Community Willingness To Pay (WTP) for Vaccination Services for Livestock Diseases in Ethiopia

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1. INTRODUCTION

Global growth in the livestock sector is driven by population and economic growth, urbanisation, and technological advancements, with much of the increased demand for livestock derived foods occurring in low- and middle-income countries. The negative consequences of unmonitored growth included environmental degradation, contributions to changing climatic conditions, and increased risk of spread of endemic and epidemic infectious diseases. Rampant animal diseases, malnutrition, poor husbandry, poor infrastructure and marketing systems, and shortage of trained manpower are already documented challenges of the livestock sub-sector in Ethiopia stifling its fullest contribution to the national economy. Although the impacts of epidemic livestock diseases are difficult to quantify due to data scarcity a few reports such as the estimate from the World Organisation for Animal Health (OIE) suggests that global food animal production has reduced by 20% due to livestock disease, while the overall disease mortality rate for livestock in low-income countries was reported to be about 18%. The under-resourced Veterinary Services continue to struggle to prepare, detect, prevent and respond to such disease epidemics.

Animal vaccination service in Ethiopia has historically been provided by the government, but the new 'private vaccination service' is exploring ways of increasing participation of the private sector in the veterinary service delivery. Under this approach, both the Federal and Regional Governments create an enabling environment by licensing the private sector to carry out vaccination services for specific livestock diseases. On of this should be facilitating access to government facilities and delivering inputs. Moreover, the role of government should be monitoring and evaluation of the quality of services. Subsequently, the private sector takes over the role of providing vaccines and other health products to livestock producers to the smallest administrative unit under full cost recovery scheme.

Vaccination is without doubt the most useful single measure available to prevent infectious diseases of livestock. It is in fact the only available method to prevent, viral infections in animals. Livestock vaccines are relatively cheaper and for diseases which cause livestock mortality, preventive vaccination is hence the most plausible economical remedy. As suggested in some reports, the benefit-cost ratio is usually very high if vaccination is properly planned and conducted. Due to this, vaccination services for many epidemic livestock diseases including transboundary disease and many others such as CBPP, PPR, lumpy skin

disease, and sheep and goat pox are provided freely by the government. These diseases are known for their rapid spread, irrespective of national borders, causing serious socio-economic or public health consequence by having major importance in the international trade of animals and animal products. Control of the service is principally made by the Federal veterinary services while the implementation of the activity is by the Regional states. On the other hand vaccination against endemic disease is performed by the Regional States. They are often conducted as a response to an outbreak in many parts of Ethiopia.

2. BACKGROUND AND RATIONALE

The quality of Veterinary Services of a country is an essential prerequisite for improved animal health and welfare, veterinary public health, food safety and hygiene and the protection of the environment. Livestock diseases have impacts that include loss of livestock and farm productivity, reduction of market opportunity, disturbance of human health and impairment of human welfare. Moreover, disease control activities may have negative impacts on improper use of chemicals and drugs. Therefore, emphasis is often placed on prevention, given the impacts of epidemic diseases and difficulty of achieving control once they are established. Ethiopia has very heterogeneous livestock production structures, where value chain actors have limited technical knowledge and fewer means or incentives for making improvements to facilities or processes. Veterinary Services are often constrained by limited resources, poor infrastructure, and lack of chain of command, insufficient and/or aging technical capacity, and ineffective regulatory enforcement. It is in these environments where epidemic risks are most often generated and therefore more effective prevention and control approaches are required.

In most African countries the animal health services has declined due to a number of reasons associated with stagnant economies with increased responsibilities of the states; inadequate and unpredictable access to foreign exchange; recession of global economy; and the presence of different production systems within a single economy in a country. In recognition of the shortcomings of conventional veterinary service delivery system, many development agents including nongovernmental organizations started using primary animal healthcare approaches. However, there are challenges to be addressed during the implementation of primary animal healthcare services related to poor organization of regulatory bodies, lack of clear demarcation between public and private goods services, poor management of the

transfer of services from the government to the private sector, delivery of animal health services in low input areas and provision of adequate services of an acceptable standard (MOARD, 2010).

The draft Veterinary Service Rationalization Road Map clearly outlines the models for facilitating veterinary service rationalization under the OIE guideline for public-private partnership in the veterinary domain. These include, among many, private vaccination service where the Government delegates the private sector to provide vaccination services for specific diseases under cost recovery model. Other modalities under the same rationalization road map include Designation of regional-woreda-kebele private sector partners for vaccination service, Mobile clinical service where the Government provides only enabling environment and regulatory service, Community-based women vaccinators for Newcastle Disease control in chickens, Strategic community-based endo- and ectoparasite control by private service providers, and Leasing kebele public animal health posts to jobless veterinary graduates in which the government rents Kebele animal health posts to enable graduates provide clinical, vaccination, and health extension services in collaboration with the woreda government clinics. Cognizant of such arrangement, anecdotal information suggests that private veterinary service providers still complain about the unfair competition from the state veterinary service providers. Community engagement in terms of bearing the cost of the service is crucial for the success and sustainability of such initiatives.

Objective

The main objective of this work is to assess willingness of livestock producers in Ethiopia to pay for vaccinations against prevailing livestock diseases as depicted in the ToR.

3. METHODOLOGY AND APPROACH

3.1. Study site selection

A consultative meeting was set-up and carried out with Regional offices and Ministry of Agriculture. The framework for the consultative meeting primarily considered on how to select best representative locations hence reflected the most prevalent livestock production systems that will also cogitate aspects of the demand for the veterinary service and its performance for selecting the study sites having different production systems. Accordingly,

three production systems viz mixed crop livestock system, Pastoral/agro-pastoral system and Urban/peri-urban production systems were identified. Strategically located 16 districts representing those production systems were selected with the help of experts in the Ministry of Agriculture, Regional MoA offices and Respective District officers (Figure 1).

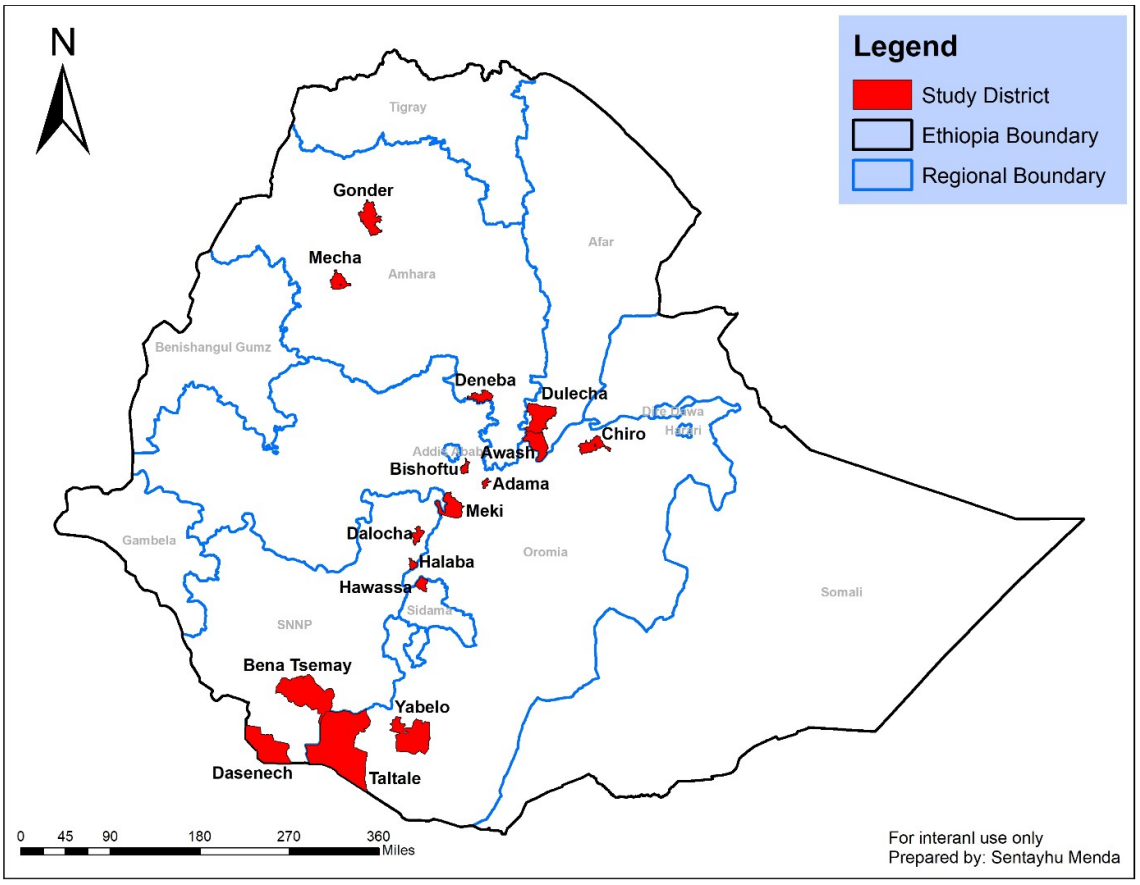


Figure 1: Regions and Districts selected for the assessment of community WTP

Study sites were stratified into production systems, regions, districts after which kebeles and households were randomly selected for the implementation of the field data collection. Accordingly, the following sites (total of 16 sites) were clustered under the different regions

1. Pastoral system: Six districts and 30 HH from each – 180HH
   - Afar – Awash Fentale, and Dulecha
   - Oromia – Yabello and Teltele districts
   - SNNPR – Benatsemay and Dasenech
2. Mixed crop livestock system: Six districts and 30 HH from each – 180HH
   - Amhara – Siyadeber and Wayou, Mecha

- Oromia – Chiro and Meki
- SNNPR – Dalocha and Halaba

3. Urban/Peri-urban – total of 240 HH
   - Amhara – Gondar city (30 Dairy and 30 Poultry farms; total 60 HH)
   - Oromia - Bishoftu and Adama cities (30 Dairy and 30 Poultry farms each; total 120HH)
   - Sidama - Hawassa city (30 Dairy and 30 Poultry farms; total 60HH)

After discussion with regional MoA offices, a support letter was requested from EVA and was communicated to the respective regional offices to facilitate the work.

3.2. Household Survey (HHS)

Both purposive and stratified clustered sampling approaches were used to draw representative samples for the household surveys in the selected sites. Data was collected using structured questionnaires (that were translated to two local languages) and personal interview. The questionnaire prepared for the three production systems were first pretested before administration. The queries were then readjusted based on the feedback. The questionnaire survey was administered by team of consultants and enumerators representing each study site. The questionnaire contained queries about the socio-demographic variables, economic variables, occurrence of major livestock diseases and their impact as perceived by the livestock owners, access to veterinary service, perception of owners towards livestock vaccination and the willingness of the livestock owner to pay for vaccination service.

Each respondent was ethically communicated and a consent paragraph containing the following topic was read out before each interview.

Consent paragraph

"There are a number of livestock diseases in your locality that may kill or reduce your animal productivity as you mentioned before. One of the main methods to keep your livestock healthy is vaccinating your animals at least once per year. There are many vaccines that are available for this use, produced either within Ethiopia or imported from other country. Most vaccinations need to be given annually; usually they are delivered by the government veterinary service down to the village level. Vaccination service involves the cost of production, transport and service charge."

Note to the enumerator: *Has the farmer clearly understood the situation stated about the vaccines discussed above? If no, please repeat the question until the respondent understood the scenario. Continue with the interview only after the respondent positively confirm"*

3.3. Stakeholder consultation

The goal of this consultation was to find out the determinants of WTP and generate information for triangulation of the findings of household survey. Main actors such as the private practitioners, public veterinary service providers, veterinary drug vendors and non-governmental organizations and a vaccine production facility were identified as follows

- Private veterinary practitioners (three from each district in each production system, totaling 48)
- Public veterinary service providers (three from each district in each production system, totaling 48)
- Veterinary drug vendors and (three from each district in each production system, totaling 48)
- Non-governmental organizations
    - Pastoral system - Pastoralist concern, VSF Suisse, VSF Germany
    - Mixed crop livestock system - World Vision and Land Olakes from MCL and
    - Urban/periurban system - SNV
- Vaccine production centre – National Veterinary Institute (NVI)

Data was collected about the experiences of the service providers, the demand for the service and its trend; opinions on community WTP, the human capacity and financial readiness. NVI was consulted to assess the status of existing demand by the public and private practitioners, opinions on governance and implementation of vaccination service to find out the conditions of community WTP and price range or limits.

4. RESULTS AND DISCUSSION

Data regarding community willingness to pay for vaccination services and factors that could potentially influence the decision for WTP were gathered based on the livestock production system viz mixed crop-livestock, Pastoral and Urban/peri-urban systems. A total 551 HH living in the three livestock production system area within five regional states and 15 districts were included in this study. Data were not collected from Dasenech and only 46HH were included from Gondar. Summary of the demographic, socioeconomic and livestock holdings by the respondents is presented in Table 1.

Table 1. Demographic, socioeconomic variables and livestock number in the different production systems investigated

Sociodemographic variables	**Mixed Crop livestock (n=178)**	**Pastoral/Argopastoral (n=150)**	**Urban/peri-urban (n=223)**
Age of the livestock owners (Years)	18 – 65 (average 39.2)	41 – 51 (Average 45.5)	21 – 70 (Average 42.5)
Average family size	6.2	8.5	5.3
Gender of respondents	92.7% Male	78% Male	72% Male
Livestock ownership			
Number of cattle	6.1±0.41	11.5	Small farm – 47.5% Medium farm – 35.0% Large farm – 17.5%
Number of shoat	8.8±2.0	48.7	
Number of camel	-	2.0	
Number of equine	-	0.44	
Number of poultry	6.3±1.0	-	Small farm –44.7% Medium farm - 43.7% Large farm - 11.6%
Breeds of livestock	50.8% Indigenous 42.9% Exotic/Crossbred 6.3% Other	100% indigenous - -	 95.9% Exotic/cross dairy 100% Exotic poultry
Contribution to livelihood	84.3% Main (Farmer) 8.9% Supplementary	100% Main (Pastoral)	66.3% Main (private) 30.5% Supplementary
Average annual income from livestock (ETB)	135,959.00/household	68,273.00/household	1,074,641.8/household

n= number of households

Livestock diseases and outbreaks of infectious diseases are rampant across production systems though veterinary service, including vaccination services, is available and accessible to most livestock owners (Table 2). Because of this, most of the livestock producers have experience of vaccinating their animals either paid or free of charges. Willingness to pay for vaccination service did not seem to be influenced by production system, educational level of the livestock owner, size of flock or livestock holding, or current market value of the animal

however. However, pastoralists in Dulecha and Teltele districts of the same production system seemed to have been influenced by their lower income. Closely observing the average annual income per household from sales of livestock or livestock products in these districts (ETB 26,944 for Teltele and ETB 40,266 for Dulecha), it is found to be comparatively smaller than the average (ETB 68,273) for all districts of the pastoral production system.

Table 2. Status of livestock disease, vaccination, access to veterinary services and willingness to pay for vaccination service

Sociodemographic variables	**Mixed Crop livestock (n=178)**	**Pastoral/Argopastoral (n=150)**	**Urban/peri-urban (n=223)**
Occurrence of disease outbreak in their locality	57.5%	100%	39.0%
Access to vaccination service	98.9%	73.3-96.7%	93%
Experience of vaccinating animals	84.9%	100%	87.6%
Payment for vaccination service	54.7% Free of charge 33.5% Paid 8.9% Both	81.5% Free of charge 18.5% Paid -	6.7% Free of charge 88.2% Paid 5.7% NA
Perception on vaccination Vaccination can protect animals from disease	81%	92.7%	95.9%
There is problems with vaccination service	87.2%	24.7%	
Willingness to pay	93.3% willing 5.6% Unwilling 1.1% undetermined	61.3% Willing 34.0% Unwilling 4.7% Undetermined	91.5% Willing 6.3% Unwilling 2.2% Undetermined
Willing to pay for 50% increment in price of vaccine	-	-	90.7%
Maximum price willing to pay for average market price of cattle	11.5+0.75 Birr/vaccination (0.022% of the animal's current market price)	20.3±7.7 Birr/vaccination (0.001% of the animal's current market price)	0.5 - 10.0 ETB Cattle 1.5- 400 ETB Poultry
Recommended payment for vaccination by Professionals and NGOs	As much as it requires	5-10% of market value	10-20% of market value
Recommendations for price of vaccine by local NGOs and Vet Professionals	Cattle - 5 ETB Shoat - 3 ETB Camel - 5 ETB Poultry - 3 ETB	Cattle - 15-30 ETB Shoat - 5-15 ETB Camel - 15-40 ETB Poultry -	Cattle - 100 ETB Shoat - 75 ETB Camel - Poultry - 15 ETB

Unwilling livestock owners in the pastoral area primarily indicated their lower economic status (being poor) for not willing to pay and further fear its affordability given the previous experiences with the government providing the service for free.

Other factors that have been indicated as challenges or concerns by the livestock owners are:

- The impression that veterinary service is monopolized by the government
- Irregularity and unavailability of the service as needed
- Delayed vaccination,
- Limitations of coverage to all kebeles/villages,
- Misconception about the objective of vaccination (some believe it has a curative effect or one vaccine works for all kinds of diseases, or vaccination works for lifetime protection etc)
- Financial ability to pay when farmers/pastorals want to vaccinate large number of animals.

4.1. WTP survey in the mixed crop-livestock production system

Data collected from a total of 178HHs from 6 districts in the mixed crop-livestock system were included.

Socio-demographic variables and livestock number

The age of the livestock owners who participated in this study in MCL system were between 18 and 65 years (average 39.2 years), with an average family size of 6.2 where in 92.7% of the cases the head of the family was male. The main livelihood is livestock keeping (84.3%) with a few proportion also doing a side-line business (8.9%) or are doing both.

Table 3. Demographic variables and livestock number in the MCL production system

Sociodemographic variables	**Deneba (n=30)**	**Dalocha (n=31)**	**Mecha (n=29)**	**Chiro (n=30)**	**Meki (n=29)**	**Halaba (n=29)**
Age of the livestock owners (Years)	43.03±1.96	29.7±1.46	40.7±1.67	41.0±1.62	40.0±1.9	41.4±1.65
Gender of respondents	0F/30M	3F/28M	0F/29M	2F/28M	6F/23M	3F/26M
Livestock ownership						
Number of cattle	6.1±0.41	3.3±0.31	6.2±0.35	4.7±0.4	8.5±2.0	4.6±0.5
Number of shoat	8.8±2.0	2.0±0.4	3.6±0.5	0.9±0.2	8.0±1.8	1.2±0.3
Number of poultry	6.3±1.0	11±1.5	6.2±1.2	43.8±3.9	5.0±0.9	4.1±0.8
Average family size	6.3	5.8	6.7	5.0	5.7	7.7

n= number of households

Respondents who are primarily government employee or running other private business made up only <3%. The educational levels were in the order of 47.5%, 13.9% and 36.8% for primary school, secondary school and uneducated livestock owners, respectively. Summary of the sociodemographic details are given in Table 3.

It can be considered that the survey was conducted in a typical society that thrives on a mixed crop-livestock system whose main livelihood depends on income from livestock. A typical household is headed by a middle age male whose educational level is at best in the secondary school. Cattle remains to be the dominant livestock species in all production systems, hence responses mostly relates to this species although other species of domestic animals still have a significant contribution in the livelihood of the farmers.

Table 4. Socio-economic variables in the mixed crop livestock production system

Economic variables	Deneba (n=30)	Dalocha (n=31)	Mecha (n=29)	Chiro (n=30)	Meki (n=29)	Halaba (n=29)
Income from the sale of animals in the last 12 months (ETB)	108,266.7±19,690.8	16,258.6±4284.8	86,862.0±9,238.5	7,8010±2,0423.2	34,906.7±5,072.2	35,655.1±1,1957.2
Income from other agricultural business in the last 12 months (ETB)	253,916.7±33076.3	22,826.9±4,415.9	31,675±5,769.5	69,528.5±12,227.7	36,250±8,851.4	41,600±1,4641.7
Income from off farm business in the last 12 months (ETB)	None	13,861.1±5591.4	20,250±6084.9	43,048.1±14201.3	16,500±7889.8	155,909.0±39,696.6
How much do you pay in birr on average for the treatment of cattle (ETB)	643.1±123.2	313.0±30.2	67.8±3.6	201.2±22.9	105.4±17.1	236.2±28.4
How much do you pay in birr on average for the treatment shoat (ETB)	101.4±11.4	150.7±19.3	27.8±1.4	82.3±8.9	79.9±29.2	54.8±9.9
How much do you pay in birr on average for the treatment poultry (ETB)	9.5±0.9	26.3±5.2	5.5±0.7	12.1±2.5	7.4±2.0	10.9±3.3

n= number of households

Economic variables

Assessment of the main livelihood, land and livestock ownership, breeds of animals kept, estimated annual income from livestock and other agricultural and off farm businesses, and the presence of other source of income, were carried out. Relatively, more livestock owners (50.8%) keep only indigenous breeds of animals. Some livestock owners (27.4%) keep both indigenous and exotic, and while 14.5% keep only crossbred animals. The remaining small proportion (<7%) keep either all breeds, only exotic breeds, only crossbred or exotic and crossbred animals. Except for small proportion (19%), the vast majority (81%) of livestock owners do own a crop land. Summary of the socioeconomic variables considered are presented in Table 4.

Even though the majority of respondents were known to keep livestock as their primary means of livelihood, only 46.4% are primarily reliant on livestock only for their income. Most of them (65.9%) were also known to be involved in a market oriented production like fatting and milk sale. A clear variation exists among the districts in income from livestock and livestock related businesses. However, this variation didn't seem to significantly influence the overall ability to pay for veterinary services for the different species of animals they keep

Status of livestock disease and access to veterinary services

Major livestock diseases in various animals, the occurrence of disease outbreaks, decisions of the livestock owners during occurrence of diseases or an outbreaks, the accessibility to veterinary services, financial capability to access veterinary service, and experience with vaccination services were assessed. Most diseases were reported in local languages and it was up to the enumerators to define the signs into a clinically known disease. Based on this, Anthrax, FMD, blackleg, and LSD were the commonest diseases reported for cattle, while sheep and goat pox, pasteurollosis, PPR and internal parasites (including fascioliasis and lungworm) were reported for small ruminants. NCD, coccidiosis, salmonellosis and diarrhea (as a syndrome) were the most commonly reported disease of poultry. Only a little over half of the respondents (57.5%) reported the occurrence of disease outbreak in their locality; nevertheless, the vast majority of them had access to vaccination service (98.9%) and have experience of vaccinating their animals (84.9%) irrespective of the occurrence of outbreaks.

Perception of owners towards livestock vaccination

Knowledge of livestock owners about vaccine and vaccination was also assessed. Problems related to vaccination service delivery were also reported. Vaccination service was reported to be free of charge in 54.7%, paid in 33.5% and both free and paid in 8.9% of the cases. Although 81% of livestock owners knew vaccination can protect animals from disease, as high as 33.5% believe only a single shot of vaccination is required to protect animals from all kinds of diseases. Even though the vast majority of respondents confirmed accessibility to livestock vaccination service, 87.2% of them also reported the presence of different kinds of problems associated with the service. The most commonly reported problems were unavailability of vaccine on time or delayed vaccination campaign, and the poor coverage of vaccination campaign to all kebeles/village. Additionally, the lack of vaccine for specific type of disease, and poor service provision by the vaccinators were also reported.

Community willingness to pay for vaccination service

Livestock owners were interviewed after a consent paragraph was read out to them concerning the cost incurred to produce, transport and deliver vaccine and carry out every vaccination programs for the various domestic animals. Base on this, the willingness of the livestock owners to pay for vaccination service was asked. Accordingly, 93.3% are willing to pay, while 5.6% are against paying for vaccination services hence are not willing to pay. A few more, 1.1%, were found to be undetermined in their decision. Those who are not willing to pay mentioned as either being poor or consider vaccination service to be expensive particularly when they want to vaccinate large number of animals. Livestock owners who confirmed to be willing to pay were further asked about how much they can afford vaccinations services for their animals. They were given a perspective putting a scenario using a modified method of "*proportional piling*" requesting them "what proportion of the current market value of the animals are they willing to pay?" Based on this, for cattle that can be sold for an average market price of 51,914.7 Birr owners were willing to pay a maximum of 11.5+0.75 Birr per vaccination which is 0.022% of the animal's current market price. Table 5 shows the summary of estimated current market price of animals and the owner's willingness on how much they can pay for vaccination of each animal in the mixed crop livestock production system.

Table 5. Current estimated market price of animals and willingness of livestock owners to pay for vaccination service (Mean±SE)

Livestock and vaccination price variables	Deneba (n=30)	Dalocha (n=31)	Mecha (n=29)	Chiro (n=30)	Meki (n=29)	Halaba (n=29)
For what average price do you sell cattle in your area? (ETB)	75,333.3	27,225.8	52,793.1	61,965.5	27,366.7	69,777.8
What is the minimum price you can pay for vaccination per cattle (ETB)	1.6±0.42	2.7±0.72	5.1±0.77	7.2±1.18	2.3±0.24	2.3±0.38
If some vaccines are more expensive, what is the maximum price you can pay for vaccination per cattle? (ETB)	11.5±0.95	10.2±1.4	15±1.57	19.5±2.95	6±1.08	7.3±1.06
For what average price do you sell shoat in your area? (ETB)	7,316.7	4,553.6	6,862.1	6,010.3	3,482.1	5,269.6
What is the minimum price you can pay for vaccination per shoat? (ETB)	1.7±0.31	1.3±0.28	2.6±0.25	0.9±0.24	1.4±0.26	1.2±0.34
For what average price do you sell poultry in your area? (ETB)	598.3	470.0	621.4	390.0	450.0	473.1
What is the minimum price you can pay for poultry vaccination? (ETB)	Free	1±0.30	2.5±0.39	3.2±0.37	0.9±0.21	2.4±0.4

n= number of households

Opinions of veterinary professionals operating in the mixed crop livestock system

Opinions of both the private (clinicians and drug vendors) and public veterinary practitioners were collected from each district. The private (clinicians and drug vendors) veterinary practitioners in the almost all districts of the mixed crop livestock systems investigated only participate occasionally in delivering vaccination service because the service is primarily given by the government or public veterinary service provider. They consider both the vaccine and the service to be inaccessible to the private practitioners. Because of this they consider vaccination service to be unattractive business. On top of this, the cost of the logistics is relatively expensive in some areas. All private veterinary practitioners believe farmers are willing to pay for vaccination service as long as they are given the opportunity for more coordinated and accessible service. Some still believe government intervention giving the service for free has impacted the transition to cost recovery scheme.

On the other hand, the public service providers believe, though farmers are willing to pay for vaccination, they have priorities among their animals, being mostly limited to cattle. A few others may include shoat and poultry in addition to cattle. Current prices for vaccine ranged from ETB 1.8 for vaccines like blackleg for cattle to 20 for Rabies in canine. Veterinarians do

recommend the cost recovery scheme to incorporate all costs incurred from production to its delivery at the field.

NGO assessment on the perception of farmers' WTP for vaccination service in the MCL

Two NGOs (SNV and Land O'Lakes Venture-37) that were operating on Dairy and Livestock production in the study districts were identified. Both NGOs confirmed that Vaccination services, Clinical/Treatment services, Drug shops and Laboratory services are the main veterinary services that are readily available. The services are provided predominantly by the Public sector and to a lesser extent by the private practitioners.

The types of common livestock diseases in the project intervention areas were also inquired. Accordingly, FMD and LSD in cattle, PPR in Sheep and Goat and Newcastle Disease in poultry are the predominant diseases that mostly occur in the areas. The opinions of the NGOs on the question "*should livestock owners get veterinary services free of charge*?" were inquired. Both NGOs are in favour of a full cost recovery scheme for all kinds of services provided. In addition they also recommended incorporation of transport/logistic cost into the veterinary service cost. Both NGO's confirmed that livestock owners are willing to pay for vaccination services against diseases. They recommended that livestock owners should pay as much as the service demands and the cost recovery scheme should be dynamic. Keeyma Foundation also suggested an average estimated vaccination service price of 5 ETB for cattle, 3 ETB for sheep and goat, and 3 ETB for chicken as a fair price while Land O'Lakes suggested that the farmer should pay whatever amount is asked by the service provider.

4.2. Community WTP survey in the pastoral/agro-pastoral production system

Data was collected from a total of 150HH within 5 districts located in three administrative regions (Oromia, Afar and SNNPR). Data from one district (Dasenech) was not collected due to local administrative reasons.

Socio-demographic and economic characteristics

The majority of respondents were male and the average age ranged from 41.5 years in Awash Fentale Woreda of Afar to 51.2 years of age in Taltale Woreda of Borena Zone; Oromia.

Most of the respondents were illiterate with only few proportions having basic, elementary and secondary school education. The average family size varied from 6.7 people in Awash Fentale to 13.5 people in Benatsemay woreda of South Omo Zone; SNNPR. Almost all respondents were pastoralists whose main livelihoods depend on consumption of livestock products and generating income through sales of livestock. The objective of livestock keeping has been described as sources of everything necessary for life by all respondents. The average annual income from livestock sales ranged from ETB 40,266.7 in Dulecha Woreda to ETB 169,833 in Awash Fentale. Only respondents from two districts had incomes from non-livestock related activities which are ETB 2,283.3 for Benstsemay and ETB 16516 for Taltale. Most of the respondents used the income generated through sales of animals to purchase household needs especially in times of shocks. The expenses of veterinary services per individual animals ranged from ETB 1158.8 in Taltale to ETB 8567 in Awash Fentale which seems to be relatively more expensive. Summary is given in Table 6.

Table 6. Socio-demographic and economic data from households in pastoral areas

Parameter	Afar		Oromia		SNNPR
	Awash (n=30)	Dulecha (n=30)	Yabello (n=30)	Taltale (n=30)	Benatsemay (n=30)
Gender (n)	10F/20M	8F/22M	8F/22M	6F/24M	1F/29M
Age (Mean)	41.5±1.9	41.6±11.0	44±3.6	51.2±3.0	49.3±2.42
Educational status (%)					
Illiterate	90.0%	100%	83.4%	80.6%	100%
Basic education	0	0	0	3.2%	0
Elementary	3.3%	0	13.3%	13.0%	0
Secondary	6.7%	0	3.3%	3.2%	0
Family size (Mean)	7.6±0.4	6.7±5.1	7.8±0.8	6.7±0.5	13.5±1.4
Income from animal sales last year (ETB)	169,833.0	40,266.7	49,093.0	23,467.7	58,705.0
Income from other sources (ETB)	-	-	-	16,516.0	2,248.3
Money spent on veterinary service annually (ETB)	8,567.0	6,838.0	2,984.5	1,154.8	3,500.0

Livestock production data

The average livestock holding per household in each district is presented in the Table 7. In general, the smallest average livestock holding was reported from districts of Borena Zone. Camels were part of the livestock herd only in Afar and Borena Zone of Oromia. Very few households were known to keep donkeys.

Table 7. Average number of livestock owned by pastoral/agro-pastoral households

Livestock species	Average number of Livestock				
	Awash (n=30)	Dulecha (n=30)	Yabello (n=30)	Taltale (n=30)	Benatsemay (n=30)
Cattle	7.3±1.54	11.6±1.77	3.9±0.68	2.2±0.41	32.4±5.05
Sheep	21.3±2.89	20.6±1.43	6.6±1.32	3.2±0.31	9.4±1.87
Goat	48.5±6.43	38.9±2.65	13.2±3.69	8.9±0.84	73.1±9.94
Camel	3.1±4.68	4.3±1.41	2.5±1.66	0.32±0.5	0
Donkey	0.06±0.00	0.07±0.00	1.0±0.31	0.77±0.46	0.3±0.25

Most of the time pastoralists take goats to the market for sale, with varying off take levels in the districts investigated, fewer in Dulecha (5.8 heads/year) and higher in Awash Fentale (27.2 heads/year). Even sheep are preferred for sale, at 19.6 heads/year in Awash Fentale compared to other places while cattle and camels are rarely sold in all areas (Table 8).

Table 8. Average number of livestock sold, current market values and number of animals lost due to disease annually in pastoral/agro-pastoral households

Livestock species	Awash (n=30)	Dulecha (n=30)	Yabello (n=30)	Taltale (n=30)	Benatsemay (n=30)
Number of animal sold in the past 12 months					
Cattle	2.0±1.4	1.7±0.2	3.8±0.9	2.6±1.8	1.7±0.4
Sheep	19.6±2.2	4.0±0.3	3.8±0.7	0.9±1.6	1.6±0.4
Goat	27.2±2.7	5.8±0.5	8.3±1.4	8.5±1.3	11.5±1.6
Camel	0.1±0.0	0.07±0.0	0.3±0.2	12.0±1.8	-
Donkey	0	0	0	0	-
Number of animals lost due to disease outbreaks annually					
Cattle	4.2±6.8	3.1±0.2	5.0±1.4	0.26±0.5	1.5±0.4
Sheep	40.7±5.4	5.1±0.2	6.9±1.6	1.19±0.2	0.5±0.2
Goat	51.4±5.7	5.4±0.4	6.3±1.2	4.1±0.6	6.2±0.8
Camel	129.6±16.3	0.7±0.1	0.63±0.4	5.6±0.7	-

Goat and sheep seem to be the most vulnerable species of livestock showing high mortality. Exceptionally, the highest was recorded in Awash Fentale (Figure 2). Mortality report is

lowest in camels. Sheep and goats had comparable market values with goat having some margin over the sheep.

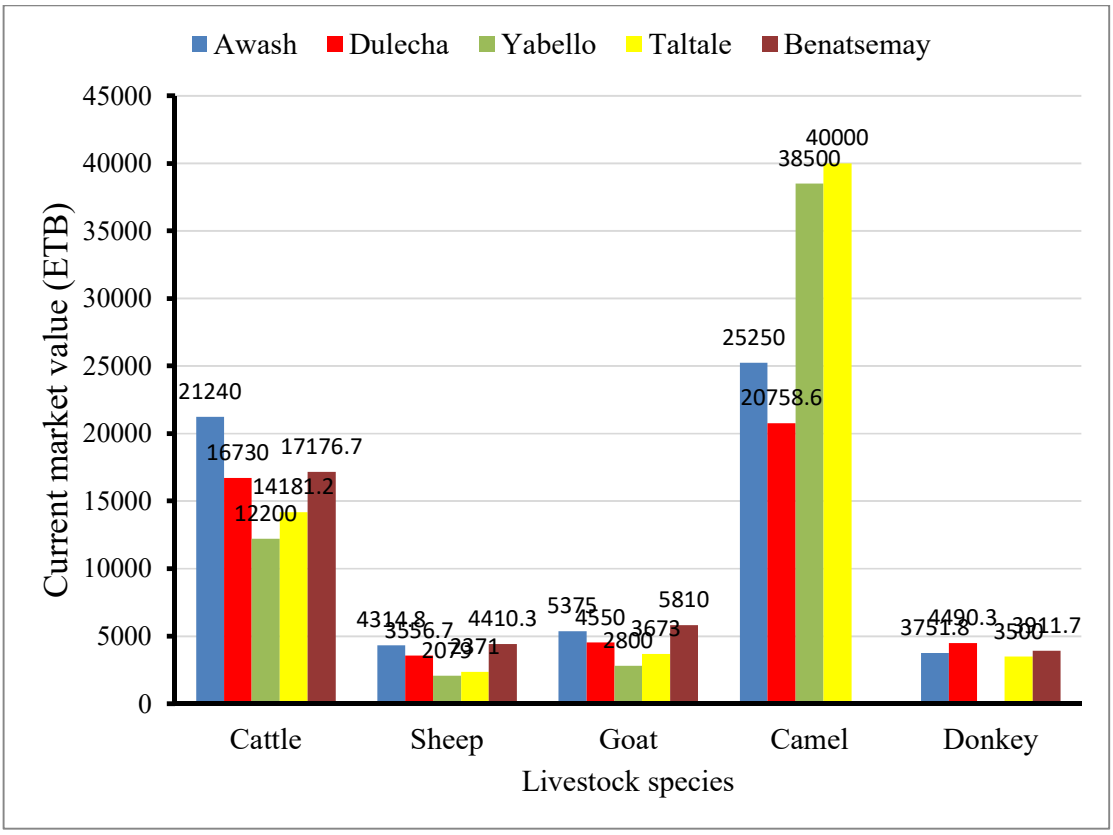


Figure 2. Estimated current price of different livestock species in study districts of the pastoral system

Major livestock diseases affecting livestock production

The list of major livestock diseases in the studied areas are presented in the Table 7. The most commonly reported cattle diseases by pastoralists, staff of the public and private veterinary service, and NGOs operating in these areas are CBPP, Anthrax, Blackleg, LSD, Bovine Pasteurellosis, FMD and Trypanosomosis. Summary of the list of diseases affecting other animals is given in Table 9.

Table 9. Livestock diseases affecting productivity of animals in pastoral/agro-pastoral areas

Species	Awash Fentale	Dulecha	Yabello	Taltale	Benatsemay
Cattle	LSD, CBPP, FMD, Blackleg, Ectoparasites, Bovine Pasteurellosis,	Blackleg, LSD, CBPP, Babesiosis, FMD, Ectoparasites, Endoparasites,	CBPP, Bovine Pasteurellosis, Blackleg, LSD, FMD,	Trypanosomosis, Anthrax, CBPP, Bovine Pasteurellosis, FMD, Heart Water, Endoparasites, Ectoparasites, LSD, Blackleg	Blackleg, Bovine Pasteurellosis, Anthrax, CBPP, Trypanosomosis, FMD, Endoparasites, CBPP, Ectoparasites
Sheep	PPR, SGP, Ovine Pasteurellosis	PPR, SGP, Ovine Pasteurellosis, Footrot, Endoparasites, Ectoparasites,	Ovine Pasteurellosis, PPR, Coenurosis,	PPR, Ovine Pasteurellosis, Coenurosis, Footrot, Ectoparasites	PPR, Orf, Ovine Pasteurellosis, SGP, Endoparasites, Ectoparasites, SGP,
Goat	SGP, PPR, CCPP, Endoparasites,	SGP, CCPP, PPR, Ovine Pasteurellosis, Footrot, Endoparasites, Ectoparasites	CCPP, PPR, Coenuroris,	Coenurosis, CCPP, PPR, SGP, Ectoparasites	CCPP, PPR, Coenurosis, Orf, Endoparasites, Ectoparasites,
Camel	Camel pox, Camel Respiratory Disease	Camel Pox, Endoparasites, Ectoparasites, Unknown Camel Disease, Dermatophilosis	Unknown Camel Disease, Pasteurellosis, Camel Pox, Nasal Bot Fly, Ectoparasites,	Pasteurellosis, Camel Pox, Trypanosomosis,	-
Poultry	Salmonellosis	NCD	NCD, Fowl Typhoid, Fowl Pox, IBR, Ectoparasites, Salmonellosis, Gomboro,	ND, Fowl Cholera, Fowl Typhoid, Coccidiosis,	-

Availability, access and affordability of veterinary services in the pastoral community

Interestingly, a significant proportion of the pastoralists were known to treat their own sick animals by themselves (50% in Dulecha, 70% in Awash and 100% in Yabello, Taltale and Benatsemay. Veterinary service was reported to be readily available only in districts of Afar region (50% in Awash Fentale and 86.7% in Dulecha). Over 67% pastoralists from Benatsemay and 70% from Yabello and Talatle districts indicated that veterinary service is not readily available. This has also been confirmed by the staffs of the public veterinary service providers. Shortage of veterinary input has been mentioned as the main reason for unavailability. The primary service provider is the government/public veterinary service with the private veterinary service making a significant contribution too evidenced from responses of 50% respondents. The most common veterinary services are clinical/treatment and vaccination. The private veterinary practitioners also provide clinical, consultancy and follow-up services. Distance from veterinary service center makes veterinary service inaccessible for most of the respondents (90-95.2%) has been indicated as the biggest challenge and very few thought the service is expensive (4.8-7.1%); hence livestock owners believed distance to be the main reason for service inaccessibility and/or shortage in their vicinity. Livestock owners from Dulecha and Taltale believe veterinary service is not affordable.

The three NGOs working in pastoral areas who were consulted indicated that veterinary service availability is very poor in pastoral areas due to various reasons such as distance from the center, poor infrastructure, weak public and private veterinary services and lack of commitment from the veterinary professional, absence of motivation and incentives for hard working professionals, lack of veterinary inputs and poor diagnostic capacity, lack of private practitioners, absence of regulation and lack of enforcement of existing laws to control illegal veterinary drug dealers. Veterinary service is provided by both the public and private practitioners and to some extent by NGOs that are operating the pastoral areas. The NGOs are mostly involved in strengthening the private veterinary services in their operational areas through in-kind support to veterinary drug vendors, linking with drug importers, providing training, networking with CAHWs as drug suppliers and vaccine distributors during vaccination campaigns. They occasionally purchase veterinary drugs from the local private veterinary stores to support their business and avoid free

deliveries even during emergencies. NGOs also provide veterinary clinical equipment's and engage the private actors in PPR Vaccine distribution to the CAHWs.

Table 10 shows summary of cost of different categories of veterinary service. In general, there is huge variation between localities on the cost of veterinary service for different categories. All prices for the various services for all species are comparatively higher for Taltale district. Generally, acaricide and antibiotic treatments (ETB 88.6) and (ETB 93.1) were known to be comparatively more expensive.

Table 10. Findings on veterinary service accessibility and affordability in pastoral areas

Parameters	Afar		Oromia		SNNPR
	Awash (n=30)	Dulecha (n=30)	Yabello (n=30)	Taltale (n=30)	Benatsemay (n=30)
Measures taken for sick animals					
Treatment by owner	21	15	30	29/30	30/30
Look for veterinary service	9	15	0	0	0
Use traditional healers	0	0	0	1/30	0
Reasons for unavailability of veterinary service					
Distance from service centre	4/14	2/4	20/21	16/21	9/20
Shortage/absence of veterinary service	9/14	2/4	1/21	4/21	11/20
Expensive	1/14	0	0	1/21	0/20
Affordability of veterinary service					
Yes	86.7%	30%	-	0	-
No	13.3%	70%	-	100%	-
Prices of veterinary service					
Deworming of cattle and camel	4.1±0.2	-	25.6±1.6	21.8±1.4	8.7±1.7
Deworming of Shoats	17.3	-	10±1.4	11.2±0.8	3.9±0.6
Application of acaricides on cattle and camel	-	-	20±1.5	93.1±6.2	13.2±1.3
Application of acaricides on shoat	-	-	6.7±0.8	88.6±10.3	5.8±0.6
Treatments involving antibiotics for cattle and camel	-	-	9.9±0.9	186.4±7.3	12.6±1.6
Treatments involving antibiotics for shoats	21.4±0.2	-	3.8±0.4	80	4.9±0.69

The NGOs operating in the pastoral areas responded that they provided vaccination service free but via voucher where beneficiaries pay through voucher provided by the NGOs to get services from CAHWs. Two of the three NGOs recommended some form of cost recovery scheme for

vaccines and vaccination service. The remaining NGO insists that NGOs should continue to provide free services for the targeted communities.

Vaccination service and willingness to pay

Table 11 shows vaccination and related issues in the study area. Vaccination of animals was considered as important by almost all respondents. Overwhelming majority (97-100% of respondent) in all districts believe vaccination is important (90.3-100%), protects their animals from diseases (77.4-100%) and the service is also readily available (73.3-96.7%). However, the majority of the respondents in Awash Fentale (96.7%) and Taltale (81.5%) said vaccination service is not readily available. Very few respondents (<1%) believe that vaccination can cause abortion in animals and thus defer from the practice. Vaccination service is inadequate in Awash Fentale and Taltale. Distance from service center and absence of regular vaccination programs are indicated as the reasons. Except at Dulecha where 57% of respondents indicated NGOs to be the vaccination service provider, in all the rest Government is the only vaccination service provider. Vaccination service is given freely by government in all studied areas, except for a small proportion (18.5%) at Taltale where they confirmed a paid service. Overall, 61.3% of the pastoralists are willing to pay while 34.0% are unwilling and 4.7% are undetermined. When this is further broken into the pastoral districts, 73% from Awash, 90% from Yabello and 83% from Benatsemay confirmed that paying for vaccination service is correct so they are willing to pay for the service. Nevertheless, a significant proportion of the pastoralists from Dulecha (60%) and Taltale (75%) are not willing to pay for vaccination services. The reason for declining payment is because the government is providing the service for free while a few others also mentioned vaccination will be expensive especially when large number of animals are to be vaccinated.

In some areas, the free vaccination service given by government has left the impression that paying for vaccine or vaccination is inappropriate. This has also been confirmed by about 41.7% of the staff of the public veterinary service. Some pastoralists believe that it should remain free as it will be likely to become unaffordable and expensive if left for the private practitioners. The impact of the free service, poor awareness of pastoralists in the cost recovery scheme and fear

that vaccination would be expensive were mentioned by the interviewed staffs of the public veterinary service.

A significant proportion of respondents from all districts believed vaccine can cure diseases; on the other hand, except those in Awash Fentale, they also believe that one vaccine protects animals only from one disease and the majority believe the effect of protection lasting only for some time. All staffs of the public veterinary service believed that pastoralists understand the importance of vaccination and are happy to let their animals vaccinated but there could still be few who know the importance of vaccination but resist vaccination or don't at all understand the importance of vaccination.

Table 11. Findings on importance of vaccination and perceptions among the pastoralist community

Parameter Categories	Afar			Oromia			SNNPR	
	Awash		Dulecha (N=30)	Yabello (N=30)	Taltale		Benatsemay	
Why vaccination service is not accessible								
Irregularity of service		73.7%	-	-		20%		0
Poor response from PVP	N=19	15.8%	-	-	N=20	25%	N=5	20%
Distance from service centre		10.5%	-	-		55%		80%
Vaccines can cure diseases								
Yes		70%	46.7%	40%	N=24	37.5%		17.2%
No	N=30	30%	53.3%	60%		62.5%	N=29	82.8%
One vaccine protects from only one disease								
Yes	N=30	40%	96.7%	73.3%	N=25	84%	N=28	82.1%
No		60%	3.3%	26.7%		16%		17.9%
Vaccines protection is only for some time								
Yes	N=30	90%	100%	56.7%	N=31	77.4%	N=28	71.4%
No		10%	0	43.3%		22.6%		28.6%

Vaccination services are most commonly given freely by the government for PPR and Sheep and Goat Pox (Shoat), and for LSD (cattle). Other vaccines commonly provided with cost covered by regional veterinary services are CBPP, Bovine Pasteurellosis, Anthrax, and Blackleg for cattle, and CCPP and Ovine Pasteurellosis for small ruminants. Pastoralists who were willing to pay for

vaccination services were asked about their fair estimate of payment for different vaccines. The summary is given in Table 12. Very few respondents provided estimates for vaccination of camels. Eighty percent of the private veterinary practitioners believed that there is a high demand for vaccination service in pastoral, 90% consider the business as attractive but they couldn't be involved in the business since the service is provided freely by government and there is no legal framework supporting their involvement in the business. Moreover, 60% of the PVPs believed that pastoralists are willing to pay for vaccination services however the free service provided by government will remain to be a challenge. They suggested it would be fair for pastoralists to pay 10-20% of the value of the vaccine as service charge.

Two of the NGOs interviewed believed that pastoralists are willing to pay while the remaining one didn't know whether or not there is willingness to pay. However, they all recommended that livestock owners should pay up to 5-10% or less of the market value of the animals for the various veterinary services. They also suggested an average estimated vaccination service price of 15-30 ETB for cattle, 5-15 ETB for sheep and goat and 15-40 ETB for camel as a fair price. They recommend the cost recovery scheme to progressively grow following proper creation of awareness on the need for payment instead of making it a surprise.

Table 12. Average prices for vaccination service as estimated by pastoralists

District		Cattle	Sheep	Goat	Camel
Awash Fentale	N	21	21	21	3
	Mean	23.4±21.80	8.4±7.71	8.4±7.71	36.7±20.62
Dulecha	N	11	11	11	2
	Mean	13.2±11.06	6.1±5.13	6.1±5.13	12.5±4.41
Yabello	N	28	27	27	15
	Mean	34.6±3.36	19.8±2.13	22.0±2.15	26.5±3.67
Taltale	N	1	1	1	-
	Mean	10±0.00	5±0.00	5±0.00	-
Benstsemay	N	27	27	27	-
	Mean	20.1±2.35	8.3±1.39	8.1±1.28	-

4.3. Community willingness to pay for vaccination service in the urban/peri-urban production system

Demography

The survey was conducted in four places: Bishoftu, Gondar, Adma and Hawassa considering both dairy and poultry producers as target population. A total of 120 dairy owners and 103 poultry breeders were interviewed. The majority of the respondents from all study area were male (72.6%) with 90.1% of them having at least primary education. The summary of demographic information is given in Table 13. Majority of respondents confirmed dairying or poultry production is their primary livelihood sources while the remaining keep this as supplementary source of livelihood.

Table 13. Summary of the demographic profile of the respondents in the urban/peri-urban system

Variable	Bishoftu (n=59)	Gondar (n=46)	Adama (n=60)	Hawassa (n=58)
Age of respondents (years)	21 - 70	25 - 70	30 - 70	24 – 70
Average family size	5.4	7.0	3.9	5.0
Gender of respondents				
Male	77.9%	84.8%	60.0%	70.7%
Female	16.9%	15.2%	28.3%	29.3%
NA	5.1%	-	11.7%	-
Main livelihood				
Farmer	-	-	-	-
Government employee	-	-	20.0%	18.9%
Private business	100%	95.7%	80.0%	81.1%
Other	-	4.4%	-	-
Contribution of livestock to the livelihood				
Main source	98.3%	78.3%	36.7%	51.7%
Supplementary	1.7%	8.70%	63.3%	48.3%
NA	-	13.0%	-	-
Educational level				
Uneducated	10.2%	8.7%	11.7%	12.0%
Primary	22.0%	15.3%	33.3%	6.9%
Secondary	61.0%	44.7%	30.0%	46.6%
College	NA	28.3%	25.0%	34.5%

*NA = no information

Socioeconomic importance of livestock

The majority of the respondents (70.0%) from Adama are owner of small-scale farm while 28% own medium sized farms. Farm sizes at Bishoftu are 47.5% medium farms, 28.8% large-scale and 23.7% small-scale farms. At Gonder, 45.7% had small-scale farms; 41.30% had medium scale farms and 13.04% had large-scale farms. At Hawassa, 41.4% had small-scale farm, 39.7% had medium scale farm and 18.9% had large scale farm. Half (50%) of the participants from Adama were poultry producers whereas 50.9% and 49.2% of the Bishoftu participants were dairy and poultry producers, respectively. At Gonder 65.2% were dairy producers while 34.78% were poultry producers while at Hawassa 51.7% were dairy producers and 48.3% were poultry producers.

Table 14. Scale of farming and livestock holding in the urban/peri-urban study areas

Variable	Number of farms	Percent (%)
Farming scale		
Small	103	45.3
Medium	87	39.0
Large	33	15.7
Breeds of cattle owned		
Exotic	80	66.7
Cross-breed	35	29.2
Zebu	5	4.1
Poultry breeds owned		
Broiler- 1200	1	0.9
Broiler-1500	1	0.9
Broiler-1801	1	0.9
Broiler-700	1	0.9
Bovans	25	24.2
Lohmann	8	7.8
Sasso	22	21.3
NA	44	42.7

*NA = no available response

The total financial revenue was estimated to be 183,763,750 EBT from sale of products (eggs and milk/milk products), with average of 1,074,641.8 ETB/household in one year. Poultry

producers obtained a total amount of ETB 111,438,750 from sale of eggs with mean income up to 1,311,044.1 ETB/household. Dairy producers obtained a total of 72,325,000 ETB with an average of 840,988.4 ETB/household per year. The annual income from the sale of animal products ranges from ETB 14,600 to over 3 million. Different breeds of dairy cattle and poultry are raised by the farmers as shown in Table 14.

Disease problems in the urban and peri-urban production system

The occurrence of disease outbreak was reported by 87 (39.0%) respondents. Occurrence of outbreaks was reported by 53.3% of livestock owners from Adama, 42.4% from Bishoftu, 32.6% from Gonder and 17.2% from Hawassa. The major infectious diseases affecting dairy cattle include mastitis, LSD, FMD and pasteurellosis. These diseases have been frequently occurring in their herd. Ecto- and endo parasites are also incriminated as disease problems for dairy cattle. As shown in Table 15, the three most important diseases of poultry in all study area were Newcastle disease (NCD), infectious bursal disease (IBD) and fowl pox.

Table 15. List of major diseases of cattle and poultry in the areas surveyed

Name livestock Disease	Rank	Frequency
Cattle diseases		
Mastitis	1	15
LSD	2	13
FMD	3	7
Ectoparasitism	3	7
Pasteurellosis	4	6
Anthrax	5	3
Blackleg	6	2
Endoparasitism	6	2
Ringworm	7	1
TBD	7	1
Poultry diseases		
ND	1	50
IBD	2	6
Fowl pox	3	5
Fowl typhoid	4	2
MD	4	2

In addition, fowl typhoid and Marek's disease (MD) were also considered as serious problems by the producers. Overall, 76.4% of respondents have experienced outbreak at least once; 10.4% experienced twice; 2.4% experienced occasional outbreaks. The majority (55.0%) of livestock owners at Adama revealed that outbreaks occur only once in a while, 40.0% disclosed occurrence of outbreaks twice; the rest indicated occasional appearance. At Bishoftu, 33.9% reported occurrence of outbreaks only once; 3.4% twice and 62.71% did not respond. At Gonder, 10.9%, 6.5%, 2.2%, 6.5% indicated outbreak occurred once, twice, frequently and occasionally, respectively while 73.9% did not provide answer. At Hawassa, 66.7% reported occurrence of outbreaks to be only once while the remaining did not report the frequency.

Status of Veterinary services

Generally, availability of veterinary service is confirmed by over 93% of the respondents in the urban system. At district level, of veterinary service availability was confirmed by 96.7% of livestock owners from Adama; 86.4% from Bishoftu and all (100%) of livestock owners interviewed from Gonder and Hawassa. Hence, 87.6% of them have vaccinated their animals at least once during their business and in 85.6% of the cases the service was provided by veterinarians (96.30%) and paraprofessionals (2.2%) either paid or for free. Apparently, in over half of the cases (55.9%) at Bishoftu, the service is basically given by paraprofessionals while interestingly a few of livestock owners (1.69%) carry out the vaccination themselves. Consultation service is provided mainly by veterinarians (75.6%), followed by paraprofessionals (20.0%) while 6 (4.44%) disclosed that they did not get any consultation. Veterinary clinical service is known to be a paid service as confirmed by all (100%). Vaccination service is also known to be a paid service as confirmed by 88.15% of the respondents though consultation is often unpaid service. Livestock owners spend an average of 209.95 ETB for the treatment of ectoparasites, 211.64 ETB for treatment of endoparasites and 806.65 ETB for treatment of infectious diseases per animal. Vaccination is known to be mostly given only once, in cattle mostly for diseases like FMD, LSD, anthrax, blackleg and pasteurellosis, and in poultry, for disease like IBD, ND, MD, fowl typhoid, fowl pox and cocidiosis. A few livestock owners from Adama and Bishoftu towns do vaccinate their animals two or more times a year. However, as high as 45% at Gonder and 55% at Hawassa, get vaccination twice or three times a year.

Willingness of livestock owners to pay for vaccination services

Even though the vaccination service, particularly for cattle, from the government clinics was often given for free, 91.5% of 223 respondents are still willing to pay if the service is provided with payment. Only 2.2% are undetermined and 6.3% are unwilling to pay for vaccination service. Based on farming type, 87.5% of dairy and 96.1% of poultry owners are willing to pay for vaccination services. At the level of the study towns, 89.7% from Adama, 88.1% from Bishoftu, 98.3% from Hawassa and 93.2% from Gonder are willing to pay for vaccination services both for poultry and cattle diseases. Thus far, poultry producers used to pay in the range of 0.5 - 1.00 ETB for vaccination services while dairy cattle owners used to pay in the range of 1.5 – 400 ETB. Although the overwhelming majority (95.9%) believe vaccination protects animals from diseases, over 90% also have a serious misconception in that they not only believe vaccination can cure animals from disease but also one vaccine can work for all kinds of disease (Table 16).

Table 16. Perceptions of the livestock owners on vaccines and their willingness to pay

Variable	N	Yes (%)	No (%)	undetermined (%)
Are you willing to pay for vaccination service?	223	91.5	6.3	2.2
Are you willing to pay for vaccination service if the cost of vaccine is increased by 50%?	223	90.7	9.3	-
Do you believe vaccines protect animals?	223	95.9	2.6	1.5
Do you believe vaccines can cure animals from disease?	223	88.4	5.8	5.8
Can one vaccine protect animals from all diseases?	223	83.4	11.7	4.9
Vaccination is only for protection of diseases for limited time?	223	88.9	9.6	1.5

Perception of veterinary service providers

Both the public and private veterinary service providers ranked pasteurellosis and anthrax to be the most important disease of cattle whereas NCD is the most important disease of poultry in the urban and peri-urban production system (Table 17).

Table 17. Important diseases of livestock in the urban and peri-urban production system according to the ranks given by the public veterinary service providers

Name of the livestock diseases	Rank	Frequency
Cattle diseases		
Pasteurellosis	1	4
FMD	2	1
Blackleg	2	1
Sheep and goats diseases		
Pasteurellosis	1	3
Sheep and Goat Pox	2	2
Poultry diseases		
ND	1	4
Fowl pox	2	2

FMD, LSD, blackleg, ringworm, BTB and mastitis have also been reported as major problems in dairy cattle. Marek's disease, fowl pox, infectious coryza, coccidiosis, fowl typhoid, mites and ascites were also mentioned as major poultry disease. Livestock owners get vaccination for their animals against diseases such as pasteurellosis, anthrax, FMD, blackleg, LSD and CBPP whereas, NCD, infectious bursal disease, fowl pox and fowl typhoid are diseases against which owners vaccinate their poultry. All public veterinary service staffs are involved in the provision of both clinical and vaccination services. Both the private and public services providers/drug vendors confirm that clinical, consultation, vaccination or a combination of any two of the services are available and accessible to livestock owners. All veterinary practitioners (100%) believe that farmers are willing to pay for the vaccination services. All practitioners believe that farmers are willing to pay for the service, therefore, they believe vaccination service is an attractive business if pursued. The NGO operating in the area recommended a cost recovery scheme for up to 10-20% of the market value of individual animal for different veterinary services. Further suggested an average estimated vaccination service price of 100 ETB for cattle, 75 ETB for sheep and goat, and 15 ETB for poultry as a fair price. NVI remains to be the major source of livestock vaccine is the NVI and occasionally other government institutions such as universities.

5. CONCLUSIONS AND RECOMMENDATIONS

Demographic figures are fairly similar among the livestock production systems; however livestock ownership is relatively higher in the pastoral areas, consisting mostly indigenous breeds in the MCL and pastoral areas whereas >95% are exotic or cross bred animals in the urban system. Average income per household is comparatively higher in the urban/peri-urban system and lowest in the pastoral system. Contribution of livestock to the livelihood is primary source in the pastoral system followed by mixed crop livestock and the urban production system. The overwhelming majority (>85%) of livestock owners have experience in vaccinating their animals. Vaccination services are mostly paid in the urban system but free in the pastoral system while both options are available in the MCL production system.

This investigation confirmed that infections in the list of transboundary animal diseases are rampant irrespective of the production system. In some instances, they were reported to be the cause of economic loss. Analysing the various components of this study, it can be concluded that the overwhelming majority of livestock owners (>90%) in the MCL and Urban production system are willing to pay for vaccination service while only 61% are willing to pay in the pastoral production system. Redacting Dulecha and Teltele, both from pastoral production system, willingness to pay for vaccination service is well over 85% for the remaining pastoral districts. However, respondents have also pointed out the various challenges that need due consideration; such as irregularity and unavailability of the service as needed or delayed vaccination, limited coverage in all kebeles/village, their inability to pay when they want to vaccinate large number of animals.

Willingness to pay for vaccination service did not seem to be influenced by production system, educational level of the livestock owner, size of the flock or livestock holding, or current market value of the animal however, pastoral communities in Dulecha and Teltele districts seemed to have been influenced by their lower income for making the decision on their willingness to pay. It was evident that the average income from sales of livestock or livestock product in these districts is less than half of the average for the whole pastoral production system studied. These unwilling households (livestock owners) in the pastoral area primarily indicated their lower

economic statuses (being poor) hence are unwilling to pay mainly for fear of affordability and previous experiences with the government giving the service for free. Therefore, a significant proportion of livestock owners in the two districts of the pastoral areas believe the service should continue to be free of charge.

The proposed cost of vaccination per individual animal as reported by the various actors seems to be too small compared to the market price of a given animal. Nevertheless, some owners believe the cost would still be high or unaffordable for livestock owners keeping large number of animals which is a common trend in the MCL and pastoral production systems. Rating the cost of vaccination with tiers, instead of blanket price, could be a plausible way forward if cost recovery scheme is to be implemented.

The fact that the government or public veterinary service is the main service provider has impacted both the attitude and future decisions on the service and cost of livestock vaccine as well. A significant proportion of livestock owners from all districts in the various production system still believe vaccination service should be free for some species like poultry though they are willing to pay for other species of domestic animals. Veterinary practitioners, whether in the public or private, as well as the various NGOs operating in the different production systems indicated their primary concern to be the monopoly of the service by the government. This has made the vaccine and other inputs to be unavailable or inaccessible to the private practitioners making the prospect of the business unattractive. Private practitioners and drug vendors couldn't be involved in the business since the service is provided freely by government and there is no legal framework supporting their involvement in the business. In this regard, the need for introduction of a statutory/regulatory body that governs the service if vaccination is to be privatized. In some instances shortage of veterinary input has been mentioned as the main reason for unavailability of the service; on top of this distance from veterinary service center has also been indicated as the other biggest challenge affecting accessibility and coverage of the vaccination service.

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