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Assessment and Evaluation of Farmer's Knowledge, Attitude, Practices and Dissemination Routes of Livestock Vaccines in Assosa Zone

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Abstract

Vaccine is one of the major ways of preventing and controlling infectious diseases in livestock. The aim of the study was to evaluate and know available vaccines, to identify and characterize factors responsible for vaccine failures in order to support improvement against disease, to understand the vaccine management and vaccine delivery system. A cross-sectional semi structural questionnaire survey was developed. A total of 86 farm owners from three districts Assosa, Bambasi, and Homosha, there were 52, 18 and 16 participants, respectively. In this study three species of animals, six farmers who have goat, 76 farmers who have cattle and 4 farmers who have poultry were included in the survey. All most all respondents in Bambasi (100%), Assosa (88.5%), and Homosha (87.5%) can use and were known about vaccines but not about all type of vaccines. In other study vaccination was the most widely known preventive measure (68.9%). There is no significant difference (P=0.3) and (p=0.06) between districts in terms of farmers' knowledge of vaccines and their use respectively. Most respondents had heard of vaccines prior to 11 years ago. The majority of respondents (66.3%) learned about the vaccine from animal health workers, followed by locals (18.6%) and elders (6.9%). Most respondent's 62.8% starting use of vaccine above nine (9) years. Pasturolosis, LSD, Anthrax, black leg, CBPP, PPR, CCPP, pox and NCD was available in the study area. In addition, in commercial poultry farms fowl typhoid, fowl pox, and mareks was found. 65.1% of the respondents were practiced vaccinating of their livestock against the most common diseases. Sick animals (88.4%) were excluded from vaccination. Vaccination mostly provided by the government (94.2%), with only a few cases (5.8%) performed by private owners. Vaccination was carried out by professionals (95.3%), SC administration and liquid preparation was applied. Commercial dairy and poultry farms have better use and adapt vaccine technology than small holder farm owners. Most respondents explained that the reason of diseases encountered after vaccination was due to poor vaccine handling and management (60.5%) followed by poor response from the host (26.7%). The factors tackle vaccine efficacy and vaccine delivery system was vaccination condition, frequency of vaccination, vaccine value channels, supply chain, access points and vaccine delivery system.

Keywords: Assosa Zone • Farmer's Knowledge • Livestock • Vaccine

Abbreviations: ANOVA: Analysis of Variance; LSD: Lumpy Skin Diseases; CBPP: Contagious Bovine Pleuropneumonia; PPR: Peste Des Petites Ruminates; CCPP: Contagious Caprine Pleuropneumonia

Introduction

The livestock sector is irreplaceable in the livelihood of the population as a source of meat, milk, drought power, and cash income. Furthermore, in Ethiopia, about 66% of the country's crop land is cultivated with the use of animal power. Despite having this massive amount of resource, the Ethiopian's unable to exploit the sector entirely because of highly prevalent infectious diseases and lack of appropriate disease control policy. The existing animal health intervention options have not been able to control major animal diseases. Low drug and vaccination coverage, absence of vaccine, low efficacy of the available vaccines are among the major reasons failure in diseases mitigate, prevent and control [1].

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In spite of the global availability of vaccines for many of the animal diseases, the veterinary vaccines present in Ethiopia are of few in number and lowest in coverage. This indicates that the success of veterinary vaccine development and adoption has not been encouraging and much more remains to do. Commercial vaccines are available for prevention and control of many livestock diseases; however, these vaccines frequently do not reach, and thus are not often used by, small holder farmers. Here, we seek to identify factors hindering strategies that can increase the adoption of animal vaccines for smallholder farmers [2-5].

To mitigate the aforementioned problems, vaccines remain the best disease control method from the existing alternative. The existing veterinary vaccines in Ethiopia are not only few in number but also it has inefficient. To address and improve the potential growth of livestock sector, effective and sustainable delivery of vaccines across the value chain is crucial. There have been several reports of post vaccination disease outbreaks. Low performance of the local vaccine and insufficient vaccination coverage are the main problems in the country [6,7].

This study was undertaken to determine information gaps, constrains identification and characterize factors of the management aspects of vaccines along the value cascades that would aid in instituting targeted interventions for the improvement of livestock production and productivity. Although some vaccines produced in Ethiopia, the general use and the farmers' knowledge, attitudes, and practices regarding vaccine use quantified in Benishangul Gumuz region. There for the objective of this study to evaluate and know available vaccines, to identify and characterize factors responsible for vaccine failures in order to support improvement against disease, to understand the vaccine management, delivery system and pathways and to assess other alternative prevention and control methods in the study area.

Materials and Methods

Study area

The research carried out in the Assosa zone, Benishangul Gumuz region, northwestern Ethiopia. Benishangul Gumuz Regional state is situated in western part of Ethiopia, between 09^0 17'-12.06" N latitude and 34^0 10'-37.4" E longitude. The region bordered with Sudan Republic in the West, Amhara region in the North and North – East, in the Southern with Gambella regional state, and in South and South East direction by Oromia region. The average annual temperature is 16-39°C; its annual rainfall is 650–1,900 mm. The region covers a total area of 5,033, 592 hectar/50,380 km^2 or 4.4% total of the country, with altitude ranges from 580–3300 m.a.s.l with 75% low land/kola/(below 1,500 m.a.s.l). According to CSA in Benishangul Gumuz region, the number of cattle, sheep and goat population was 592,228, 61,335 and 446,323 respectively. Assosa zone is located in Benishangul Gumuz region, the lowland agro ecological zones of western part and the climate is characterized by bimodal rainfall consists of rain season, called Keremt (June-November), dry season, called Bega (December-May). The agro ecology is mid and low land with a mixed agricultural farming system. In Assosa zone the number of cattle, sheep, goat, donkeys, poultry and beehives are 69420, 11542, 154346, 17670, 352960, and 36263 respectively but there is no horse, mules and camels.

Study design and sampling

A purposive cross-sectional survey conducted in this study. A pre-tested semi structural questionnaire developed to collect information on the study variables relating to livestock before main data collection time.

Selection of study farms and farmers

This study included model farmers, with a focus on farm owners who have livestock and kept a large number of animals. During the entire study period, all volunteer farm owners, as well as coverage, access to vet clinics, and extension services, were taken into account.

Target population

The study districts included Assosa, Bambasi, and Homosha. Three peasant associations or Kebeles selected in each district. Overall 86 purposively selected model farms included in the interview. The respondents comprising either of farm owners, farmworkers, and agricultural development agents, veterinarians and farm managers involved during face-to-face interview. The dominant type of livestock species selected as a target, that means the animal with large in number in the house hold count as a target species and details of interviewed about that specific target species in the household.

Sample size determination

The number of respondents for unknown population calculated using the formula $(((Z/2)^2 \times p \times q)/e^2)$ and assuming minimum variation (5%) between farm owner's management system and farming types. According to the formula number of respondents were $((1.96)^2 \times 0.05 \times 0.95/(0.05)^2)=73$ but to increase precision the number of respondents increase to 86.

Questionnaire preparation

A semi structural questionnaire deliberately developed for this study. The data collected using a pretested, structured questionnaire administered by a team of researchers. The three answer choices for respondents were yes, no, and do not know. The demographic questionnaire included information on gender, age, education, primary livelihood activity, ethnicity, marital status, and residential area of respondents. The other contents of the questionnaire were farmers' knowledge and attitudes on the vaccination of the livestock, source of vaccine, pathway of vaccine distribution channel and its implication.

Farmers knowledge and attitude

Question on knowledge, attitude and practice concerned on use of vaccine, length of use of vaccine, hear about vaccine, length of hear about vaccine, source of information about vaccine, vaccine application practice, farmer's preference of vaccine, about vaccinators, reason of diseases encountered after vaccination, and advantage of vaccine.

Farmers' vaccine practice and trained understanding

These questions focused on type of farming system adopt vaccine technology vaccine rapidly, efficacy of vaccine, broad specterm nature of vaccine, type of vaccine induced illness or death after vaccination.

Dissemination way of vaccine

Vaccine campaign and factors that hinder vaccination system: Vaccine campaign includes species of animal involved, type of vaccines and season or time of vaccine campaign. Factors that hinder effective vaccination were vaccine delivery system, vaccination condition, frequency of vaccination and booster vaccination system and vaccine value channel's.

Data analysis

Data were entered, edited, organized, summarized and analyzed using SPSS statistical package version 20. For data involving frequencies, descriptive statistics and one-way ANOVA employed to analyze the collected information in the study areas.

Results and Discussion

This is the first survey narrating livestock disease control practices undertaking the field of animal health management. The study included the demographic situation of respondents' knowledge about vaccines, the type of vaccine, and the veterinary vaccine delivery system in this Assosa zone of Benishangul Gumuz region.

Demographic characteristics: A total of 86 farm owners from three districts took part in the survey. In Assosa, Bambasi, and Homosha, there were 52, 18 and 16 participants, respectively. As shown in Table 1 among 86 respondents 15.1% were female. Similar to the current study most respondents 84.2% of them were males while 15.8% of them were females. Based on age 76.1% of them were adults (>30 years). In addition, other study, the male participants comprised the majority, accounting for 89.1%, whereas the female participants made up 10.9%. The majority of respondents (72.1%) were adults (aged 30 to 60), with the fewest respondents aged over 60. Similar to the current study, studied that 44.1% were aged between 36 and 45 and 30.9% were 46 years or older. Most of the respondents (37.2%) were illiterate and very few respondents around 9.3% were college and university graduates. Most of the respondents around 88.37% were reared cattle. The majority of the respondents (83.7%) were smallholder farm owners, while 14 respondents were commercial and model farmers. There were 91.8% private farm owners and 8.2% state-oriented farm owners among the respondents. The number of state oriented farm owners was small because of selection bias during farmer selection; farmers who have large number of animal were given preference during selection. According to respondents, 44.2% of respondents keep animals above 15 years, while 20.9% keep farm animals below 5 years. In this study three species cattle, goat and poultry were included and the species with large number in the house hold count as a target. Six farmers who have goat, 76 farmers who have cattle and 4 farmers who have poultry were included in the study.

Factor	Categories of factors	Frequency	Percent
District	Homosha	16	18.6
	Assosa	52	60.5
	Bambasi	18	20.9
Sex	Male	73	84.9
	Female	13	15.1
Age	Below 30	18	20.9
	30 to 60	62	72.1
	Above 60	6	7.0
Education	Illiterate	32	37.3
	Read and write	15	17.4
	Elementary	22	25.6
	High school	9	10.4
	College and university	8	9.3

Farm owner	Private	79	91.9
	State	7	8.1
Duration of farming	Below 5 year	18	20.9
	5 to 15 year	30	34.9
	Above 15 year	38	44.2
Species of livestock	Goat	6	7.0
	Cattle	76	88.4
	Poultry	4	4.7
Farm type	Small holder's	72	83.7
	Commercial and medium farms	8	9.3
	Model farmers	6	7.0

Table 1. Respondent's demography and herd structure (n=86).

Knowledge of farmers about vaccine

As shown in Table 2 below all most all respondents in Bambasi (100%), Assosa (88.5%), and Homosha (87.5%) can use and knew about vaccines but not all type of vaccines. In other study, vaccination was the most widely known preventive measure (68.9%). There is no significant difference (P=0.3) and (p=0.06) between districts in terms of farmers' knowledge of vaccines and their use respectively. In other study animal health, extension about livestock diseases impact and vaccines has a potential to increase farmers' use of vaccine for disease control. Although the majority of respondents (87.2%) stated that vaccines manufactured locally, 12.8% were unaware of where the vaccine produced [8,9].

Knowledge and use of vaccine	Use of vaccine	Hear about vaccine	Pearson *chi*^{2} (X^2)	p-value
Homosha	9 (56.2%)	14 (87.5%)	5.5, 2.3	0.3, 0.06
Assosa	31 (59.6%)	46 (88.5%)		
Bambasi	5 (27.9%)	18 (100%)		

Table 2. Farmers knowledge about vaccine and farmers who used vaccine.

As shown in Table 3 below most respondents had heard of vaccines prior to 11 years ago. The majority of respondents (66.3%) learned about the vaccine from animal health workers, followed by locals (18.6%) and elders (6.9%). Around 8.1% of respondents had not heard about the vaccine until this time, this respondent's count vaccine as drug.

Districts	Source heard			When hear about vaccine in years			
	Elders	Health worker	Local	No heard at all	0 to 10	11 to 20	Above 20
Homosha	2 (12.5%)	10 (62.5%)	2 (12.5%)	2 (12.5%)	5 (31.2%)	11 (68.7%)	0 (0%)
Assosa	4 (7.69%)	30 (57.69%)	13 (25%)	5 (9.61%)	6 (11.5%)	20 (34.5%)	26 (50%)
Bambasi	0 (0%)	17 (94.44%)	1 (5.55%)	0 (0.00%)	6 (33.3%)	6 (33.3%)	6 (33.3%)
Total	6 (6.9%)	57 (66.%)	16 (18.6%)	7 (8.1%)	17 (19.78%)	37 (43.02%)	32 (37.21%)

Table 3. Source heard and when hears about vaccine in years.

As shown in Table 4 below most respondents around 62.8% starting use of vaccine above nine (9) years.

District	Length of years use vaccine				
	0-3 year	3-6 year	6-9 year	Above 9 year	Not heard and not give idea
Homosha	3 (18.6%)	2 (12.5%)	2 (12.5%)	8 (50%)	1 (1.9%)

Assosa	12 (23.1%)	4 (7.7%)	2 (3.8%)	30 (57.7%)	4 (7.7%)
Bambasi	0 (0%)	2 (11.1%)	0 (0%)	16 (88.9%)	0 (0%))
Total	15 (17.4%)	8 (9.3%)	4 (4.6%)	54 (62.8%)	5 (5.8%)

Table 4. The lengths of years of start vaccinate their animals in the study area

Different vaccine applied in study area

As shown in Tables 5 and 6 the available cattle vaccine were pasturolosis, LSD, Anthrax, black leg, and CBPP vaccines. Available shoat (sheep and goat) vaccines were PPR, CCPP, Pasturolosis, and sheep pox vaccines. NCD, fowl typhoid, fowl pox, and mareks were among poultry vaccines available in the study area. There is no preference between animals varied in breed and species of vaccination. Livestock diseases are the main problems of smallholder farmers' in the study areas. To control the spread of these diseases about 65.1% of the respondents were practiced vaccinating of their livestock against the most common diseases. Similar to the current study, lumpy skin disease vaccine, contagious bovine pleuropneumonia, bovine pasturolosis, anthrax vaccine, and blackleg vaccine was available vaccine of cattle. In addition to this poultry vaccine newcastle disease vaccine, infectious bursal disease vaccine, fowl typhoid vaccine, fowl pox vaccine and Marek's disease vaccine was available. As respondent and Ethiopian contest almost all use vaccine that was made locally but some poultry farm owners use imported combined vaccine. According to some farmers, vaccines are less effective and sometimes cause disease. Many farmers, particularly in Assosa districts, refuse to accept vaccines administered by local healers.

Species	**Vaccine type**						
	Cattle			**Shoat**			
District	**Pasturolosis**	**LSD, anthrax, CBPP pasturolosis, black leg**	**No vaccine**	**PPR**	**CCPP**	**Pasturolosis**	**CCPP, PPR, sheep pox**
Homosha	2 (12.5%)	12 (75%)	2 (12.5%)	13 (81.2%)	2 (12.5%)	1 (6.3%)	2 (12.5%)
Assosa	12 (23.1%)	39 (75%)	1 (1.9%)	22 (42.3%	5 (9.6%)	4 (7.8%)	21 (40.3%)
Bambasi	2 (11.1%)	16 (88.9%)	0 (0%)	16 (88.9%)	0 (0%)	0 (0%)	2 (11.1%)

Table 5. The type of vaccine and respective species.

District	**Poultry vaccine**			
Homosha	**Only NCD**	**NCD, fowl typhoid**	**NCD, fowl typhoid, fowl pox and marex**	**NCD, fowl typhoid, marex**
Assosa	14 (87.5%)	2 (12.5%)	0 (0%)	0 (0%)
Bambasi	46 (88.5%)	0 (0%)	4 (7.7%)	2 (3.8%)
District	16 (88.9%)	0 (0%)	0 (0%)	2 (3.8%)

Table 6. The type of vaccine and respective species.

As shown in Table 7 respondents explained that animals exclude animals from vaccination due to different reasons. The most dominant one listed as pregnant animals, injured animals, lactating animals and sick animals. Animal health issues such as abortion, delayed estrus, stillbirth, and diseases induced, swelling at the site of vaccination, and others have occurred following vaccination. The first age, the animals received this vaccine determined by manufacturer and professional recommendations.

List of conditions	**Yes (Percent)**	**No (Percent)**	**No idea (Percent)**
Do you exclude animals from vaccination?	91.9	8.1	0
Exclude sick animals	88.4	5.8	5.8
Exclude injured animals	4.7	17.4	79.9
Exclude lactating animals	0	60.5	39.5

Exclude pregnant animals	80.2	2.3	17.4
Other way (work load, owner performance and professional preference)	7	4.7	88.4

Table 7. List of reason of exclude animals from vaccination.

As shown in Table 8 in this study, Vaccine utilization by farmers mostly provided by the government (94.2%), with only a few cases (5.8%) performed by private owners. Similar to the current study, in other study Dugassa et al., about 58.5%, have access to governmental veterinary services in East Welega Zone. In addition, other study Hooper crop-livestock mixed farmers have a better access to veterinary services such as vaccination and health education through different campaigns implemented by government. Vaccination was carried out by professionals (95.3%), but in some cases, around 2.3% of people in the Assosa district vaccinated their animals themselves, and another 2.3% relied on others (brokers and traditional healers). The most common method of using vaccine in the study area is SC administration and liquid preparation. Animal health workers stated that normal dosing with the guidelines from leaflets for administering vaccine is recommended. When farmers noticed an adverse effect from veterinary vaccines, they immediately consulted with animal health workers.

District	Who vaccinated			Vaccine source	
	Professional	Owner	Others (brokers, traditional healers)	Government	Private
Homosha	16 (100%)	0 (0%)	0 (0%)	16 (100%)	0 (0%)
Assosa	48 (92.3%)	2 (3.8%)	2 (3.8%)	47 (90.4%)	5 (9.6%)
Bambasi	18 (100%)	0 (0%)	0 (0%)	18 (100%)	0 (100%)
Total	82 (95.4%)	2 (2.3%)	2 (2.3%)	81 (94.2%)	5 (5.8%)

Table 8. Who is responsible to administer vaccine in your area?

As shown in Table 9 below most respondents explained that the reason of diseases encountered after vaccination occur due to poor vaccine handling and management (60.5%) followed by poor response from the host (26.7%).

Reasons of diseases rarely encountered after vaccination							
District	Poor response from the host	Environment related diseases	Seasonal influence	Outdated vaccine	Vaccine dosage	Rout of administration	Vaccine formulation and handling problems
Homosha	4/16 (25%)	0/16 (0%)	6/16 (37.5%)	8/16 (50%)	0/16 (0%)	0/16 (0%)	12/16 (75%)
Assosa	5/52 (9.6%)	6/52 (11.5%)	21/52 (40.4%)	3/52 (5.7%)	4/52 (7.7%)	3/52 (5.7%)	28/52 (53.8%)
Bambasi	14/18 (77.8%)	0/18 (0%)	2/18 (11.1%)	6/18 (33.3%)	2/18 (11.1%)	4/18 (22.2%)	12/18 (66.7%)
Total	23/86 (26.7%)	6/86 (7%)	10/86 (11.6%)	17/86 (19.7%)	6/86 (7%)	7/86 (8.1%)	52/86 (60.5%)

Table 9. Reasons diseases rarely encountered after vaccination.

Evaluate veterinary vaccine adoptions

Advantage of vaccine: The advantage of vaccine by the respondent's view, indicates that Vaccine reduce death, reduce morbidity, production improvement and induce immunity. In Assosa districts commercial dairy and poultry farm owners can adopt vaccine technology but in Bambasi small holder farm owners can adopt vaccine technology. As shown in Table 10 there are few peoples who do not give any idea about the vaccine technology. In study area most respondents told that commercial dairy and poultry farms have better use and adapt vaccine technology than small holder farm owners. The respondent not suggests any of the adoption idea.

Districts	Which farming system do you think adopt vaccine technology rapidly?			Total
	Stallholder farms	Commercial dairy and poultry farms	No idea	
Homosha	6 (37.5%)	10 (62.5%)	0 (0.00%)	16

Assosa	19 (36.5%)	25 (48.1%)	8 (15.4%)	52
Bambasi	4 (22.2%)	10 (55.6%)	4 (22.2%)	18
Total	29 (33.7%)	45 (52.3%)	12 (14.0%)	86

Table 10. Which farming system do you think adopt vaccine technology rapidly?

As shown in Table 11 the illness, death and diseases occurrence after vaccine was evaluate by respondents and the diseases occurrence after vaccination was vary in different species of animals. Aggression, asphyxia/dyspnea, coughing, unnecessary pain or distress/ swelling at the site of injection, diarrhea, death, bloat restlessness, fever, vomiting, risk to public health, and risk to trade are common side effects after vaccination.

District	How do you evaluate illness, death and diseases occurrence after vaccination		
	Remain unchanged	Decrease	No idea
Homosha	8 (50%)	8 (50%)	0 (0.00%)
Assosa	11 (21.10%)	40 (76.9%)	1 (1.92%)
Bambasi	0 (0.00%)	18 (100%)	0 (0.00%)
Total	19 (22.1%)	66 (76.7%)	1 (1.16%)

Table 11. Evaluations of vaccine after vaccinate the animal.

As shown in Table 12 the efficacy of veterinary vaccine after vaccination evaluated by respondents and the effectiveness of vaccine was, vary in different districts. In total 55.81% of respondent's efficacy of vaccine is effective, 33.72% of respondents explained as moderately effective and 9.3% explained that not effective but 1.16% from the respondents not give idea.

District	How do you evaluate the efficacy of veterinary vaccine?			
	Effective	Moderately effective	No idea	No effective
Homosha	4 (25%)	8 (50.00%)	0 (0.00%)	4 (25.00%)
Assosa	26 (50%)	21 (40.38%)	1 (1.92%)	4 (7.69%)
Bambasi	18 (100)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Total	48 (55.81%)	29 (33.72%)	1 (1.16%)	8 (9.30%)

Table 12. How do you evaluate the efficacy of veterinary vaccine?

As shown in Table 13 most of the respondents around 50% Saied vaccines have not broad spectrum nature but 36.04% of cannot understand weather the vaccine has broad spectrum nature or not. But other 19.23% of respondents understand vaccination is better for diseases prevention and may have broad spectrum nature. The response was varying in different districts.

District	Have broad spectrum nature to protect against different strain of a specific pathogen?		
	Yes	No	No idea
Homosha	0 (0.00%)	6 (37.50%)	10 (62.50%)
Assosa	10 (19.23%)	21 (40.38%)	21 (40.38%)
Bambasi	2 (11.11%)	16 (88.89%)	0 (0.00%)
Total	12 (13.95%)	43 (50.00%)	31 (36.04%)

Table 13. Have broad-spectrum nature to protect against different strain of a specific pathogen?

Vaccination campaign: As shown in Table 14, 75.75% respondents explained vaccination campaign common but around 22.09% Saied there were no vaccine campaign and 2.23% of respondents not give idea. The response of respondents varies among districts.

Districts	Is door to door vaccination campaign common to your area?		
	Yes	No	No idea
Homosha	9 (56.25%)	5 (31.25%)	2 (12.50%)
Assosa	39 (75.00%)	13 (25.00%)	0 (0.00%)
Bambasi	17 (94.44%)	1 (5.56%)	0 (0.00%)
Total	65 (75.58%)	19 (22.09%)	2 (2.23%)

Table 14. Is door-to-door vaccination campaign common to your area?

As shown in Table 15 vaccine campaign common in sheep and goat (46.51%) followed by poultry (27.9%).

Districts	If yes for which species of animals it is given? list the type of vaccines given by campaign in your area			
	Select cattle vaccine	Chicken vaccine	Sheep and goat	No idea
Homosha	4 (25.00%)	1 (6.25%)	5 (31.25%)	6 (37.5%)
Assosa	2 (3.84%)	17 (32.69%)	24 (46.15%)	9 (17.30%)
Bambasi	0 (0.00%)	6 (33.33%)	11 (61.11%)	1 (5.56%)
Total	6 (6.98%)	24 (27.90%)	40 (46.51%)	16 (18.60%)

Table 15. If yes for which species of animals, it is given.

Season of vaccination: As shown in Table 16 vaccination of animals performed in different season, which is, vary according to vaccine type and animal species. The response of respondents varies among districts that are in Bambasi around 55.6% of respondents the particular season was Dry season (summer).

Districts	In which particular season of the year do you do vaccinate your animals			
	Dry season (Summer)	Winter (Keremt)	No give idea	Vary according to vaccine type
Homosha	4 (25.00%)	2 (12.5%)	4 (25.00%)	6 (37.50%)
Assosa	12 (23.08%)	4 (7.69%)	11 (21.15%)	25 (48.07%)
Bambasi	10 (55.60%)	3 (16.67%)	0 (0%)	5 (27.78%)
Total	26 (30.23%)	9 (10.46%)	15 (17.44%)	36 (41.86%)

Table 16. In which particular season of the year do you do vaccinate your animals.

Factors influence on effective vaccine delivery systems and vaccine efficacy: There were list of factors that affects vaccine efficacy and vaccine delivery system. Similar to the current study the factor of vaccine failure may be environmental factor, improper storage and improper vaccine delivery system. As shown in Tables 17-19 factors such as animal's vaccination condition, frequency of vaccination or booster dose, vaccine value channels, supply chain, access points and vaccine delivery system.

Districts	Vaccination condition								
	Isolate sick animals			Consult veterinarians			Vaccinate all animals		
	Yes	No	No idea	Yes	No	No idea	Yes	No	No idea
Homosha	6 (37.5%)	4 (25%)	6 (37.5%)	4 (25%)	4 (25%)	8 (50%)	6 (37.5%)	0 (0%)	10 (62.5%)
Assosa	17 (32.69%)	0 (0%)	35 (67.30%)	34 (65.38%)	1 (1.92%)	17 (32.69%)	2 (3.85%)	7 (13.46%)	43 (82.69%)
Bambasi	6 (3.33%)	4 (22.22%)	8 (44.4%)	14 (77.78%)	2 (11.1%)	2 (11.1%)	2 (11.1%)	6 (3.33%)	10 (55.56%)

Total	29 (33.72%)	8 (9.3%)	49 (56.97%)	52 (60.46%)	2 (2.32%)	27 (31.39%)	10 (11.62%)	13 (15.11%)	63 (73.25%)

Table 17. Animal's vaccination condition.

Districts	Time of vaccination schedule								
	Ones per year			Ones per six month			Vary accordingly schedule		
	Yes	No	No idea	Yes	No	No idea	Yes	No	No idea
Homosha	0 (0%)	2 (12.5%)	14 (87.5%)	12 (75%)	0 (0%)	4 (25%)	2 (12.5%)	0 (0%)	14 (87.5%)
Assosa	18 (34.6%)	2 (3.85%)	32 61.54%)	38 (73.07%)	1 (1.92%)	13 (25%)	2 (3.85%)	3 (5.77%)	47 (90.38%)
Bambasi	2 (11.11%)	0 (0%)	16 (88.89%)	16 (88.89%)	0 (0%)	2 (11.11%)	2 (11.11%)	0 (0%)	16 (88.89%)
Total	20 (23.3%)	4 (4.7%)	62 (72.1%)	66 (76.7%)	1 (1.2%)	19 (22.1%)	6 (7.0%)	3 (3.5%)	77 (89.5%)

Table 18. For how many times you vaccinate your animal.

Districts	Time of vaccination schedule		
	Vary accordingly schedule		
	Yes	No	No idea
Homosha	2 (12.5%)	0 (0%)	14 (87.5%)
Assosa	2 (3.85%)	3 (5.77%)	47 (90.38%)
Bambasi	2 (11.11%)	0 (0%)	16 (88.89%)
Total	6 (7.0%)	3 (3.5%)	77 (89.5%)

Table 19. For how many times you vaccinate your animal.

Livestock vaccine value channels

As shown in Tables 20 and 21 most respondent explained supply chain and access, points of veterinary vaccine were district level veterinary stores. Similar to the current study to demonstrate an improved and coasted last mile immunization supply chain 671 model that uses district based trained cold chain personnel.

Vaccine type	Vaccine distributed by both indigenous and international NGO			Vaccinated by farmers		
Districts	Yes	no idea	No	Yes	No	No idea
Homosha	0 (0%)	16 (100%)	0 (0%)	0 (0%)	16 (100%)	0 (0%)
Assosa	0 (0%)	49 (57%)	3 (3.5%)	2 (3.85%)	46 (88.46%)	4 (7.69%)
Bambasi	0 (0%)	12 (66.7%)	6 (33.3%)	0 (0%)	11 (61.11%)	7 (38.89%)
Total	0%	77 (89.5%)	9 (10.5%)	2 (22.3%)	73 (84.88%)	11 (12.79%)

Table 20. Livestock vaccine value channels, supply chain and access points.

Districts	Distribute by district veterinary store					
	Yes	No	No idea	Yes	No	No idea
Homosha	14 (87.5%)	2 (12.5%)	0 (0%)	0 (0%)	14 (87.5%)	2 (12.5%)
Assosa	35 (67.30%)	6 (11.53%)	11 (21.15%)	1 (1.92%)	29 (55.77%)	22 (42.31%)
Bambasi	14 (77.78%)	0 (0%)	4 (22.22%)	0 (0%)	14 (77.78%)	4 (22.22%)
Total	63 (72.41%)	8 (9.19%)	15 (17.44%)	1 (1.15%)	57 (66.28%)	28 (32.56%)

Table 21. Livestock vaccine value channels, supply chain and access points.

Evaluate vaccine delivery system

As shown in Table 22, 70.93% of respondents not satisfy in vaccine delivery system but 27.90% satisfied and 1.12% not wanted to give idea. In all districts most of the respondents not satisfied in vaccine delivery system. Similar to the current study more than half numbers (52.5%) of the farmers did not get enough access of animal health facility and near to half numbers (44.17%) of the farmers also didn't voluntary to vaccinate their animals as scheduled.

District	How do you evaluate vaccine delivery system		
	Satisfactory	No-satisfactory	No idea
Homosha	0 (0%)	16 (100%)	0 (0%)
Assosa	24 (46.15%)	27 (51.92%)	1 (1.92%)
Bambasi	0 (0%)	18 (100%)	0 (0%)
Total	24 (27.90%)	61 (70.93%)	1 (1.12%)

Table 22. How do you evaluate vaccine delivery system?

Conclusion

This study revealed that the knowledge of farmers about vaccine, source to use vaccine and vaccine delivery systems as whole. There is no significant difference among districts in terms of farmers' knowledge of vaccines and their use respectively. In the study area most farmers not differentiated vaccine from drug. In Assosa zone there were different types of vaccine in different type of animal species. The source of vaccine was mostly from governmental institution as vaccine campaign but it was very weak and focuses on only very few type of vaccine without booster dose. Mostly vaccines have no good efficacy because of poor vaccine handling, wrong management practice and weak vaccine delivery system. There for common diseases found in the study area should be identified. Awareness creation about vaccine and develop proper vaccine management system should be implemented. The governmental office, veterinarian, animal health workers, farmers and other stakeholders should work together on vaccine dissemination and management. The mass media should be adequately engaged in the dissemination of animal vaccine campaign messages.

Author Contributions

Betelihem Yirdaw: Conceptualization, data curation, methodology, writing–original draft, writing–review and editing.

Dessie Abera: Validation, methodology, software.

Habtamu Alebachew: Supervision, conceptualization, data curation.

Bekisisa Urga: Investigation, supervision, writing–review and editing.

Conflicts of Interest

The authors declare no conflicts of interest.

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