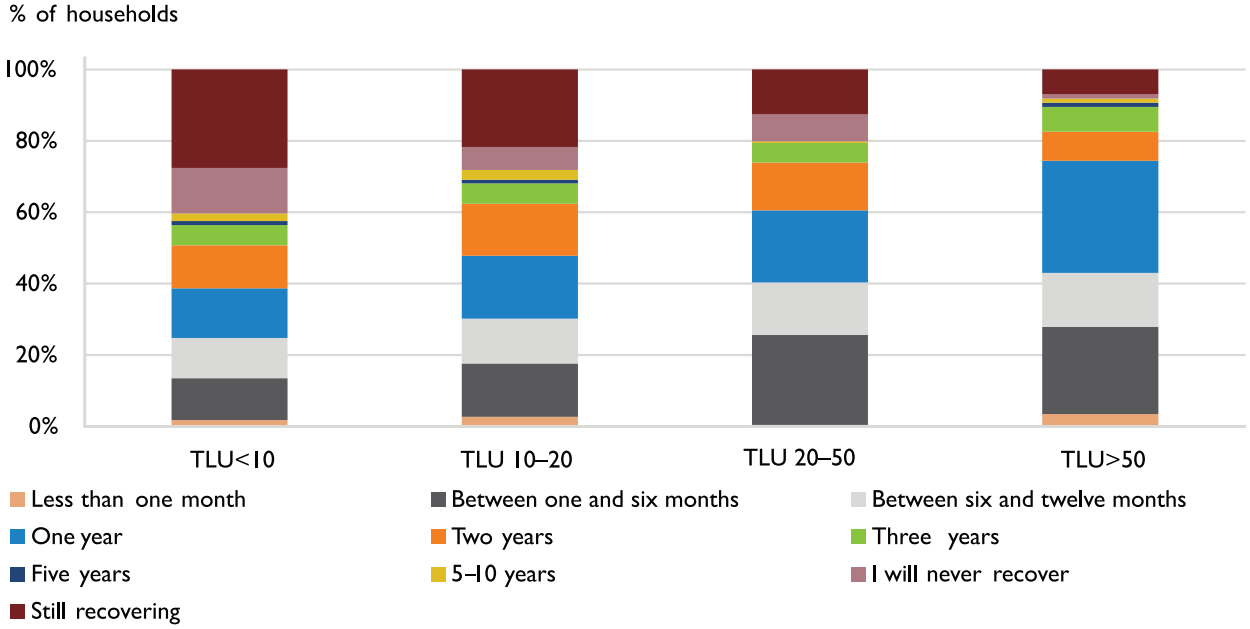


Table 101. Frequency of reasons that made recovery from disaster/shock more difficult

	Oromia (Borana)	Somali region	Afar	SNNPR (South Omo and Bench Maji)	Total
Loss of grazing areas	207	207	98	97	609
Climate change	229	129	74	49	481
Lack of government aid/assistance	102	123	126	38	389
Lack of loans	56	112	55	27	250
Loss of community support and help	6	80	78	10	174
Lack of NGO aid/assistance	33	74	30	30	167
Lack of jobs	24	36	43	9	112
Lack of health and extension services	39	22	20	26	107
Population growth	40	10	4	41	95
Cumulative disasters	47	4	19	10	80
Lack of insurance for livestock/crops	66	6	1	3	76
Other	8	17	4	1	30
Smaller herd sizes	2	0	12	2	16
Blockage of migration routes	0	0	1	6	7
Lack of land ownership in pastoral areas	0	4	2	1	7

When taking total herd size (in TLUs) into account, it was clear that time to recovery tended to be shorter for those livestock keepers with larger herd sizes (Figure 33). Indeed, 74.4% of households with a herd size of 50 TLUs or more recovered within one year. In contrast, for poor households with TLU herd size below 10, less than 40% reported to have recovered within one year. Combining this with the fact that TLU herd size in female-headed household was significantly lower, indicates that female-headed households were more vulnerable to shocks, and struggled more to recover. This was also confirmed by the fact that 9% of male-headed households mentioned that they will never fully recover, whereas 17% of female-headed households said so.

Figure 33. Time to recovery by TLU.



Men and women prioritized the same reasons why recovery was more difficult with the top three reasons being loss of grazing areas at *kebele* level, climate change and lack of government aid. Some households also mentioned that recovery has become easier. The most frequent reasons for easier recovery include government aid/assistance, savings, having small herd of animals, having large herd of animals, migration of livestock, community support and taking loans (Table 102).

Table 102. Reasons that make recovery easier

	Oromia (Borana)	Somali region	Afar	SNNPR (South Omo and Bench Maji)	Total
Government aid/assistance	6	33	48	60	147
Savings	1	3	36	40	80
Having small herd of animals	8	3	12	51	74
NGO aid/assistance	5	36	2	10	53
Having large herd of animals	1	2	32	18	53
Other	2	26	8	3	39
Migration of livestock	17	5	7	7	36
Community support and help	5	17	5	4	31
Taking of loans	0	13	2	8	23
Having changed my livestock type to more drought resilient ones	6	2	7	1	16
Drought reserves	4	6	3	1	14
Restocking of livestock by community/NGO/government	0	2	4	0	6
Provision of livestock feed during drought	1	2	0	0	3
Opening of water points by community/NGO/government	0	1	1	1	3
Provision of livestock health services during drought	0	1	1	0	2
Land certification of my land	0	1	0	0	1
Livestock insurance scheme	0	0	1	0	1
Provision of livestock health services after drought	1	0	0	0	1
Provision of livestock feed after drought	1	0	0	0	1
Destocking of livestock supported by NGO/government	0	0	1	0	1
Restocking of livestock by community	0	0	1	0	1
Tankering of water by NGO/government	0	0	1	0	1

10. Technology adoption and use

10.1.Crop technologies

As expected crop technologies are important only in the agro-pastoral areas. We calculated adoption of different crop technologies from among the households who practice crop production. Drought resistant crops are especially important in the dry and uncertain environment of the lowlands. Among the agro-pastoralists, between 3.37% (Borana) and 64% (Afar) of crop producers reported using drought resistant crops (Table 103). About a third of the crop growers in the agro-pastoral areas of Borana, and about a quarter of growers in the Somali region also use drought resistant crops. The high adoption rate in Afar seems to be due to the establishment of new irrigation schemes.

Table 103. Proportion of crop growers in agro-pastoral areas who reported technology adoption and use for crop production (%)

Region	Drought resistant crops	Dual purpose crops	Seeding practice (example row planting)	Improved seeds	Fertilizers	Irrigation pumps (diesel/electric)
Afar	64.0	52.3	39.6	78.4	7.2	0.9
Oromia (Borana)	38.4	36.7	15.7	20.3	31.1	0.0
Somali region	25.9	1.9	0.0	0.0	0.0	0.0
SNNPR (South Omo and Bench Maji)	3.4	3.9	24.7	30.3	39.9	0.0
Total	31.6	25.5	19.4	28.9	24.8	0.1

Crop growers in the agro-pastoral areas also use dual purpose crops which serve as food and feed sources. More than half of the producers in Afar and more than a third in Borana use dual purpose crops (Table 103). Dual purpose crops do not seem to be important in the Somali region and SNNPR. Improved seeds (as opposed to local seeds) are widely used in Afar agro-pastoralist crop producers where about 78% of respondents reported using them. About 30% in SNNPR and about 20% in Borana reported using improved seeds. No agro-pastoralist reported using improved seeds in the Somali region.

Fertilizers are important inputs to improve crop yield, particularly in areas where soil fertility is poor and adequate soil moisture is available. While no fertilizer use was reported in the Somali region, about 40% of crop producers reported using fertilizer to their crop fields in SNNPR, 31% reported applying fertilizer in Borana and about 7% reported applying fertilizer in Afar. Although irrigation schemes are emerging in the study areas, irrigation pumps are not used indicating that gravity irrigation is what is applied to irrigate fields. Use of irrigation pumps was reported only in Afar, where just under 1% of agro-pastoralists use the technology. No modern harvesters or threshers were reported, except in Borana where about 2.3% of agro-pastoralists reported using them.

10.2.Livestock technologies

Hay or crop residue balers are not used in the Somali region and Borana (Table 104). About 4.5% of agro-pastoralists in Afar and less than 1% of agro-pastoralists in SNNPR reported using balers. Similar to the highlands of Ethiopia, adoption of improved breeds is very low. While no improved livestock breeds were reported in the Somali region,

about 3.6% of agro-pastoralists in Afar, and 4.49% of agro-pastoralists in SNNPR adopted improved breeds. Just under half a per cent of agro-pastoralists adopted improved breeds in Borana. Interestingly, about 1.37% of pastoralists in Borana reported adopting improved breeds while no pastoralist reported adoption of improved breeds in the other regions.

Table 104. Proportion of households who reported technology adoption and use for livestock production (%)

Region	Bailing of hay or crop residues			Improved breeds			Artificial insemination			Participate in community based breeding program			Processing skins/ hides			Processing dairy products		
	P	AP	Total	P	AP	Total	P	AP	Total	P	AP	Total	P	AP	Total	P	AP	Total
Afar	0.0	4.5	1.7	0.0	3.6	1.4	0.5	0.9	0.7	9.8	9.9	9.9	0.5	0.0	0.3	0.5	0.0	0.3
Oromia (Borana)	0.0	0.0	0.0	1.4	0.3	0.5	0.0	2.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Somali region	0.4	0.0	0.3	0.0	0.0	0.0	0.4	0.0	0.3	0.8	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
SNNPR (South Omo and Bench Maji)	0.0	0.6	0.4	0.0	4.5	3.2	0.0	4.5	3.2	0.0	2.2	1.6	0.0	0.0	0.0	0.0	0.6	0.4
Total	0.2	0.9	0.5	0.2	1.9	1.1	0.3	2.1	1.3	3.4	2.1	2.7	0.2	0.0	0.1	0.2	0.1	0.2

Community breeding programs are practised only in the regions of Afar and SNNPR, albeit at a limited scale. About 10% of pastoralists and agro-pastoralists are involved in community breeding programs in Afar, while about 2.25% of agro-pastoralists are involved in community breeding programs in SNNPR. Households do not process hides and skins in the study areas, except in the pastoral areas of Afar where about half per cent of households reported processing hides and skins. Surprisingly, no household reported processing dairy products in the study areas except for about half per cent of pastoralists in Afar and half per cent of agro-pastoralists in SNNPR.

10.3.Electric power supply

No respondent in the pastoral and agro-pastoral areas of the Somali region reported connection to the main grid electric power supply system. Connection to the main grid supply systems seems to be better in the agro-pastoral than in the pastoral households of Afar and Borana. In Afar, about 11% of agro-pastoralists and about 3.83% of pastoralists are connected to the main electric supply system. In Borana, about 14% of agro-pastoralists and about 3% of pastoralists are connected to the main supply system.

Interestingly, solar power supply is more widely available than the main electric supply both in the pastoral and agro-pastoral areas. Between 6.74% (SNNPR) and 11.71% (Afar) of agro-pastoralists reported access to solar power, while between about 4% (Borana) and about 10% (Somali region) of pastoralists reported access to solar power. No pastoralist reported access to solar power in SNNPR.

11. Conclusions and implications

Analysis of the household survey data set of 1,295 households and the various qualitative methods revealed interesting results and implications both for development and research in the pastoral and agro-pastoral areas of Ethiopia. Households are led by relatively young household leaders, offering opportunity for innovation and technology adoption. Given the resource scarcity and risky environments prevalent in the study areas, the average household sizes of 6–6.87 indicate the need for aggressive interventions in birth control and family planning. Further research is needed on why the number of females is lower than the number of males across the regions and livelihood systems, and any implications this might have for development.

Impressive results seem to have been achieved in promoting school enrolment in the study areas since up to about a third of the population is in school. However, interventions are required to improve enrolment of females and pastoralists. It seems that settlements accompanied with agro-pastoralism provide better environment for school enrolment.

The quality of housing, as a measure of welfare of households, indicates that pastoralists and agro-pastoralists mostly live in thatched houses with dirt floors, indicating the need for improvements in housing. Perhaps, improvements in housing could be facilitated by the development of agro-pastoralism with the introduction of crop production and irrigation development.

The most important livestock assets in the study areas are ruminants. While cattle and goats stand out as most important in Afar, Borana and SNNPR, cattle and sheep seem to be most important in the Somali region. These results indicate the focus species for priority intervention in each region. The high calf, kid and lamb death rates indicate the need for interventions to reduce young animal mortality, especially in the pastoral areas. Cow milk yield is very low perhaps as a result of the combination of low yielding breeds, and feed and disease problems.

Higher proportions of households sell livestock during drought years than during normal years. The livestock marketing system in the study area is characterized by challenges related to access (distance to market places), market services and infrastructure. Apparently, market development is among the top priority development interventions in the study areas.

Annual household cash income is low at about ETB23,000 to ETB26,000, and most of it is accounted for by livestock sales. In general, average household cash income is higher in pastoral areas than in agro-pastoral areas. Crop farming stands out as second important source of cash in Borana and SNNPR, while businesses are second cash sources in the Somali region, and transfers seem to be important in Afar. These results suggest a closer look at these sources of cash income to design interventions to enhance their contribution to household income.

While savings are practised, most savings are made at home, suggesting for interventions to promote modern means of saving including saving and credit cooperatives and banks. Most commonly cited causes of animal deaths are starvation and diseases, indicating the need for aggressive interventions in feed development and disease control.

Different watering points are used for livestock watering. While rivers and permanent springs are most prevalent in Afar and SNNPR, shallow community wells are more prevalent in Borana. In the Somali region, various sources are used including community wells and communal cisterns. Communities identified inadequate quantity and low quality of water as major challenges of access to water for livestock, suggesting for the need for interventions to improve water supply.

Interestingly, although significant proportions of households operate private lands for crop farming or feed enclosures, investment in SLM remains very low. The same is true in communal grazing areas. Despite the considerable stress that pastoralists and agro-pastoralists face regarding feed and water shortage problems, conflicts over resource use is minimal. When conflicts arise, traditional ways of solving them are predominantly used and seem to be effective.

Households reported that they had reasonable access to market price information, but primarily from traditional sources. Use of modern ways of access to price information is limited. Interestingly, use of mobile phones as ways of sourcing market information is expanding. The importance of access to price information is reinforced by the fact that more than a third of surveyed households indicate that price information influences their decision to sell livestock.

Drought was singled out as the most important disaster affecting households, followed by floods. Interesting results were obtained regarding the availability of early warning services. While households reported low access of early warning information, experts claimed otherwise. There is, therefore, a need to take a closer look at the nature and challenges of the early warning services.

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