An Empirical Study on the Perspective of Vaccination for Livestock and Poultry of Poor Households in Rural Bangladesh: Challenges & Opportunities

ASM Golam Hafeez
M. Wakilur Rahman
Md. Alimul Islam
Mirza Safaruh
Md. Saiful Islam

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The Authors

EXECUTIVE SUMMARY

The present research was undertaken with the financial assistance from Islamic Relief Worldwide, Bangladesh aimed at examining the state of vaccination program for livestock and poultry of rural poor households in Bangladesh. The study was basically based on primary data collected from haor areas of Mohanganj upazilla of Netrokona district,coastal areas of Shamnagor upazilla of Stakhira district and plain areas of Gangachara upazilla of Rangpur district. Then a total of nine villages taking three from each selected upazilla were chosen purposively where population of livestock animal was high. A total of 450 poor farm households rearing livestock and poultry were selected randomly as sample of the study. In forming the sample size, 150 farm households were selected from each region taking 50 households from each selected village. Secondary data were collected from different public and private organizations, published and unpublished reports, books and journal. In addition to this, 7 FGDs, 18 KIIs were held to have qualitative information required for the study. Required farm level data were collected employing direct farm survey method using pre-designed and pre-tested interview schedule by the trained enumerator under the direct supervision of the researcher. Both tabular and statistical techniques were used to analyze the data. About 61% of the respondent was head of the household and about 39% of the respondent was housewife. The average age was 42 years. Overall illiteracy rate was 48%. Average family size of the surveyed households was 4.73. The average landholding size of the respondent HHs across the regions was 48.15 decimal and average absolute land owned by the respondent was only 12.48 decimals across the region. About 27% respondent HHs was landless both in plain and haor region and it was 13% in coastal region. Farming or agriculture was the major occupation of 47% of HHs across the study areas. Average earning member in the respondent HHs across the region was more than one and the average annual income of the respondent household was Tk. 74826.10 for all the regions.

The major source of income was off farm in the study regions (49%). The contribution of livestock and livestock product to the HHs annual income was 18.06% describing clearly the importance of livestock and poultry on the livelihood of the rural poor household in the study areas. The average value of the cattle owned by the respondent was Tk. 39231.25, that of goat was Tk. 8124.59 and chicken was Tk.1212.96. The average herd size of the cattle per household was 2.47, goat 3.2 and flock size of birds was 8.16 across the study areas The maximum household of the study area used tin to make roof and wall of the cattle shed, the floor of the cattle shed was made by mud. Most of the respondent households have no separate shed for goat, usually keeping their small ruminant in the cattle shed or in the bed room. The floor and wall of the goat shed were made of tin and the floor of the maximum goat shed was earthen made.

The formal name of the diseases was not known to the farmers in the study areas. Most of the farmer can tell the Bengali name of the diseases. Incidence of FMD disease was prominent in July in plain region, March in haor and June in coastal region. Prevalence of BQ disease was prominent in June in plain region, April in haor and June in the coastal region. The prevalence of Anthrax disease was spread over the Month of January to October across the region. Prevalence of HS disease was prominent in the month of March in the plain region, April in haor region and May in coastal region.

The incidence of PPR disease was most prominent in February in the plain region, peak in January in hoar region and in February in the coastal region. The prevalence of ND was prominent in December in plain and haor region and in January in coastal region. FP disease prevalence was prominent in the March in the plain region, in May in the haor and in January in the coastal region. The incidence of DP disease was prominent in January across the regions.

Regarding health and hygiene, the respondents used to clean their animal shed not more than once in a day, the respondents had washed (bathed) their large ruminant only 12 times and small ruminant (goat) only 7 times a month across the region. About 100% of the respondents regularly fed their livestock animals. About 49% of the respondents households fed their animals (goat and cattle) three times daily across the region, 39% fed their animals two times a day and only 8% of the respondent households once in a day. The feed supplied to the livestock animals was composed of grass and straw followed by concentrate feed across the region. The composition of the feed supplied to the livestock animals by the respondents was combination of grass and straw (81%) and concentrate feed (19%) in the plain land, grass and straw (73%) and concentrate (27%) in haor, and grass with straw 69% and concentrate 31% in the coastal region. Poultry birds mostly depend on natural feed.

Regarding knowledge on vaccination (for livestock and poultry) only about 26% respondent in the plain region, 29.34% in haor and 26.77% in the coastal region knew that vaccination is important for controlling the diseases. Regarding the sources of information from where the respondent knew about importance of vaccine- Private Service Provider (PSP) was the major source of information about importance of vaccine. To protect the animal from diseases was the main reason behind the vaccination as reported by the respondent. None of the respondent knew the vaccination schedule in the study areas. Regarding access to the livestock services, 15% of the farmers in the plain region, 25% farmers in the haor and 9% in the coastal region visited their respective ULO office for vaccination and treatment purpose only.

The farmers of the plain region visited ULO office 1.6 times in a year, farmers in haor region visited ULO office 1.84 times in a year and farmers in coastal areas visited ULO office 1.22 times in a year. About 92% of the respondent in the plain region, 90% in the haor region and 97% in the coastal region were visited by the PSP when the respondent called them for services. The purpose of the visits included not only for vaccination but also for treatment of animal. Regarding the vaccination coverage for large ruminant- about 49.42% of the cattle in the plain region, 38.63% in haor and 24.44% in the coastal region were covered by vaccination.

Regarding the vaccination coverage for small ruminant- about 20% of the goat in the plain region, about 5.49% goat in the coastal and only 1.43% of the goat in the haor region was vaccinated. Regarding the vaccination coverage for poultry- no poultry bird was vaccinated both in the plain and coastal region almost the coverage was negligible in the haor region. Regarding the cattle households coverage by vaccine- about 47.66% ot the cattle HHs in the plain region. 61.24% in the haor and 27.05% in coastal regions was covered by vaccination.

Regarding the goat households coverage by vaccine -about 19.70% of the goat HHs in plain region, 5.26% in the haor and 3.92% in the coastal region was covered by vaccination. Regarding the poultry household coverage by vaccine only 4.92% hoseholds in the haor region was covered by vaccination.

Regarding the doses of vaccine, highest number of doses against anthrax was given to the cattle in the haor region (average 74 doses) followed by 69 in coastal and 58 in the Plain region. Highest number of doses of vaccine against FMD was given in the plain region followed by 47 doses in haor and 32 doses in coastal region. Highest number of doses of vaccine against BQ and HS was also given in haor region compared with other region. The service charge of PSP was 3.20 times higher than that of the Govt. paravet or veterinarian in the plain region that was 2.20 times higher in haor and 1.20 times higher in the coastal region.

Average vaccination cost for FMD was highest in haor region, vaccination cost for BQ was highest in plain region, and that for anthrax was highest in coastal region, HS cost was highest in plain region and PPR cost was highest in haor region. The average cost was Tk. 34.67 for FMD, Tk. 37.58 for BQ, Tk. 22.87 for Anthrax,tk.16.07 for PPR. Poultry vaccine was given only in haor region against ND, FP and DP diseases. Average cost was Tk. 29.1 for ND, Tk. 8.00 for FP and Tk. 53 for DP.

Regarding vaccination services- among the vaccinated cattle about 85% was vaccinated by DLS and 15% by the private service provider. About 65% of the goat was vaccinated by the DLS and 35% was vaccinated by PSP. No poultry was vaccinated in the studied areas by DLS personnel. A very few number of cattle and goat vaccination program was held in the study areas. In the plain region, two vaccination program were held and only one vaccination program was held both in the study areas of haor and coastal region organized by DLS.

Regarding mortality-the highest number of mortality in the large ruminant rose to 35 for BQ disease, 28 for Anthrax 15 for HS and 7 for FMD. Mortality of small ruminant- PPR was identified as the only fatal disease for small ruminant that causes to death of a total of 148 animal in the sudy areas. Within the study areas the small ruminant in the coastal region was affected severely by PPR and the death toll rose to 95, that was 9 in haor area and 44 in plain area. Regarding mortality of poultry birds- Newcastle Disease was identified as most fatal disease for poultry birds that caused to huge losses of flocks of the respondents household in the study areas. The mortality of birds was highest in the plain region (1023) and that was lowest in the haor region (502).

Economic losses due to prevalence of disease infestation- the respondent farm households had to incur a loss of animal worth of Tk. 10980.74 in the haor area, Tk. 10155.41 in the plain region and Tk. 3738.40 in coastal region annually. Results of the binary Logistic Regression showed that the participation in the vaccination by the farm households are influenced by family size, farm size, herd size and distance of ULO office. The value of coefficients of the variable was statistically significant. Effectiveness of the vaccination was measured by the treatment cost of vaccinated and unvaccinated households and the results of the "t" test shows that treatment cost of the animal of vaccinated households (Tk. 333.7) is significantly lower than that (Tk. 887.86) of the unvaccinated households which proves the effectiveness of the vaccinating the animal.

There is a relationship between vaccination and mortality of animal but it was not proved statistically significant probably the reasons behind that the farmers did not maintain the schedule of vaccination, vaccine was not properly administered, quality of vaccine and farmers did not consider the age of the animal during vaccination. The reasons for not vaccinating the animals were ranked based on the responses by the respondents. Veterinarian/VFA do not come on regular basis which ranks first, most of the farmers are not aware about the vaccination which ranks second, very weak publicity ranks 3rd and unavailability of suitable vaccine which ranks 4th for unvaccinating their animal across the region.

Regarding the supply chain of vaccine- the key player in the public sector supply chain is the LRI, DLS, and Bangladesh. The vaccines are produced by the state owned LRIs in Dhaka and Comilla. The LRI in Comilla produced vaccine that to be distributed through LRI, Mohakhali Dhaka and also through their own channel. From the LRI's vaccines are delivered to the District Livestock Office by freezing van then to Upazila Livestock Office as per their demand keeping it in the thermocol boxes. Upazila Livestock Office then gives it to the stakeholders such as NGO, VFA, volunteers to distribute the vaccines to the ultimate user through vaccination program or other ways. However the LRIs produced only 10% of the total approximate requirement of the doses of vaccine.

Regarding cold chain management- LRI has specialized vehicles to dispatch the vaccine from the laboratories to the designated district with proper maintenance of cold chain. The cold chain is maintained at village level with the help of thermoflask. Management of cold chain is very difficult in rural areas. Up to the district level the cold chain was managed but beyond that it was difficult to maintain temperature because of the lack of the refrigerator or sporadic electricity supply.

Reasons for failure of vaccination were identified by the respondent- not following the schedule of vaccination was one of the causes for vaccination failure followed by not considering the age of the animal. The solution to the problems proposed by the farmers was analyzed. Most of the respondent placed suggestion to provide suitable vaccine to the farmers timely manner with free of cost, veterinarian should visit farmers house or common place regularly, number of govt. veterinarian/paravet should be increased, mass publicity of vaccination program for more coverage should be done, number of yearly vaccination program in each village should be increased, adequate supply of poultry vaccine by the government should be ensured to cover more poultry.

Regarding the constraints in relation to vaccination faced by the farmers, unavailability of suitable vaccine was identified as one of the main constraints followed by irregular vist by the veterinarian/VFA, weak publicity of vaccination program, vaccination is expensive and vaccine was not available in time.

Findings of the FGD describes that participants were not satisfied with the existing vaccination services, cold chain management was not properly done, vaccination program was not organized on regular basis.KII findings(held at upazilla level among the VFA) explain that VFAs need suitable ice box, vehicle support, availability of suitable vaccine. The drug sellers addressed the issues like availability of vaccine and training. The private service provider emphasized on training, maintaining cold chain during transportation of vaccine and ensures availability of suitable vaccine. The findings of the KII(among the upazilla livestock officers in the study areas) explain that the ULO faced

challenges such as lack of sufficient number of technical manpower, inadequate supply of vaccine, lack of facilities of management of cold chain, lack of adequate fund severely suffered by logistic support and weak management of publicity. KII (held in Dhaka among the officials of DLS, LRI and BLRI) findings clearly state that the vaccination program is suffered by lack of manpower, lack of suitable vaccine, lack of logistic supports and lack of fund.

Major constraints at the national level were identified as capacity of vaccine production is far below the required level, unavailability of automated sealing machine, cool chain maintaining vehicle is not adequate to supply vaccines across the country, lack of specialized training of the scientist working at LRI, scientist engaged in vaccine production can't work for long time due to transferable job, lack of modern machineries and infrastructural facilities at LRIs, lack of supporting staffs for operating sophisticated machine at vaccine production unit of LRI like bio medical engineer, lack of continuous supply of raw materials for the bulk production at LRI.

Important finding from the present study is that all the major players are keenly interested in enhancing coverage for the livestock and backyard poultry within the constraints of their organizational structure. The government sector also recognizes the importance of this activity. However, the issue of limited vaccine production, limited man power for administering the vaccines and inadequate cold chain management facilities cannot be overcome in the short run. A strong collaboration and coordination between various institutions need to be involved to enhance coverage of vaccination for livestock and poultry of rural poor households in our country. The next step will be to bring tohgether all the stakeholders to formulate strategic plan for enhancing coverage of vaccine to this sector specifying the role of the key players. A well- planned strategy should be taken that will surely help go a long way in meeting the objective of bringing a large share of livestock and poultry birds under vaccination program .

Poor livestock and poultry keepers of Bangladesh are severely suffered from required vaccination services leading to heavy economic losses. Due to unavailability of vaccines, lack of adequate number of veterinarian personnel, lack of knowledge on vaccination schedule poor livestock and poultry keepers could not receive the required services that resulted in lower productivity in egg, meat and milk. Vaccination coverage for poultry was all most nil, but coverage of vaccination for cattle was five times higher than that for small ruminant in the study areas. Due to inadequate vaccination coverage rural poor livestock keepers are placed in vulnerable situation. There is a dire need to support the backyard poultry sector by enhancing access to vaccines and exploring service delivery model that are suitable in rural areas of Bangladesh.

Policy Recommendations:

1. Diagnostic facilities for existing, emerging, re-emerging and trans-boundary diseases of livestock and poultry should be expanded up to the union level
2. Rural farmers (male and female) should bring under regular elementary and advance training
3. Skilled man power and logistic supports of DLS should be increased (in relation to good health management and production practices of rural poultry and livestock)
4. Advance and refreshing training programs should be designed for the veterinary personnel
5. Government of Bangladesh should allocate more funds for strengthening vaccine production capacity LRI, DLS to fulfill the total demand for poultry and livestock vaccines in the country

6. Innovative research and extension linkage among DLS, BLRI and other relevant dept. of the faculties of BAU and other agricultural universities must be strengthen

7. To ensure effectiveness of the livestock and poultry vaccines (live or inactivated) cold chain system must be introduced and maintained strictly throughout vaccination program

8. Govt. should take policy to create awareness of the small and medium scale farmers about vaccination program through mass media (Radio, Television and Newspaper)

9. Policy support should be provided to encourage Private sector by giving them more incentives to come forward to produce highly effective and less expensive livestock and poultry vaccines and their quality control must be monitored strictly

10. More fund should be allocated for strengthening the capacity of BLRI, relevant department of Agricultural Universities towards vaccine development research

11. Under the Public Private Partnership mechanism, mass vaccination program should be organized at the village level

12. Govt. should take urgent decision right this moment to stop importing any kinds of (live monovalent and polyvalent vaccines) livestock and poultry vaccines from any countries of the world in future

13. To make the vaccination program success, more veterinary surgeon and VFA should be produced and employed at village level

14. Govt. should take appropriate measures to enhance the coverage of vaccination for livestock and poultry in the coastal and haor regions of the country

15. Special emphasize should be given to arrange regular vaccination program for backyard poultry throughout the country

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ABBREVIATION

AIS	:	Agriculture Information Service
AI	:	Avian Influenza
BQ	:	Black Quarter
DLS	:	Department of Livestock Services
BER	:	Bangladesh Economic Review
DP	:	Duck Plague
DVH	:	Duck Viral Hepatitis
FP	:	Fowl Pox
FGD	:	Focus Group Discussion
FMD	:	Foot and Mouth Diseases
FYP		Five Year Plan
GDP	:	Gross Domestic Product
HS	:	Haemorrhagic Septicemia
IRB	:	Islamic Relief Bangladesh
KII	:	Key Informant Interview
LRI	:	Livestock Research Institute
MMT	:	Million Metric Ton
ND	:	Newcastle Disease
NGO	:	Non-Government Organization
NLEP	:	National Livestock Extension Policy
OIE	:	World Organization for Animal Health
PSP	:	Private Service Provider
PPR	:	Peste des Petites Ruminants
RDV	:	Ranikhet Disease Vaccine
Tk.	:	Taka (Bangladeshi Currency)
ULO	:	Upazilla Livestock Officer
VFA	:	Veterinary Field Assistant
VS	:	Veterinary Surgeon
TAD	:	Transboundary Animal Diseases

SECTION 1

INTRODUCTION

1.1 Background Information

In Bangladesh, agriculture generally means production of crop and crop sub-sector is considered synonymous with agriculture. Most public documents and statistical publication present statistical information on agriculture largely covering crops. Livestock is particularly a glaring example of this neglect.

Livestock sub-sector is very important in our agro-based economy. The livestock sub-sector contributes 2.5% to the GDP, contributes 16.71% to the agricultural GDP, generates 20% of country's employment directly and 40% indirectly, contributes 4.31% to country's total export earning, provides 25% of households energy supply, produces 125 MMT of organic manure utilized for crop production (AIS,2014). Livestock not only provides milk, meat and egg for nutritional and food security of the nation but also provides energy for land cultivation, fuel for household consumption in rural areas, hides and skin for industrial use, employment for the people. It is the only means of livelihood of many poor and marginal farm household of Bangladesh by providing cash income. Livestock animal are generally reared by women members of a farm family and it is the means of cash income of women thus empowering them in a farm family. Livestock and poultry rearing are considered to be the integral component of agricultural production system in rural Bangladesh.

In Bangladesh, the population of livestock and poultry rose to 5 crore 30 lakh 2 thousand and 29 crore 32 lakh 35 thousand respectively in 2012-13 (BER, 2013). About 75% of the population rely to some extent on livestock for their livelihood specially the landless farmers (Tareque and Chowdhury, 2010). In the line of vision 2021, livestock sub-sector can contribute (i) reducing unemployed people to 1.5 crore instead of 2.8 crore by 2021 through creation of direct job opportunities for 112 lakh people; (ii) can increase the income of the poor people and enhance food security through implementing one house one farm model; (iii) supportive role in reduction of poverty and extreme poverty 25% and 15% respectively (Tareque and Chowdhury, 2010).

Though the country witnessed remarkable achievement in food grain production but it could not achieve self sufficiency in livestock and livestock products i.e. milk, meat and egg. The estimated per capita consumption of fluid milk is 107 ml/day as against the requirement of 250 ml/person/day (AIS, 2015). The per capita consumption of meat is 24.38 gm/day as against the per capita requirement 120 gm/day. The estimated per capita consumption of

egg/year is 58.6 as against the demand for 104/year (BBS, 2013). There is a huge gap between the demand and supply of milk, meat and egg in our country. The consumption of animal protein in the form of milk, meat and egg is completely inadequate. To build a healthy and brilliant nation, there is no alternative to the development of this important sub sector. In order to meet the gap between demand and supply of meat, milk and eggs, the country needs to increase the population of livestock many fold. Livestock diseases are the major constraints to increase the population of livestock.

Economically important diseases of Livestock and Poultry generally occur in the country are: **Viral Diseases:** Livestock: a. Foot and mouth disease (FMD) b. PPR/PSR c. Goat Pox. Poultry: a. Avian Influenza (AI); b. Newcastle Disease (ND); c. Fowl Pox d. Duck viral enteritis/Duck plague, e. Duck viral hepatitis

Bacterial Diseases: Livestock: a. Anthrax, b. Black quarter (BQ), c. Hemorrhagic Septicemia (HS) **Poultry:** a. Fowl cholera, b. Fowl Typhoid, d. Pullorum disease

1.2 Justification of the Study

The most important factor that affects productivity of animals is disease incidence and its consequences. Apart from economic impact, diseases also may have price and market effects, trade impairment, impacts on food security and nutrition, livelihood and employment, health and environment. The only available information on livestock disease outbreaks in Bangladesh is from the OIE (World Organization for Animal Health) in the absence of published information on the mortality of livestock animal due to diseases. A report by Islam estimated that the predicted annual direct loss stood at Tk. 819 million for FMD, Tk. 1,842 million for PPR and Tk. 1,105 million for HS in Bangladesh (Islam, 2013). A study on the economic impact of HPAI outbreaks in 2007 and 2008 was conducted at Bangladesh Livestock Research Institute (BLRI). The study estimated a total loss of Tk. 38,583 million (US$ 551 million) due to HPAI outbreaks in the first two years. The financial losses actually are borne by the poor farm household. The economic losses due to diseases could be minimized through control measures of the diseases of livestock. The population of livestock can grow at a fast rate if we are able to control the diseases.

The Department of Livestock Services (DLS) the only public sector organization is responsible for the diagnosis, surveillance, and control of epidemic diseases in livestock, through vaccination program countrywide but it suffers from acute shortages of staffing, funding, and laboratory facilities to control epidemic, endemic diseases of livestock. However, as the production of vaccines in Bangladesh is adequate to vaccinate only about 10 percent of large and small ruminants, it is apparent that only a very small percentage of the national herd/flock is vaccinated against these diseases. The DLS has been the principal

provider of veterinary services including AI in the country. The DLS field staff is also supposed to provide extension service as there is no separate livestock extension service in the country. DLS is severely short of staff to deliver its mandated services. One author stated that with existing infrastructure and staff, the DLS is capable of vaccinating only 10% and provide treatment to 6.5% of the ruminant livestock population in the country. The ratio of animals to a qualified veterinarian is 1: 1.7 million and only 15-20% of farm animal received routine vaccine (MoFL, 2007). Treatment of poultry is considered superficial and is now mostly carried out by NGOs. Especially the DLS has serious shortage of front line staff (veterinary field assistants and technicians) that is the principal contacts with producers in rural areas. According to data in 2003, there were about 4600 staff in this category (staff responsible for supporting primary treatment, vaccination, AI, fodder extension, clinical assistance as compounders) (Rahman, 2003). Unlike agricultural extension service, there is no livestock staff employed at the union or village level. There are about 15000 village level Assistant in DAE as against only about 3600 technical staff in DLS to serve the same no. of farm households. The support staff is employed at the upazilla vet clinics, so each such staff has to cover about 15 villages or about 2-3 unions. Consequently they can do very little beyond assisting the upazilla vet officers at the upazilla clinics. In the absence of adequate access to proper vet care at reasonable cost, poor farmers often resort to traditional medicine with poor outcomes.

The prevalence of common diseases of the livestock coupled with the paucity of grazing land, high price of livestock and poultry feed cause to the rise of the cost of rearing animal that must hamper the development of this sub-sector. Despite the immense potentials of this sub-sector gradually livestock and poultry rearing is becoming a risky choice for livelihoods for the poor people due to market volatile and high prevalence of diseases. Extant literature showed that the access to vaccination services, quality of service, poor diagnosis & expensive treatment, access to information and ineffective supply chain found to be the major challenges faced by the livestock farmers in rural Bangladesh that needs to be solved through proper policy implementation. Without addressing as well as solving the aforesaid challenges particularly the access to vaccination service with affordable cost by the rural poor, they will give up livestock & poultry rearing activities and ultimately that will put them in vulnerable situation resulting in food and nutritional insecurity of the country. Therefore, proposed research aims at identifying the potential policy and implementation gaps on ongoing vaccination program of the Government of Bangladesh and addressing the constraints faced by the rural farmers in accessing the vaccination of livestock.

1.3 Objectives of the Study

The specific objectives are as follows:

i. To know the socio-economic characteristics of the poor livestock and poultry keepers in the selected areas;

ii. To review the government existing policy and program for livestock and poultry vaccination activities in Bangladesh;

iii. To analyze the cost of treatment for livestock and poultry of the rural poor households and to examine the farmers access to veterinary services including the existing vaccination program management in the study areas;

iv. To determine the factors affecting farmers access to the vaccination services;

v. To identify the constraints associated with the vaccination and effective and appropriate measures for way forward to improve overall vaccination program towards sustainable development of livestock sub-sector;

vi. To disseminate the research findings to the relevant stakeholders through organizing national seminar

1.4 Hypothesis of the Study

Three different hypotheses were considered such as-

1. H_0 : There is no difference between the treatment cost of vaccinated and unvaccinated households
2. H_o: There is no relationship between the mortality of animal of vaccinated and unvaccinated households
3. H_o: Farmers' access to vaccination services is not influenced by the age, education, farm size, distance and number of animal

1.5 Limitations of the Study

The study suffers from the number of limitations such as follows:

1. Updated, reasonable and complete secondary data were unavailable particularly related to vaccine production, demand, import and supply
2. In Bangladesh farmers do not keep any written records or information with respect to the vaccination that's why it was very difficult to get accurate data and the information was generated based on the memory of the respondent. Furthermore they were very

busy with their work and were reluctant to provide information since they would not get any benefit. Relevant government officials were also reluctant to provide the data.

3. The present study is basically based on 450 sample poor households drawn from three selected areas covering only nine villages which does not reflect the population.
4. Findings should therefore be interpreted cautiously if any greater generalizations are sought for different regions with distinct topographies of BD

In spite of the limitations, some of the findings of the study may be useful in providing important information for the policy makers, researchers, academics, extension workers and the relevant officials of government and non-government agencies but a word of caution should kept in mind while considering the findings or result of the study for other areas of the country.

1.6 Organization of the Report

This report consists of six sections. Section one describes the background information, problem statement and justification, objectives and limitations of the study. Section two provides a brief review of previous studies relevant to the present study and review of relevant policy of the government while section three describes the methodology of the research with some specific analytical model applied to measure the determinants of factors affecting vaccination services. Section four presents the results and discussion while section five describes the key findings of FGDs and KIIs. Section six describes the conclusion and recommendation.

REEVIEW OF LITERATURE

This section comprehensively reviews the extant literature on livestock and poultry vaccination related review to the resent study. It is always beneficial for the researcher to consult available literature to assess the past stock of knowledge with the hope of receiving future guidelines for further research in the particular area. Some of the relevant study findings are presented here:

2.1 Review of Journal Article and Reports

Aini (1993) found that Pasteurellosis is an acute or chronic disease causing severe economic losses in ducks. It is caused by Pasteurella multocida and spread by contaminated equipments or carrier birds. The disease can be prevented by vaccination or treated with antibiotics. Similarly with other diseases where vaccine is available, vaccination is seldom carried out. Pasteurellosis is one of the common diseases encountered in ducks in Malaysia.

Alders R.G. (2001) found that in many developing countries, circulating strains of ND virus are capable of causing 100% mortality in unprotected flocks. Outbreaks of ND are unpredictable and discourage villagers from paying proper attention to the husbandry and welfare of their chickens. The lower the price of the vaccine, the greater the number of farmers who will be able to afford to pay for it and, consequently, the greater the vaccination coverage.

Delgado *et al.* (1999) reported that from the early 1970s to the mid-1990s, consumption of meat and milk in the developing countries increased by 175 million tones, more than twice the increase that occurred in developed countries. Delgado et al. (1999) projected that per capita consumption of meat and milk will increase by about 50% from 1993 to 2020 and that developing countries, where at least three-fourths of livestock production come from smallholders/backyard producers, will produce about 60% of all meat products and 52% of all milk products.

FAO (1997) recommends NDV4-HR vaccine for the control of Newcastle disease in village chickens in tropical countries and developing countries as a means of improving the food securities of rural communities.

Huque (1987) found that small farmers were the most effective beneficiaries of family poultry rearing in Bangladesh. Family poultry production in Bangladesh is spread all over the country without much input. It is a low input-low output profitable system with little care and

with almost no extra supplementary feeding. More than 80 percent of the rural households raise poultry

Imtiaz and Rana (2014) conducted a study entitled "Problems Faced by the Small Scale Dairy Owners in Receiving Veterinary Services in Selected Areas of Chittagong" reported that majority of the respondents think that establishment of a veterinary hospital in their locality (Chittagong metropolitan area, Sitakunda and Patiya Upazila) and increasing the number of doctors in existing veterinary hospitals can solve the major problems are mainly related to unavailability of veterinarians in the locality as well as door step services by the DLS, high cost of medicines and services from specialist doctors and shortage of veterinary services at hospitals. Based on the findings, they concluded that veterinary hospital related problems were in higher extent faced by the small scale dairy owners. Most the problems could be solved through strengthening upazilla veterinary hospitals with proper material and technical support by the government and also establishing private veterinary clinics.

Islam (2013) in his study stated that FMD, PPR and HS are endemic in Bangladesh. A total of 59,181 cases of FMD, 84087 cases of PPR and 3,437 cases of HS were treated at Upazilla Veterinary Hospitals of the country at 2010. Exact incidence of these diseases would be several fold higher as only a fraction of cases are brought to hospitals for treatment. Out of seven serotypes of FMD four have been detected in Bangladesh, that includes serotype O, A, C and Asia 1. In Bangladesh, PPR outbreaks occur frequently in goats and sheep. Tissue culture homologus PPR vaccine is produced to a limited extent at the vaccine production facility of the department of livestock services, Bangladesh. However, there is no organized vaccination campaign. An oil-adjuvant bacterium is prepared by the vaccine production facility of the department of livestock services.

Jha (2010) revealed in his study entitled that FMD is endemic in Nepal and occurs round the year. Vaccination coverage of FMD is very low because of unproductiveness and the formal import record of FMD vaccine is only 0.15 million doses in the year 2010 (CAQO, 2010).The most devastating disease PPR entered in Nepal in the year 1995.Compared to the 9.27 million goat and sheep in the country the vaccination coverage/year is not even 50% of the total population in case of PPR. He also found that Nepal is at high risk of HPAI because both migratory bird and illegal importation of poultry seems to be responsible for the outbreaks.

Kingori *et al.*, (2010) in a study found that Newcastle Disease (ND) is the most prevalent and fatal disease of poultry in Kenya and thus, a major key unmet need initially identified by GALVmed was for a sustainable supply of thermo-tolerant ND vaccine. Farmers' perception of the single most important disease of poultry was Newcastle Disease (ND). ND is a severe

and highly contagious disease of poultry and is regarded as second in impact only to avian influenza.

Kothalawala (2013) found in his study that FMD prevalence was notably high in the dry zone areas of Sri Lanka; HS was reported in cattle and buffalo herds. He also found that the PPR has not been reported clinically in Sri Lanka so far. Sri Lankan livestock sector uses local as well as imported vaccines in disease control. In Sri Lanka the FMD prevalence was recorded as 1.01%, 0.1% and 0.39% in 1997, 1998 and 1999 respectively. FMD vaccine is being imported and annual average cost is around 16.5 million SLR. The vaccination coverage for FMD varies from 40%-80% in endemic areas.

Lapar *et al.* (2002) found in a case study on "Policy options promoting market participation of smallholder livestock producers" Smallholders generally have inadequate capital resources-including, physical and financial resources, and also intellectual capital resources such as experience, education and extension-that limit their ability to diversify farm activities

Mehta and Kaur (2011) conducted a study and found that the importance of poultry in rural livelihoods is clearly evident from the reasons for rearing Poultry. In all the states (Haryana, Orissa, Madhya Pradesh) the two dominant reasons for keeping poultry birds are that poultry can be sold immediately for cash and eggs and meat can be used for home consumption.

Naeem (2013) in his study found that many of the transboundary animal diseases such as foot and mouth disease (FMD), peste des petities ruminants (PPR), hemorrhagic septicemia (HS) in livestock; and highly pathogenic avian influenza (HPAI) of poultry etc. prevalent in Pakistan. All the TADs reported in Pakistan cause losses worth of billions of dollars every year despite the efforts by the government authorities.

Pattnaik (2013) stated that the economic impact of FMD incidence in four districts of Andhra Pradesh were extrapolated to approximately understand the economic dimensions of FMD outbreaks in the state. The total economic loss estimated due to FMD outbreak could have been to the tune of Rs. 1147.31crores in Andhra Pradesh. He also found that in India, outbreaks of HS mainly occur during the monsoon season probably due to increased stress.

NLDP (2007) recommended that the quality and quantity of vaccines produced and delivered by the DLS are inadequate. The use of subsidies in vaccine production in present form is a possible deterrent to private investors. There is no independent authority to check the quality of domestically produced or imported vaccines. Vaccination is done in a haphazard manner without any strategic plan for controlling the targeted diseases. There are no provisions for movement control and quarantine during disease outbreak or epidemics.

NLDP (2013) in India found that livestock sector acts as a best insurance for farmers against vagaries of nature like drought. It is estimated that about 70 million rural households own livestock of one species or the other. Women constitute about 69% of workforce engaged in livestock sector. The backyard poultry produces 30 to 35% of the eggs and is highly important for livelihood and nutritional securities of the rural poor.

Ramlah (1999) reported that Village chicken production under the free-range and semi-intensive system is still the most popular and viable production systems for rural households with little inputs. This system of production will supplement the protein intake of the rural households as well as additional income when the needs arise. The Asian countries contribution towards the world's chicken meat and egg production is about 33% and 50%.

Saliu *et al.* (2009) recommend that both public and private agricultural extension agents should give more attention to the adoption of vaccination against Newcastle disease while women poultry association should be formed to encourage possible avenue for pooling the few numbers of poultry birds kept together for group vaccination of birds against the deadly disease.

Seri (1996) found that DVE is also known as duck plague. It is caused by herpes virus; it can be a chronic infection in carrier ducks. It is often thought that migrating waterfowls are involved in disease transmission. This disease has been reported in all south-east Asian countries. Although vaccines are available, vaccination is commonly not practiced by small farmers.

Sharma and Dem (2013) stated that in Bhutan, FMD is the priority disease with major economic impact followed by Avian Influenza, Hemorrhagic Septicaemia, Swine Fever and PPR based on the disease outbreak trend and economic losses to the communities. HS is mainly seen in cattle, yak, sheep, rabbit and pigs. The outbreaks of the disease (HS) are seen in sporadic forms with very few number of animals (> 5 or 10 at a time) affected in a lot. The disease could be effectively controlled through ring vaccination and control on the movement of animals.

Sonaiya *et al.* (1999) found that sustainable family poultry development in Central America and elsewhere depends on the interplay between the environment, local resources, community size and agricultural practices, poultry management systems, political, cultural and the general socio-economic milieu. Through the International Network on Family Poultry Development (INFPD), the Food and Agriculture Organization (FAO) has shown its interest and commitment to family poultry development.

Subha (2013) found that different kinds of vaccines from conventional to molecular types are nowadays manufactured to combat infections. But it is the livestock and the poultry owner who should determine the potential form of the same which may prove helpful as prophylactic measure against various diseases. Judgment about the effectiveness of a vaccine type depends upon its compatibility, administration route and dose, cost effectiveness and maintenance of proper cold chain.

Ali and Hossain (2014) reported that the contribution of animal farming has remained largely stagnant with a share of around 13percent of agricultural GDP over the last two decades. The stock of small farmers (<2.50 acres) not only increased but also displayed impressive growth (36.0percent for cattle and buffaloes, 28.4percent for goats and sheep and 14.4percent for poultry over the same period).

Rajasekhar (2005) found that HS is endemic in most parts of India and seasonal outbreaks are an annual feature. BQ, a soil-borne clostridia infection of bovines, is ranked fourth in terms of economic importance as disease of livestock in India. It is most frequent in the state of AP (Andhra Pradesh) and Karnataka. Newcastle disease, a virus infection of domestic poultry and wild free-living birds, is widespread in India.

2.2 Review of Livestock Development Policies

In order to have an idea about the policy regarding vaccination issues, the past and current policy are reviewed and the summary of those are discussed below.

There was no such comprehensive national livestock development policy in the past as the guidance for the development of this important sub-sector. The first livestock development policy was drafted in 1992 but hardly any attempt was made to implement the policy. Furthermore the document was not prepared through a process of analysis of constraints and consideration of a range of options in any dialogue with the different stakeholders. The main policy objectives included in the 1992 policy document were as under:

- Development of improved varieties of cattle, poultry and ducks
- Production of feed for cattle, poultry and ducks
- Treatment and control of diseases of cattle, poultry and ducks
- Appropriate livestock education, training and research
- Capital investment and credit management
- Insurance arrangement
- Establishment of cattle and buffalo bank
- Marketing management
- Institutional development

In that policy, the vaccination program was not well addressed separately though it was under the domain of third objective as a component. The strategic plan how the vaccination

program and coverage will be improved was not adopted. Finally the policy did not come in to the light. In the absence of national livestock development policy the sub sector mainly followed the plans and programs as defined in the FYP plans and policy measures taken by the Ministry.

Livestock Policy and Action Plan 2005

Important Policy Issues had been identified in "Livestock policy and Action plan 2005"in order to make veterinary services more effective in Bangladesh are as follows:

Private veterinary service functions – Animal health

- Spatial coverage of veterinary service delivery
- Harmonization and privatization of AI service delivery
- Veterinary drug distribution and dispensing

Public veterinary services delivery – Animal disease control

- Institutional reform
- Capacity for preparation and response to trans-boundary animal diseases
- Disease emergency preparedness
- Privatization of vaccine production and QC of veterinary pharmaceuticals

Public veterinary services delivery – Veterinary public health

- Capacity to perform surveillance, diagnosis, epidemiological analysis and to conduct studies on specific veterinary public health issues and veterinary public health education.
- Sanitation of the meat industry

In the "Livestock Policy and Action Plan 2005" the vaccination issues was not addressed in a specified manner but it was under the domain of public veterinary services delivery. Although it has emphasized the privatization of vaccine production and quality control of veterinary pharmaceutical.

National Livestock Development Policy 2007

The Government of Bangladesh has adopted a provisional National Livestock Development Policy document (MoFL, 2007). The general objective of the policy is "To provide the enabling environment, opening up opportunities, and reducing risks and vulnerability for harnessing the full potential of livestock sub-sector to accelerate economic growth for reduction of rural poverty in which the private sector will remain the main actor, while the public sector will play facilitating and supportive role."

The specific objectives of the National Livestock Development Policy are: 1) To promote sustainable improvements in productivity of milk, meat and egg production including processing and value addition 2) To promote sustained improvements in income, nutrition, and employment for the landless, small and marginal farmers; and 3) To facilitate increased private sector participation and investments in livestock production, livestock services, market development and export of livestock products and by-products.

Policy framework for Veterinary Services and Animal Health:

A total of 13 issues have been included and some of the issues are as follows:

- Soft loans would be provided to accelerate the development of private veterinary services;
- Community based veterinary service would be developed through special projects;
- Mobile veterinary services will be provided by DLS;
- An autonomous Quality control agency would be established to ensure quality of veterinary drugs, vaccines, feeds, feed ingredients and breeding tools and materials;
- Specific strategy would be developed for controlling economically important trans-boundary animal diseases;
- A separate "Veterinary call" would be established.
- Capacities of disease investigation network of DLS would be strengthened for disease surveillance, quarantine services and emergency planning to manage major disease outbreaks including Avian Influenza and other emerging diseases.
- Though one of the specific objectives of the NLDP is to facilitate increase public sector participation but their participation in vaccine production and distribution services are not visible. Only BRAC and some NGOs are working in vaccination services.

National Poultry Development Policy 2008

The objectives of the national poultry development policy are divided into three parts such as i) Production ii) Entrepreneurship Development and iii) Extension. Under the domain of production- the specific objectives are to increase the production of egg and meat, to make available of quality and healthy meat and egg and poultry products, to achieve self sufficiency in poultry feed production gradually and to develop breed / variety of poultry. Under the entrepreneurship development-the specific objectives are to increase employment opportunity through the development of poultry industry, creation of market to earn foreign exchange by exporting poultry from our country, to create skilled manpower in the poultry sector, to reduce poverty of rural women and landless farmers through developing the poultry sub sector and to develop waste management of poultry firm. Under the extension domain the specific objectives are- to control the quality of day old chick, feed, medicine and

vaccine, to strengthen research program in the poultry sector at public and private level, extension of poultry health services and its modernization, to create opportunities for proper marketing of poultry and poultry products, to encourage for establishing the poultry meat processing industry and creating congenial environment for the development of this sub sector. In this policy document it is stated that the availability of quality medicine and vaccine would be ensured. To judge the quality of medicine and vaccine, a quality control laboratory would be established at BLRI. Surveillance program for poultry diseases would be strengthened both at government and private level. Research on production of medicine and vaccine in the country would be facilitated.

National Livestock Extension Policy Bangladesh 2013

In the NLEP, the objectives were set emphasizing some key issues like sustainable improvements in safe milk, meat and egg production to satisfy national demand, facilitate increased private sector participation and investments in the livestock sector development, contribute towards direct national food security, strengthen health services, veterinary public health, develop human resources and skill of extension service providers and farmers. This document also did not recognize seriously the vaccination issues and implementing for coverage.

As the animal diseases can have a major impact on rural economy, nutritional and food security and livelihood of household of particularly the poor segment. Vaccination is considered as the important measure to prevent the animal from different diseases. To increase the population of livestock and poultry in the country for nutrition and food security, income and employment generation, the government should take appropriate policy measures to strengthen the vaccination program. In the national plan of the country the issue needs to be addressed adequately.

In the light of the policy of livestock and poultry development adopted in different regime in our country, it may be concluded that every past policy emphasized the objective of livestock and poultry production in the form of milk, egg and meat production. All the above policy addressed the areas those are important component with a view to produce more egg, milk and meat but the vaccination program and actions to be taken was not addressed adequately and not included in the previous national plan.

METHODOLOGY

3.1 Selection of the Study Area

Selection of the study area is an important step of methodology. Multistage sampling technique was used to select the areas. To achieve the objectives of the present study, first three different geographical regions were selected purposively in consultation with the management of IR,B and these are- haor, coastal and plain regions of Bangladesh. Netrokona, Shatkhira and Rangpur districts were selected as haor, coastal and plane regions respectively. After that Mohanganj upazila of Netrokona district, Shyamnagar upazila of Shatkhira district and Gangachara upazila of Rangpur district were selected. A total of 9 villages were chosen from three selected upazilas of haor, coastal and plain region taking 3 villages from each upazila considering the population of livestock and poultry in those villages. The following table shows the details of the selection of areas and sample for the present study.

Table 1. Distribution of areas and sample

Region	District	Upazila	Selected Villages	No. of sample	Distance from upazilla HQ
Plain Land	Rangpur	Gangachara	1. Uttar Kolkondo	50	7
			2.Alikishamot	50	7
			3. Dhamur	50	1.5
Haor	Netrokona	Mohanganj	1. Purbovoram	50	14
			2.Shoair(Khurshimul)	50	09
			3. Tethulia	50	12
Coastal	Satkhira	Shymnagar	1. Taranipur	50	10
			2. Zadabpur	50	08
			3.Gouripur	50	04

HQ=Head Quarter

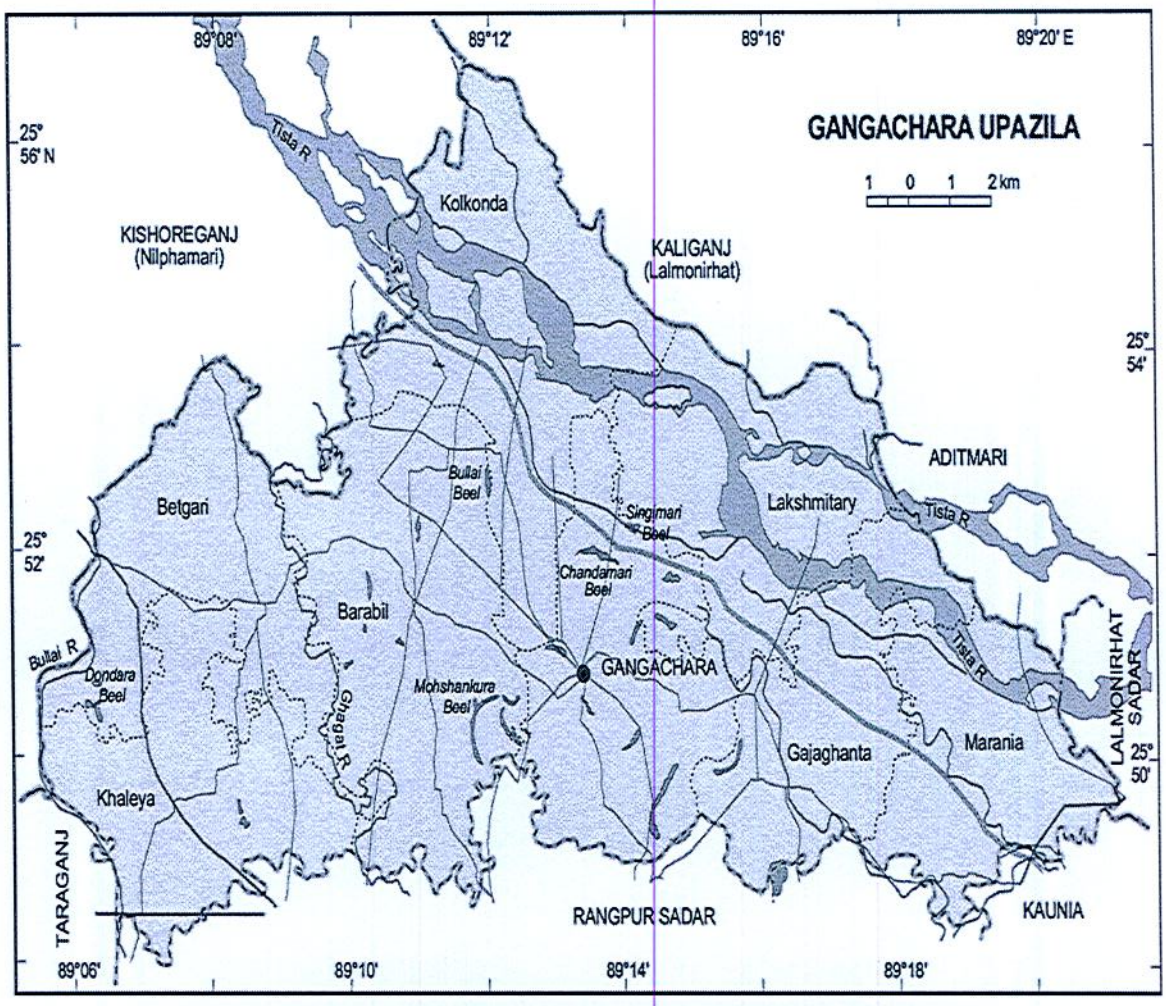

Figure 1. Map of Gangachara Upazilla of Rangpur District

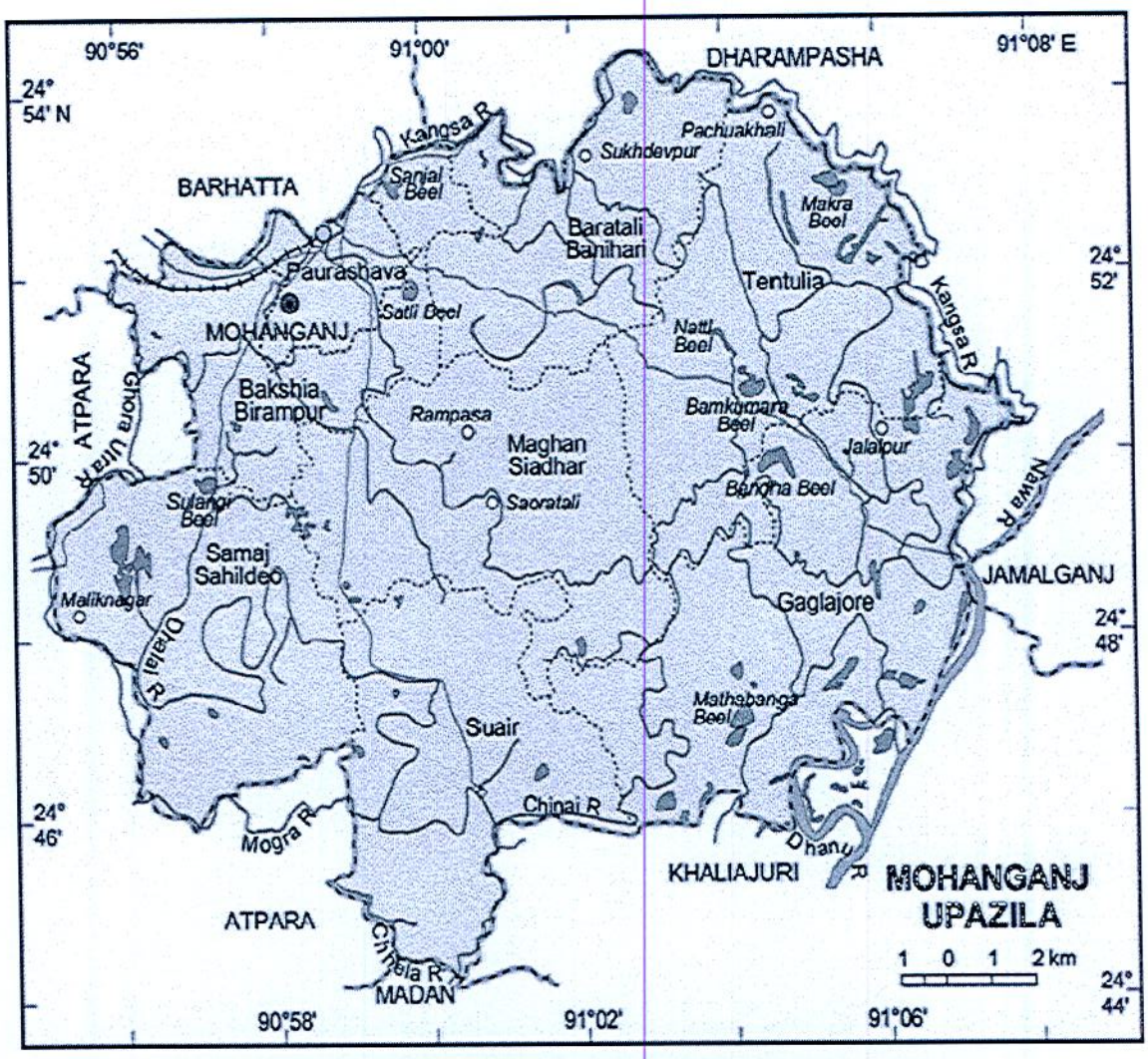

Figure 2. Map of Mohanganj Upazilla of Netrokona District

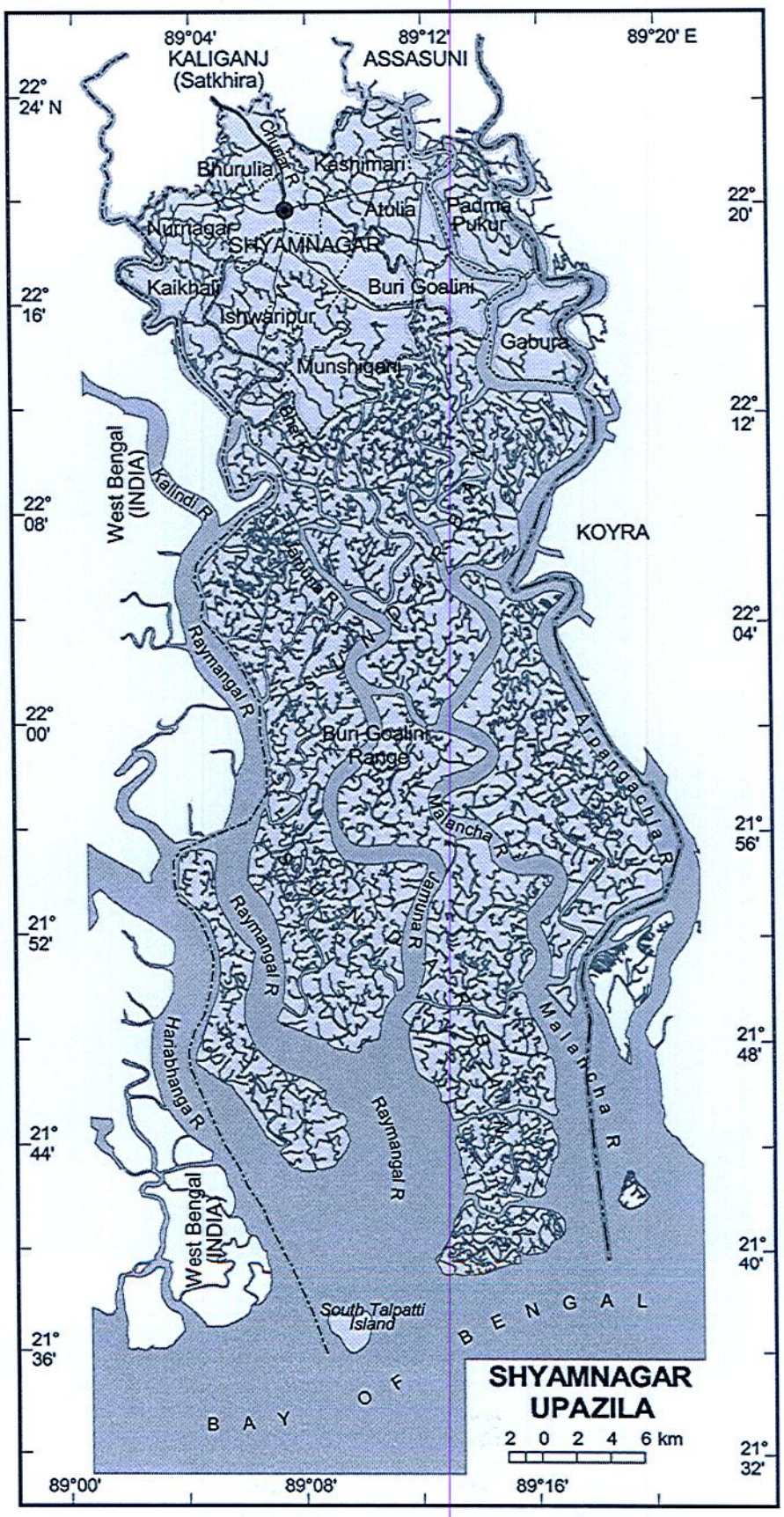

Figure 3. Map of Shyamnagor Upazilla of Satkhira District

3.2 Selection of Sample and Sampling Technique

Sample selection is an important part of any social research. It is generally not possible to conduct census survey covering all the livestock and poultry holder and it is not worthwhile to include too many livestock holder in a survey.. The areas were selected purposively as the IRB desired to include haor, coastal and plain region for this study. From each of the selected region 150 poor farm households rearing livestock animal were selected taking 50 households from each of the three villages of each geographical region. Thus a total of 450 poor farm households were selected as the sample of the study. Simple random sampling technique was followed to select the sample of the study.

3.3 Preparation of Survey Instruments and Pre-testing

To collect the required information a comprehensive household survey instrument was prepared/designed by the research team through extensive discussions in accordance with the objectives set for the study. The survey instrument had also been checked by the concerned person of IRB head office. Survey instrument then was pre-tested in the field among some livestock and poultry rearing households before final data collection. After pre-testing, the final survey instruments was prepared after making necessary corrections, modifications and adjustment in the light of the experience gained from the field. The interview schedule was prepared in such a way that all aspect of information associated with the objectives could be included. Furthermore, checklist for FGDs and KIIs had also been checked by the responsible person of IRB.

3.4 Type of Data, Collection of Data and Processing

Both quantitative and qualitative data were collected for the present study. A day long training workshop on "Data Collection Procedure" was held before going to the field. Data were collected by the trained enumerators through face to face interview with the selected respondents using the predesigned and pretested interview schedule under the direct supervision of the researchers. Afterwards, collected data were edited, processed, summarized and scrutinized carefully. The collected data were computerized using SPSS software. Secondary data were collected from different published and unpublished report.

Qualitative data

Beside quantitative survey, qualitative tools such as Focus Group Discussion (FGD) and KII (Key Informants Interview) were conducted to have better understanding on existing constraints or challenges, expansion of the vaccination program, policy of the government and expectations of the stakeholders. A total of nine FGDs were conducted in each of the selected nine villages among livestock keepers in three different regions. One VFA, one PSP

(Private service provider/ private paravet/technician), two drug sellers, ULO from each upazilla were chosen for KII and thus 15 KIIs were conducted in selected three upazillas of three different regions. Furthermore, 3 KIIs were conducted at national level taking one scientist of BLRI, one director of LRI and one staff of DLS. It was supposed to have KII with the secretary of MoFL accordingly researcher made contact with her and sent the KII checklist through email. She acknowledged on receiving the checklist however she could not be able to give an appointment due to other important assignment of the government. The FGDs and KIIs were conducted by the researcher himself.

3.5 Analytical Technique

Both tabular and statistical techniques were used to analyze the data.

3.5.1 Tabular technique

Tabular technique is a technique that is widely used to find out the crude association between variables. Tabular analysis was used to find out simple statistical measures like average, percentage, ratios etc. This method is simple in calculation, easy to understand and applied to classify the data.

3.5.2 Statistical technique

i) Binary Logistic Regression Model

In order to find out the factors influencing the livestock keepers to participate in vaccination program, the following binary logistic regression model was used. The binary dependent variable was assigned the value 1 for the livestock keepers those gave vaccine to their animal and zero otherwise. The independent variables were age, education, family size, farm size, number of cattle and village distance from ULO office. Logit model can be written as-

$$Y = g(X) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8$$

Where,

Y = Types of farmer (0= have not received vaccination service and 1= have received vaccination service)

X_1 = Age of the respondent

X_2 = Years of schooling of the respondent

X_3 = Family size (in number of family members)

X_4 = farm size

X_5 = No. of cattle

X_6 = Distance of village from ULO office

β_0 = intercept

$\beta_1, \beta_2, \ldots \beta_8$ = Regression co-efficient

Relationship between vaccinated and unvaccinated animal with the treatment cost were measured applying "paired t" test. Similarly, relationship between mortality rate for vaccinated animal and unvaccinated animal were also measured adopting "paired t" test. Formula used for "paired t" test can be written as follows-

$$t = \frac{\sum D}{\sqrt{\frac{N\sum D^2 - (\sum D)^2}{N-1}}} \ldots\ldots\ldots\ldots\ldots\ldots (i)$$

Where:

$\sum D$= is the sum of the differences (i.e. the sum of d)

$\sqrt{\frac{N\sum D^2-(\sum D)^2}{N-1}}$= The square root of the following- N times the sum of the difference squired minus the sum of the squired differences, all over n-1

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Socio Economic Characteristics of the Respondents HHs

This section discusses the findings of the household survey on livestock and poultry keepers in three different geographical regions of Bangladesh.

4.1.1 Demographic information of the respondent

It is evident that 61% of the respondent was head of the household and the average age was 42 years and ranged between 20 years to 75 years across the geographical areas. The average family size was 4.73 across the region. The family size of the respondent HHs in haor area was highest at 5.22 followed by coastal and plain region (Table 2).

Table 2. Demographic information of the respondent

Region	Family size (no.)	HH headship (%)		Age distribution (years)		
		Head	Non-head	Average	Minimum	Maximum
Plain	4.19	61	39	43.42	22	74
Haor	5.22	58	42	41.93	20	70
Coastal	4.80	65	35	40.69	21	75
All average	4.73	61	39	42	21	73

Source: Field Survey, 2015

4.1.2 Educational status of the respondent

It is evident that overall illiteracy rate was 48% for the respondent across the study areas. Illiterate respondent was found more in numbers in the haor region followed by the plain and coastal region (Table 3). The respondent having no schooling was quite high at 61% in the haor region, 55% in the plain region and that was lowest at 29% in the coastal region. Across the study areas about 21% of the respondent was observed having education upto primary level, 24% respondent had the education at secondary level, where as only 3% respondent had the education at higher secondary level.

Table 3. Educational status of the respondent

Region	Level of education (% of the respondent)						
	Illiterate	Can sign	Upto primary	Secondary	Higher secondary	Degree	Total
Plain	55	4	16	23	2	0	100
Haor	61	3	20	14	2	0	100
Coastal	29	1	27	34	5	1	100
All average	48	3	21	24	3	1	100

Source: Field Survey, 2015

4.1.3 Occupational status of the respondent

It is evident (from Table 4) that farming or agriculture was the major occupation of the half of the respondent households (47%) across the study areas. About 39% of the respondent was housewife whereas petty business was the main occupation of about 5 % of the respondent across the region. Rickshaw pulling and day labor jointly represents 6% of the respondent's occupation and service was the occupation of 3% of the respondent across the region. Within the study areas number of day labor in the respondent household was observed highest in the coastal region followed by haor and plain region.

Table 4. Occupational status of the respondent

Region	Occupation (% of respondent)						Total
	Day labor	Farming	House wife	Petty business	Rickshaw/ van puller	Service	
Plain	2	50	40	3	1	4	100
Haor	3	49	41	4	1	2	100
Coastal	9	42	36	8	2	3	100
All average	5	47	39	5	1	3	100

Source: Field Survey, 2015

4.1.4 Farm size of the respondent households

The average size of land holding of the respondent HHs across the regions was 48.15 decimal which falls in poor farm category according to the census of Bangladesh Bureau of Statistics. The landholding size of the respondent HHs was observed highest in haor region (58.85 decimal) and it was lowest (40.64 decimal) in plain region. If we consider the absolute

land owned by the respondent HHs then the average size of land holding stood at only 12.48 decimals across the region. About 40 % of the respondent households were absolutely landless both in the plain and coastal region and that was 19% in the haor region (Table 5).

Table 5. Farm size of the respondent households

Region	Landless Family	Average size of land holdings (decimal)			
		Homestead	Own land	Rented in	Total
Plain	40	6.45	13.72	20.37	40.64
Haor	19	10.25	12.60	34.09	58.85
Coastal	40	8.33	11.13	21.28	44.96
All average	33	8.34	12.48	25.25	48.15

Source: Field Survey, 2015

4.1.5 Annual income and its sources

It is evident that average number of earning member in the respondent HHs across the region was more than one (Table 6). It also reveals that the average annual income of the respondent household was Tk. 74826.10 across the regions. The annual average income of the respondent was higher in the haor region (Tk.80422) and that was lowest (Tk.67603) in the plain region.

Table 6. Earning members, annual income and its sources

Region	Earning member (no.)	Annual income (Tk.)								
		Crop		Livestock and poultry		Livestock, poultry and fish product sell		Others (petty business, rickshaw pulling)		Total Income
		Income	%	Income	%	Income	%	Income	%	
Plain	1.24	21408.00	31.67	6289.04	9.30	203.46	0.30	39703.33	58.73	67603.84
Haor	1.43	35587.00	44.25	7846.66	9.76	9201.66	11.44	27787.33	34.55	80422.66
Coastal	1.25	16931.33	22.15	6792.56	8.88	10215.23	13.36	42512.66	55.61	76451.80
All	1.30	24642.11	32.93	6976.09	9.32	6540.12	8.74	36667.78	49.00	74826.10

Source: Field Survey, 2015

The table reveals that the major source of income of the respondent HHs both in the plain and coastal region was off farm (service includes rickshaw/ van pulling, petty business, other small service). Other than service, the major portion of the income of the respondent HHs in haor region came from crop production (44.25%). The contribution of livestock and livestock product (in terms of percentage) to the annual income of the respondent HHs was about

10% in the plain region and that accounted for 22.24% in the coastal region which was highest among the three areas (Figure 4). The figure describes clearly that livestock and poultry is one of the important sources of income of the rural poor households in the study areas.

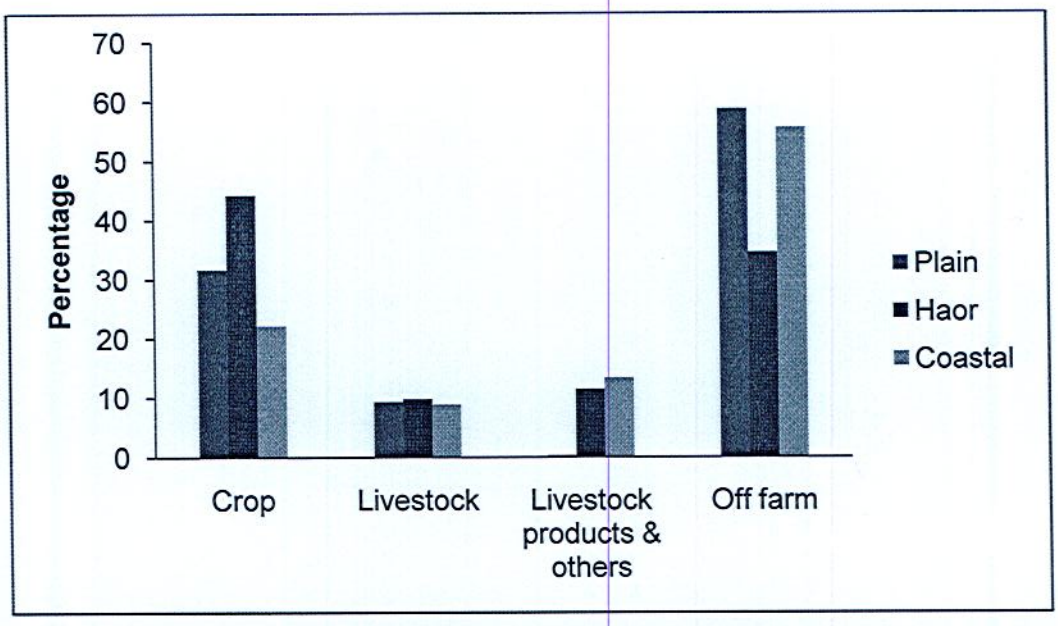

Figure 4. Percentage share of income from different sources in the study regions

4.1.6 Average herd and flock size per HHs in the study area

It is evident that average herd size of cattle per farm household was 2.5 across the study areas. The average herd size of cattle per household was observed highest in the haor region (2.83) and that was lowest in the plain region (2 cattle/hh) and 2.58 in the coastal region. The average size of small ruminant in plain region was observed lowest amounting 2.53. The highest population of small ruminant was observed 3.68 (animal per HH) in haor region (Table 7). The table showed that in the haor region cattle population was highest but that of goat was the lowest among the three different geographical regions and the population of goat was highest in the coastal region. Average flock size of the birds in the household was 8.16 in the study areas. The flock size per household was observed highest in the haor region and that was found lowest in the coastal region.

Table 7. Average herd and flock size per HHs in the study area

Region	Cattle	Goat	Poultry
Plain	2.01	2.53	7.15
Haor	2.83	3.39	11.49
Coastal	2.58	3.68	5.85
All average	2.50	3,2	8.16

Source: Field Survey, 2015

4.1.7 Value of animal owned by the respondents

The average value of the cattle owned by the respondent HHs was Tk. 33031.25 to Tk. 38261.72 in plain and coastal region, whereas in the case of haor region it was about Tk. 46400 emphasizing the importance of rearing cattle in this region. The average value of the goat owned by the respondent households accounted for Tk.9375 in the haor region that registered highest among the three areas. The average value of the poultry owned by the households was Tk. 1212.95 across the regions. It may be concluded that there is potential of raising livestock and poultry both in the study areas of coastal and haor regions.

Table 8. Value of animal owned by the respondents

Region	Value of Cattle (tk//HH)	Value of goat (Tk.)/HH	Value of poultry (Tk.)/HH
Plain	33031.25	6292.42	1178.75
Haor	46400.78	9375	1267.87
Coastal	38261.72	8081.37	1192.231
All	39231.25	8124.59	1212.95

Source: Field Survey, 2015

4.2 Information on Animal Shed

4.2.1 Cattle shed

Roof: It is evident that maximum number of roof of the cattle shed of the farm household was made of tin in all the three region followed by straw and very few number of roof of that was made of bamboo and polythene (Figure 5).

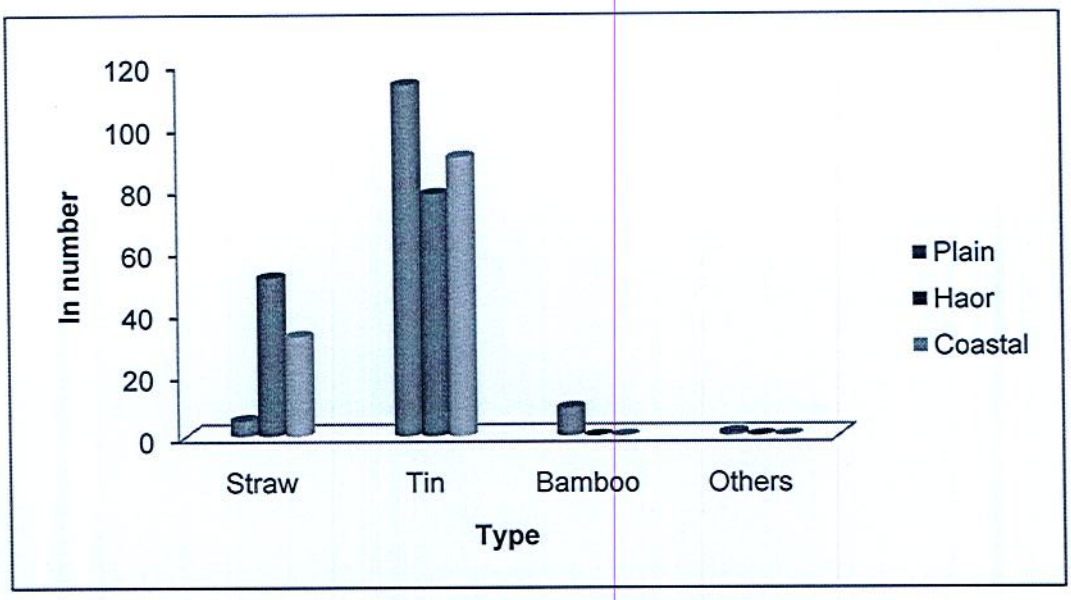

Figure 5. Roof type of cattle shed

Floor: The floor of the cattle shed of the majority of the respondent household was made of mud in all the three study areas. The floor of cattle shed of the households was made of brick was seen in the coastal region (Figure 6).

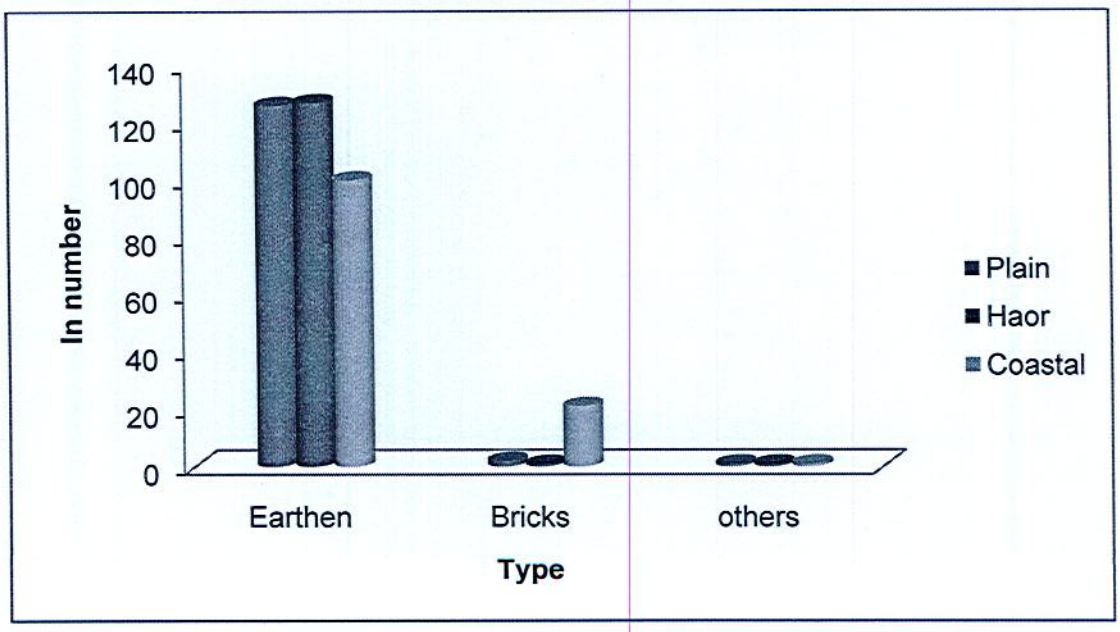

Figure 6. Type of floor for cattle shed

Wall: It is evident from the figure that the wall of the cattle shed of the majority respondent in the plain region was made of tin, but in the coastal region the wall of cattle shed of the majority respondents household was made of mud and in the haor region that was made of straw (Figure 7).

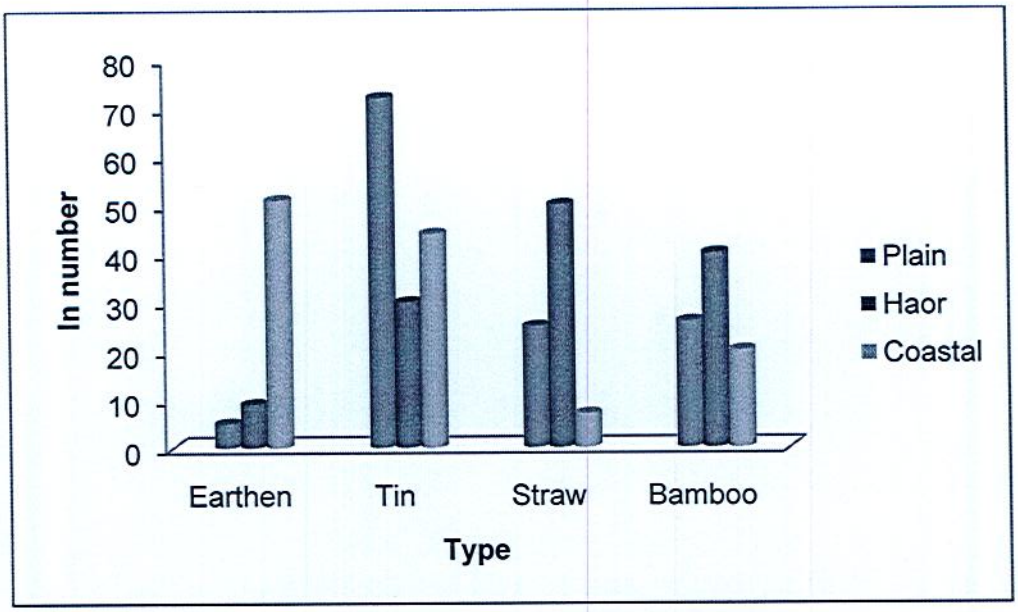

Figure 7. Type of wall for cattle shed

The wall of the cattle shed was made of bamboo and it was observed in the haor region (40 in numbers). Earthen made wall was observed highest (51 nos.) in the coastal region.

4.2.2 Goat Shed

Roof: Most of the respondent households (87%) in the haor region had no separate shed for goat usually keeping their small ruminant in the cattle shed or in the bed room. It is also evident that about 56% of the respondent in the plain region and 32% of the respondent in the coastal region had no goat.

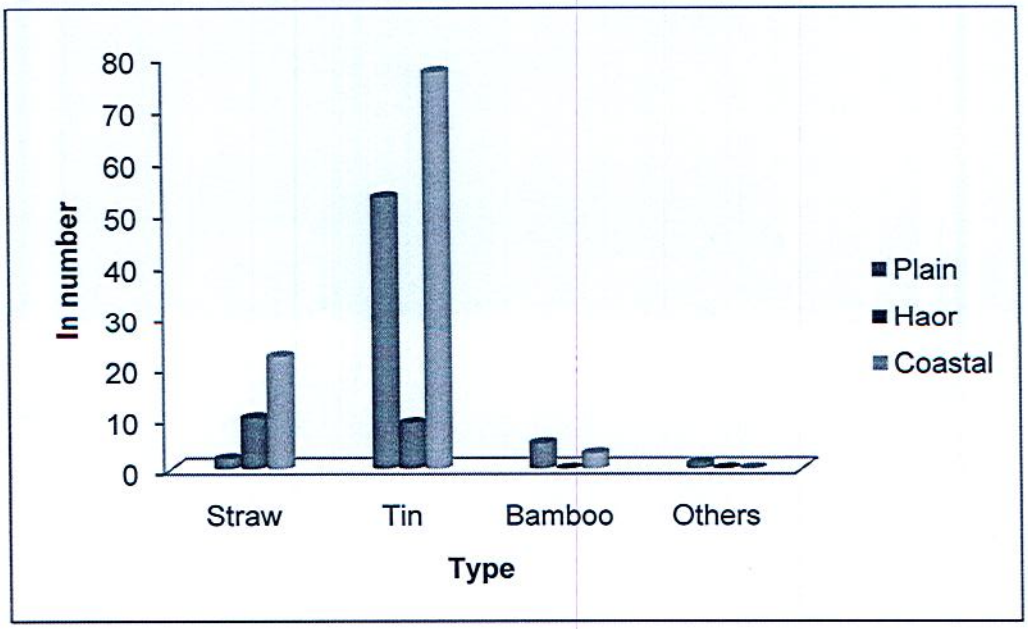

Figure 8. Type of roof for goat shed

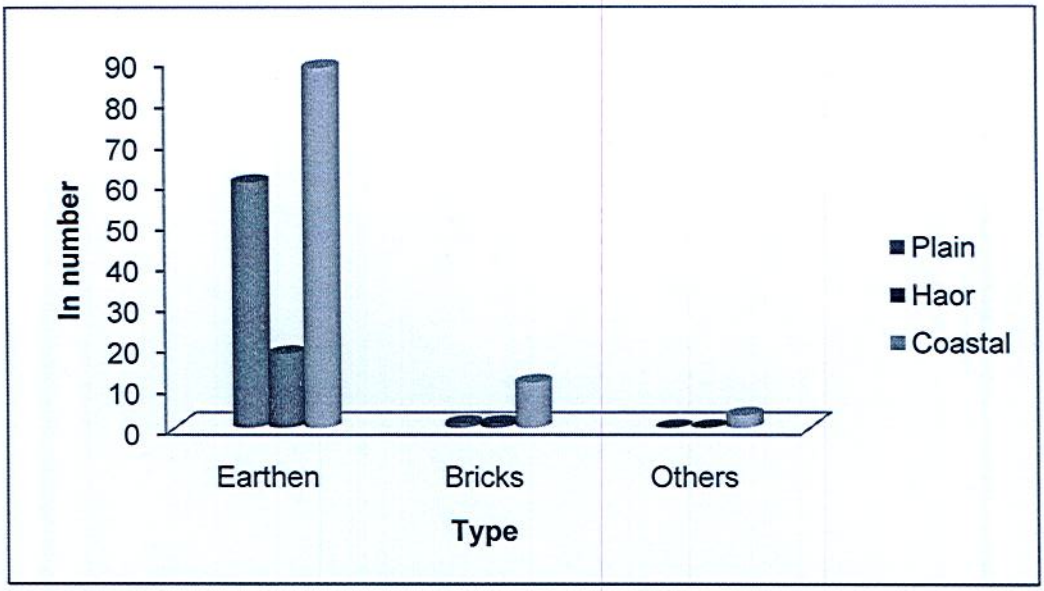

Figure 9. Type of floor for goat shed

Floor: Floor of the goat shed of the majority of the respondents HHs was made of mud across the study areas. But only in the coastal region 11% of the of the floor of goat shed was made of bricks, that was only one in both the study areas of plain and haor region (Figure 9).

Wall: It is evident that wall of the goat shed of the majority of the respondents was made of tin in the both coastal and plain areas. About 30% of the goat shed had earthen made wall and 21% had bamboo made wall in the coastal zone followed by straw made (4%). Only five sheds had wall- made of straw in the plain region and that was four in the coastal region. It was found that ten goat shed had bamboo made wall in the haor region and that was only seven in the coastal region (Figure 10).

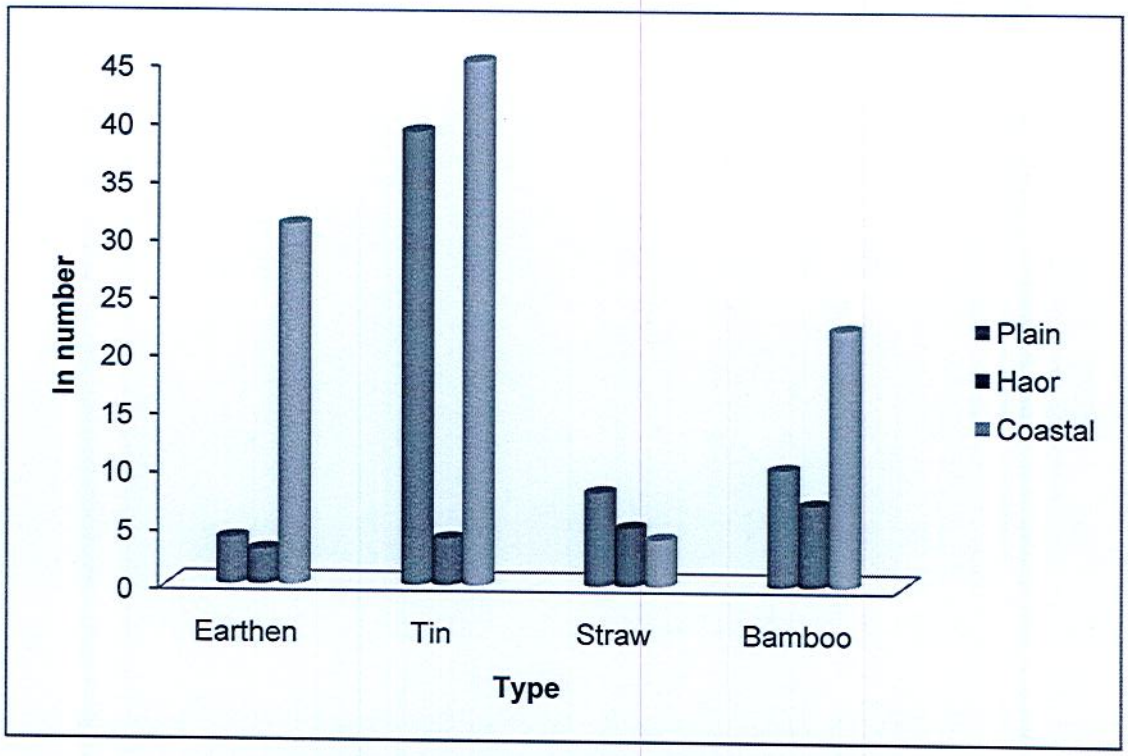

Figure 10. Type of wall of shed for goat shed

4.3 Health and Hygiene of Animal

4.3.1 Cleaning of animal shed

It is evident that the respondent had cleaned their animal shed more than one time in a day on average across the region for three types of animal. The respondents of the haor region were more conscious about the cleaning of their shed than that of the other two regions. The average number of frequency of cleaning was 1.51 for cattle shed 1.12 for goat shed and 1.19 for poultry shed. The figure in the table implied that the respondents were not so aware about the hygiene of the animal shed. Across the study region no respondent was observed to have cleaned the animal shed three times in a day (Table 9).

Table 9. Cleaning of animal shed by the respondent (times/day)

Region	Cattle Shed	Goat Shed	Poultry Shed
Plain land	1.43	1.1	1.16
Haor	1.5	1.06	1.13
Coastal	1.6	1.2	1.3
All average	1.51	1.12	1.19

Source: Field Survey, 2015

4.3.2 Frequency of washing the animal (per month)

The respondents were asked about washing their animals per week or month. It was reported that the respondents had washed their large ruminant only 12 times a month across the regions means that the large ruminant households do not bathe their animal regularly. In case of goat, the frequency of washing was only average 7 times a month across the region meaning that the farm household is very irregular in washing their small ruminant. It also reveals that majority of the respondent on the plain and haor region washed their animal (both large and small ruminant) with pond water followed by river water, but majority of the respondent in the coastal region washed their cattle with river water(Table 10).

Table 10. Frequency of washing the livestock animal (monthly)

Region	Cattle/buffalo			Goat/sheep		
	Freq.	Pond water (%)	River water (%)	Freq.	Pond water (%)	River water (%)
Plain land	12	60	40	7	70	30
Haor	12	55	45	11	60	40
Coastal	13	40	60	5	75	25
All average	12.33	52	48	7.6	68	32

Source: Field Survey, 2015

4.3.3 Feeding the livestock animals

The respondents were asked about the feeding of their animals. Almost 100% of the respondents replied that they regularly fed their livestock animals. About 50% of the respondents households fed their animals (goat and cattle) three times daily across the region, 39% respondents fed their animals two times a day and only 8% of the respondent reported that they fed their animal only once in a day across the region (Table 11). Only 8%

of the respondent households in the plain area replied that they feed their animal four times a day.

Table 11. Regular feeding practiced by the respondent

Region	Regular feeding		No. of frequency of feeding in a day (%)			
	Frequency	%	One	Two	Three	Four
Plain land	148	99	8	32	51	8
Haor	150	100	8	40	52	0
Coastal	147	98	9	45	45	0
All	149	99	8.33	39	49.33	2.66

Source: Field Survey, 2015

4.3.4 Composition of livestock and poultry feed

It is evident that in the plain region the composition of feed supplied to the livestock animals by the respondents was the combination of grass and straw (81%) and concentrate feed (19%) (Figure 11). The composition of feed for livestock supplied by the respondent in haor region was combination of grass and straw (73%) and concentrate feed (27%) (Figure 12). The composition of feed for livestock supplied by the respondent in coastal region was combination of grass and straw (69%) and concentrate feed-31% (Figure 13).

Regarding poultry feed, the backyard poultry birds mostly depend on natural feed but the household supplied some feed like rice (left over wastage food), broken rice, paddy to the birds.

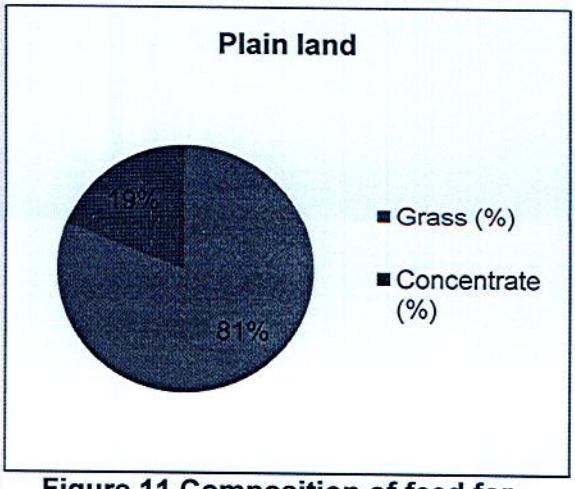

Figure 11.Composition of feed for livestock

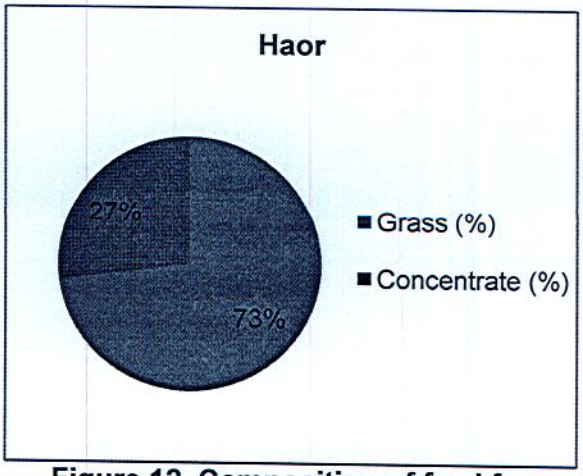

Figure 12. Composition of feed for livestock

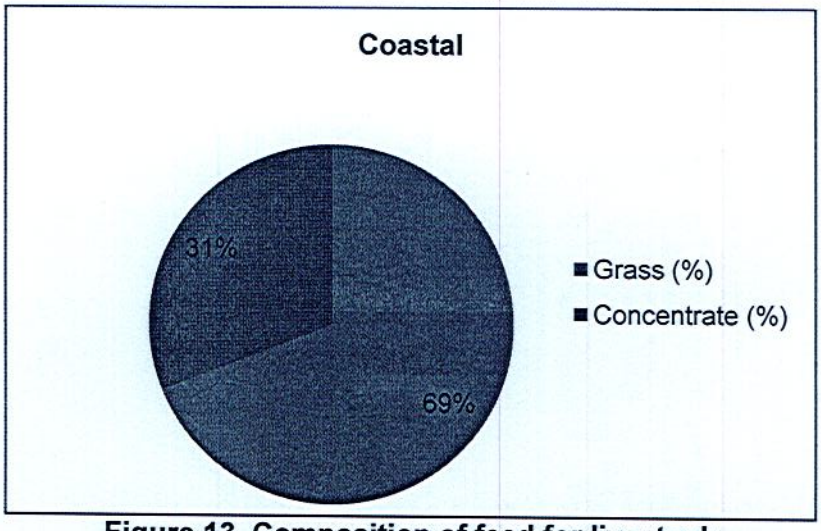

Figure 13. Composition of feed for livestock

4.4 Seasonal Incidence of Disease Occurrence in the Study Areas

4.4.1 Symptoms of Diseases Known to the Respondent

It was observed that the formal name of the diseases was not known to the farmers in the study areas. Most of the farmer can tell the Bengali name of the diseases. But in case of PPR for goat, maximum (80 percent) respondent can tell the name of the disease. Ninety percent respondent in the plain and coastal zone can tell the name of ND as Ranikhet (Table 12).

Table 12. Symptoms of diseases Known to the respondent

Diseases	Plain		Haor		Coastal		All	
	No.of Respondent	%	No.of Respondent	%	No.of Respondent	%	No.of Respondent	%
FMD/Khurarog	136	90.67	56	37.33	124	82.67	316	70.22
BQ/Badla	132	88.00	76	50.67	91	60.67	299	66.44
Anthrax/Torka	128	85.33	65	43.33	100	66.67	293	65.11
HS/Golafula	89	59.00	8	5.33	122	81.33	265	58.89
PPR	126	84.00	126	84.00	119	79.33	371	82.44
ND/Ranikhet	136	90.67	85	56.67	137	91.33	358	79.56
FP/Bosanta	6	4.00	21	14.00	2	1.33	29	6.44
FT/	5	3.33	36	24.00	2	1.33	43	9.56
DP	34	22.67	28	18.67	63	42.00	125	27.78

Source: Field Survey, 2015

4.4.2 Seasonal incidence of disease occurrence in the study areas

Prevalence of FMD: The prevalence of FMD was spread over the year February to July in the plain region, but it was prominent in the month of July as evidenced by the figure 14. In the Haor region, prevalence of FMD was spread over the month of January to July and it was peak in the month of March. FMD prevalence was spread over the month of March to

July in the Coastal region and prominent in the month of June. Prevalence of FMD was not observed as reported by the respondent during the month of August to December across the regions.

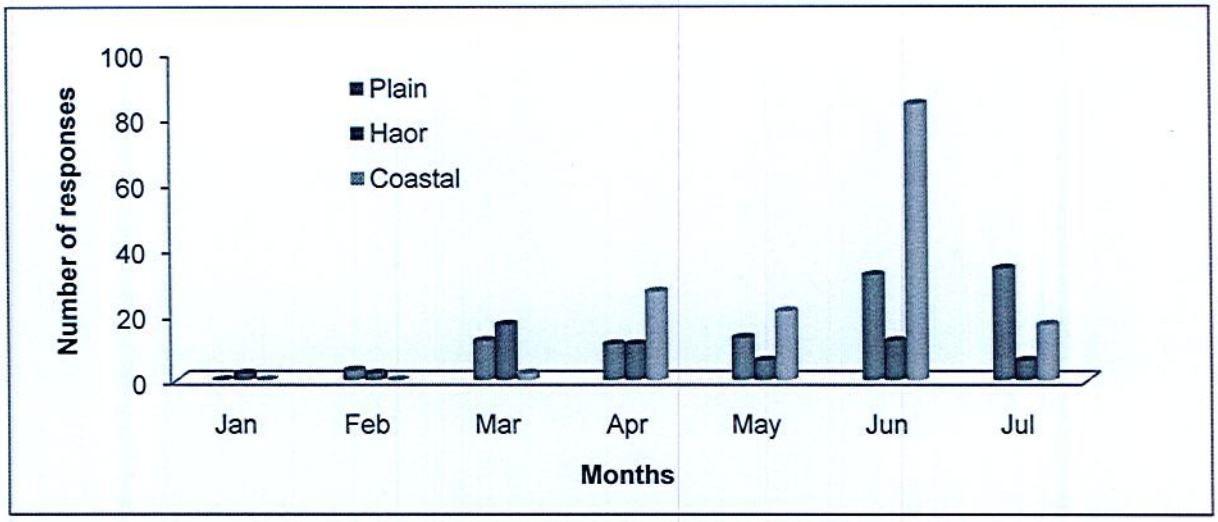

Figure 14. Seasonal pattern of incidence of FMD as reported by the respondents

Prevalence of BQ: The prevalence of BQ disease was spread over the year from January to October in the plain region, but it was prominent in the month of June (Figure 15). In the Haor region the BQ disease prevalence was spread over the month of January to October and highest was peak in the month of April to June.

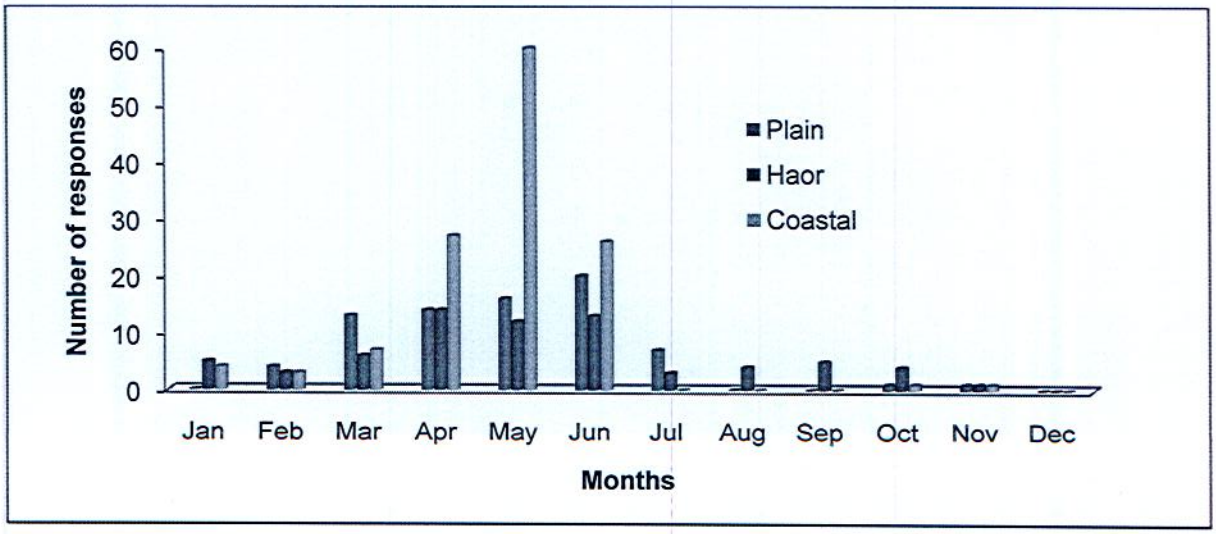

Figure 15. Seasonal pattern of incidence of BQ as reported by the respondents

In the coastal region BQ disease prevalence was spread over the year from Jan-June and peak in the month of May, also prominent in the month of April and June (Figure 15)

Prevalence of Anthrax: The prevalence of anthrax disease was spread over the Month of January to October across the region (Figure 16). The incidence of disease is most

prominent in the month of June followed by October and September in the coastal region. But in the hoar region it was peak in the month of September followed by August and also prominent in the month of October. In the plain region the incidence of disease was peak in the month of October followed by September and August.

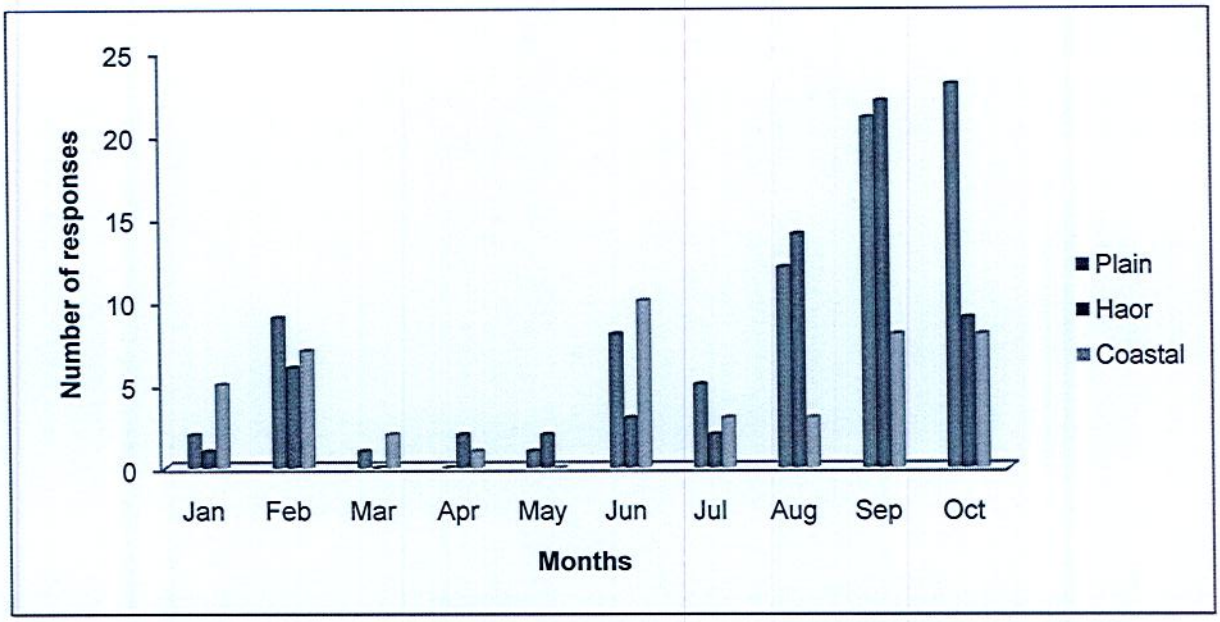

Figure 16. Seasonal pattern of incidence of Anthrax as reported by the respondents

Prevalence of HS: The prevalence of the disease was spread over the year except September, November and December in the plain region, but it was prominent in the month of April followed by March and May (Figure 17). In the Haor region the HS disease prevalence was spread over the year except the month of August, November and December, but was prominent in the month of April. HS disease prevalence was spread over the month of January to September in the Coastal region. No incidence of HS was occurred in the month of October to December as reported by the respondents in the Coastal region and prevalence of incidence was prominent in the month of May followed by April and June.

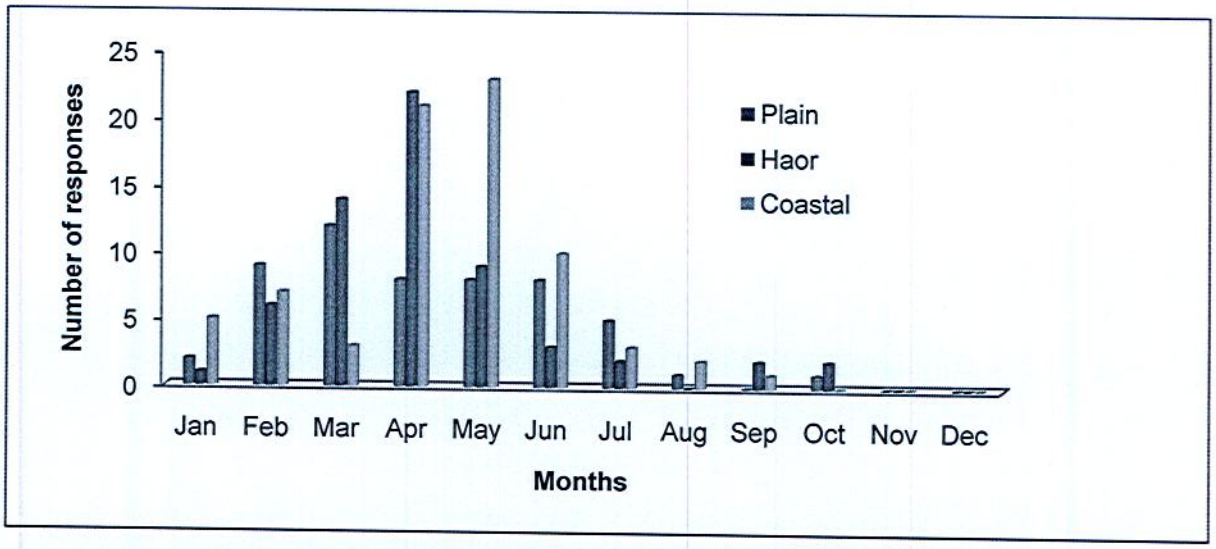

Figure 17. Seasonal pattern of incidence of HS as reported by the respondents

PPR of Goat: The prevalence of PPR disease for small ruminant was spread over the month of January to August across the region (Figure 18). The incidence of disease is most prominent in the month of February followed by April and March in the plain region. In the coastal region it was peak in the month of February followed by January and March. The figure also explained that incidence of PPR disease was less compared to other two regions (Figure 18).

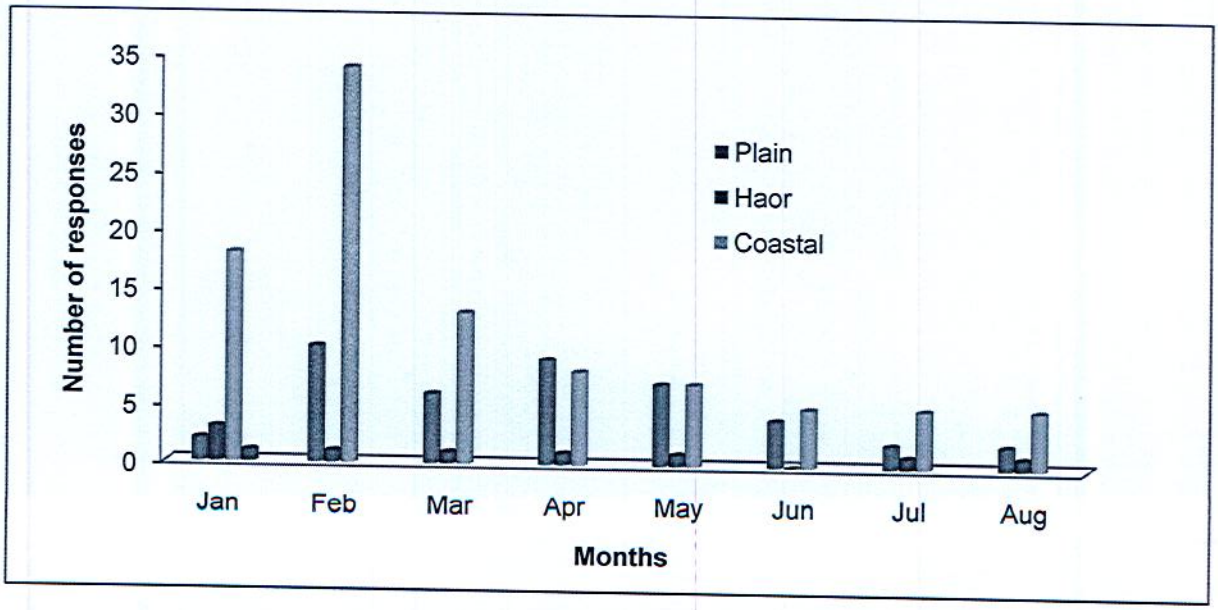

Figure 18. Seasonal pattern of incidence of PPR as reported by the respondents

Newcastle Disease (ND): The prevalence of ND was spread over the year except August and September in the plain region, but the incident was prominent in the month of December followed by November, February and January (Figure19). In the Haor region the ND prevalence was spread over the year except the month of September and the incidence was

peak in the month of December. Prevalence of ND was nil in the Month of May to September over the year in the Coastal region and the incidence was prominent in the Month of January followed by February, December and November (Figure 19).

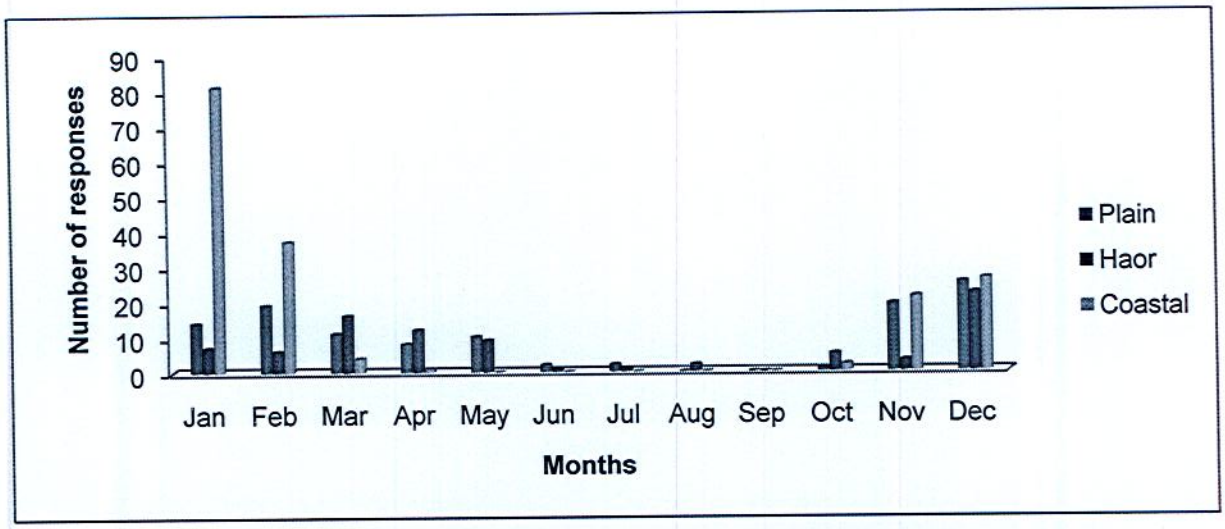

Figure 19. Seasonal pattern of incidence of ND as reported by the respondent

Fowl Pox: Prevalence of FP disease was spread over the year except February and October in the plain region, but the incident was prominent in the month of March (Figure 20). In the haor region the FP disease prevalence was spread over the year except the month of September and November, but the incidence was highest in the month of May. FP disease prevalence was nil in the seven month of the year in Coastal region and FP disease incidence was prominent in the Month of January. It is evident from the figure that the prevalence of FP disease in the coastal region was less compared to plain and haor region.

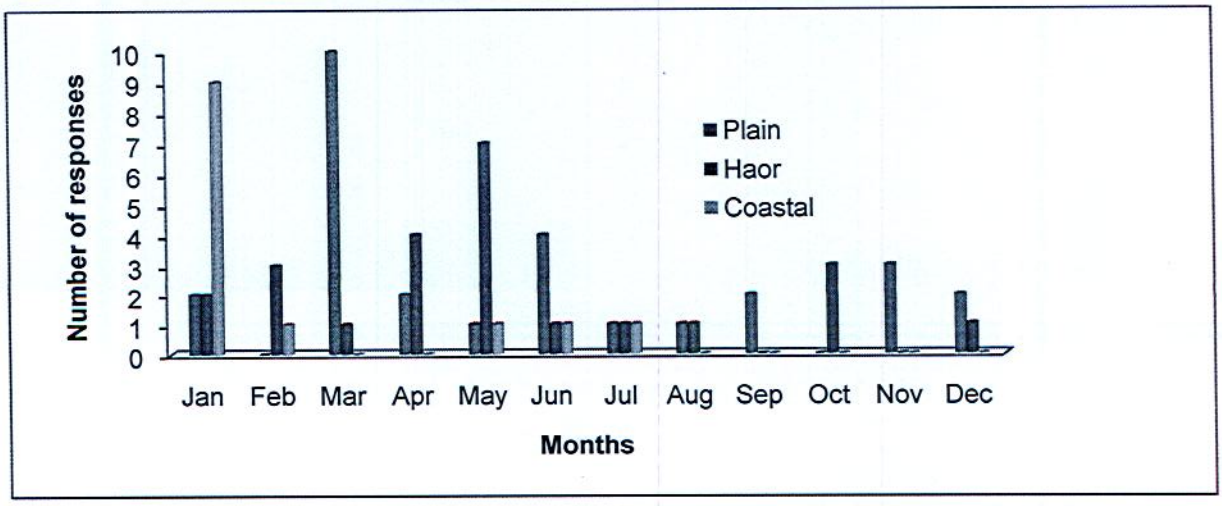

Figure 20. Seasonal pattern of incidence of FP as reported by the respondent

DP: Prevalence of DP disease was almost insignificant in the plain region over the year but the incident was prominent in the month of January (Figure 21). In the Haor region the DP

disease prevalence was prominent in the month of January. DP disease prevalence was almost nil in the month of April to November in coastal region and DP disease incidence was prominent in the Month of January. It is evident from the figure that the prevalence of DP disease in the Haor region among the months was more compare to Plain and Coastal region.

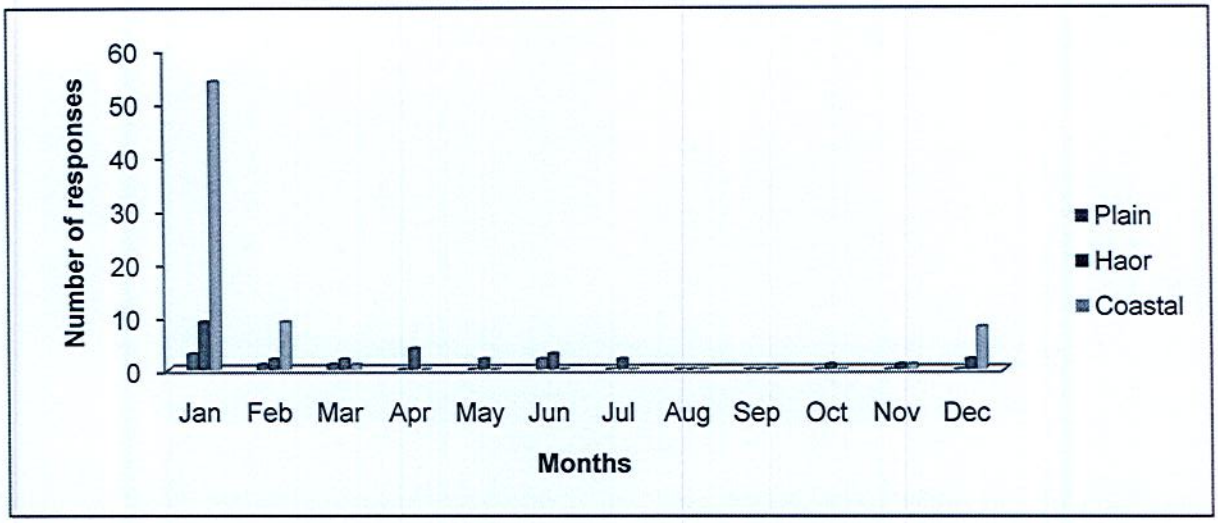

Figure 21. Seasonal pattern of incidence of DP disease reported by the respondent

4.5 Knowledge on Vaccination

4.5.1 Knowledge on the importance of vaccination

Respondents were asked about their concept on the importance of vaccination. About 26% of the respondent in the plain land know that vaccination is important for the animal, about 29% of the respondent in the haor region and 27% in the coastal region know about the importance of vaccination (Figure 22).

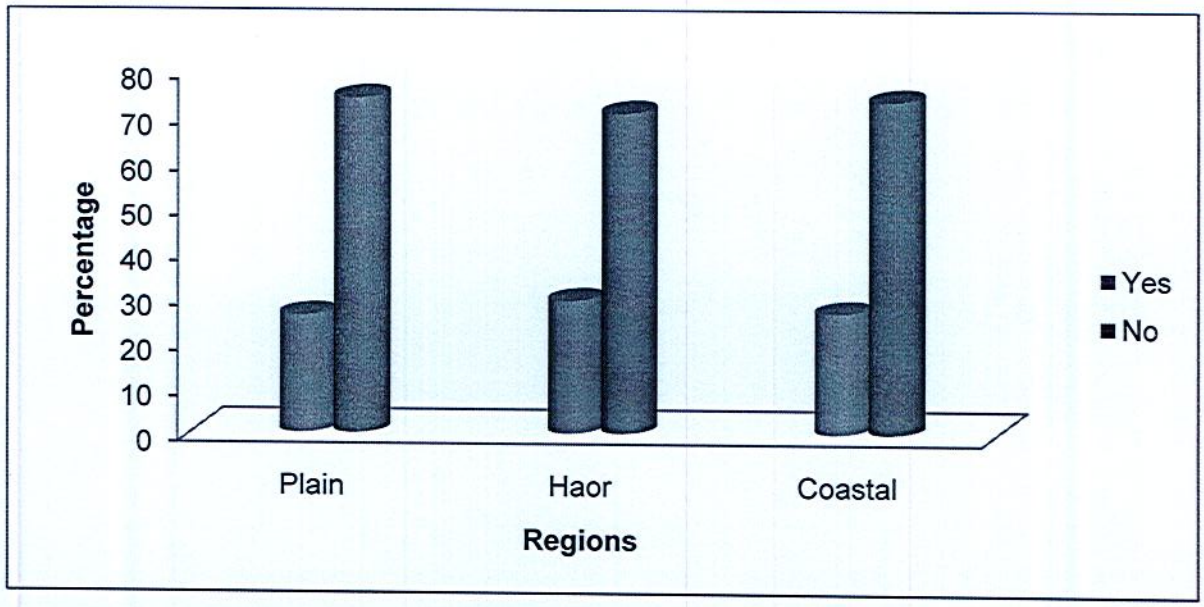

Figure 22. Knowledge on the importance of vaccination (% of respondent)

4.5.2 Reasons for vaccination of animal

Farmers were asked about the reasons for vaccination of their animal. About 87% of the respondent of the vaccinated HHs in the plain region, about 73% respondent of the vaccinated HHs in the haor region and 79 % in coastal region reported that the vaccination is required to protect the animal from diseases.

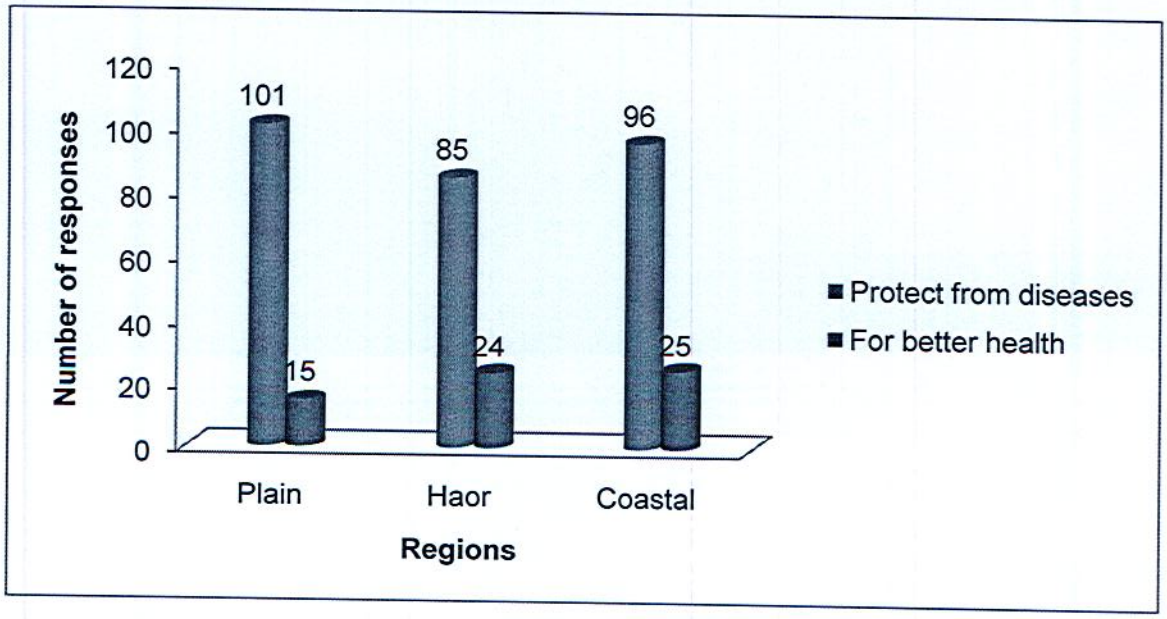

Figure 23. Reasons for vaccination of animal as reported by the respondent (No.)

4.5.3 Sources of information about vaccination

The respondent households were asked a question "what is the source from where they knew vaccination is important". The answer from the respondent in the plain region was that, 60% respondent was informed from the PSP, 29% from DLS and 20% from friends and neighbor. In the haor region, 53% of the respondent was informed from PSP, 33% from DLS and 17% from friends and neighbor. In the coastal region, 65% of the respondent knew about the importance of vaccination from PSP, 25% from DLS and 12% from friends and neighbor (Table 13).

Table 13. Source of information on the importance of vaccine

Region	Sources of Information (% of respondent)				N	Total
	PSP	DLS	Friends & Neighbor	Others		
Plain	60 (54.05)	29 (26.13)	20 (18.02)	2 (1.8)	111	(100)
Haor	53 (50.00)	33 (31.13)	17 (16.04)	3 (2.83)	106	(100)
Coastal	65 (59.09)	25 (22.73)	12 (10.91)	8 (7.27)	110	(100)
All	60(54.43)	87 (26.61)	49 (14.98)	13 (3.98)	327	(100)

Source: Field Survey, 2015 Parenthesis indicate percentage

4.5.4 Schedule of vaccination known to the respondent

Schedule of vaccination is very important that must be known by the livestock keepers for the effectiveness of vaccine. The vaccine is not administered properly maintaining the schedule. The respondent households were asked whether they know the vaccination schedule or not, the answer was that none of the respondent knew the vaccination schedule in the study areas (Table 14).

Table 14. Schedule of vaccination known to the respondent

Region	Answer by the respondent	
	No	Yes
Plain	150	0
Haor	150	0
Coastal	150	0
All	450	0

Source: Field Survey, 2015

4.5.5 Knowledge and perception about vaccination with treatment cost

It is evident that 84.67% of the respondent In the plain region, 79% in the haor and 71% in the coastal region agreed that vaccination reduces the treatment cost and overall only 21% respondent in the study areas disagree with this proposition. About 69% respondent in the plain region expressed their opinion that they agreed to pay higher cost for vaccination and 31 % respondents did not agree to pay higher cost for vaccination. About 87% respondent in the haor region agreed to pay higher cost for vaccination and only 13% respondent did not agree to pay higher cost for vaccination. About 63% of th respondent in the coastal region agreed to pay higher cost for vaccination. Across the regions 78.22% respondent agree that vaccination reduces treatment cost of their animal, but 21.78% respondent did not agree. Across the region about 72% respondent agreed to pay higher cost for vaccination where as 28% did not agree to pay higher cost for vaccination implies that most of the livestock and poultry keepers were willing to pay for vaccination (Table 15).

Table 15. Knowledge and perception about vaccination with treatment cost

Region	Vaccination reduces the cost of treatment		Willing to pay higher amount for vaccination	
	Agree	Disagree	Yes	No
Plain	127 (84.67)	23 (15.33)	103 (68.67)	47 (31.33)
Haor	119 (79.33)	31 (20.67)	131 (87.33)	19 (12.67)
Coastal	106 (70.66)	44 (29.34)	94 (62.67)	56 (37.33)
All total	352 (78.22)	98 (21.78)	328 (72.88)	185 (27.12)

Field Survey, 2015, Parenthesis indicate the percentages

4.6 Access to Vaccination Services

4.6.1 Visits by the respondents to Upazilla livestock offices in a year

It is evident that 15% of the respondent HHs in the plain region visited respective ULO office only 1.6 times in a year, in the haor region 17% of the respondent visited respective ULO office about twice in a year and only 6% of the respondent in the coastal region visited respective ULO office 1.6 times in a year. The respondent in the haor region was more aware about the diseases than other two areas with respect to frequency of visit to ULO office by them (Table16).

Table 16. Visits by the Respondents to Upazilla livestock offices in a year

Region	Visit to ULO office (% of respondent)	Average visiting time	Distance of ULO office from village
Plain	15	1.6	7.83
Haor	25	1.84	11.67
Coastal	9	1.22	7.33
All average	16.3	1.65	9.94

Source: Field Survey, 2015

4.6.2 Visit to PSP by the respondent and vice-versa

Respondents were asked regarding how they have received vaccination service from the Private Service Providers (PSP). In response to the question, about 92% of the respondent in the plain region replied that PSP visited their home upon calling and that was 90% in the haor region and 97% in the coastal region (Table 17). For the same purpose, 8% of the respondent in the plain region, 10% in the haor region and 3% in the coastal region went to PSP at the center/medicine shop. The purpose of the visits include not only for vaccination but also for treatment of animal.

Table 17. Visit to PSP by the respondents

Region	PSP visits to Farmers' house (No.)	Farmers Visit to PSP (No.)
Plain	138 (92)	12
Haor	135 (90)	15
Coastal	146 (97)	4
All	419 (93)	86

Source: Field Survey, 2015; Figures in the parenthesis indicate the percentage

4.6.3 Prescription for treatment and vaccination

It is evident that most of the medicine and vaccine were prescribed by the PSP in all the three regions. In haor area highest number of prescription was made by the PSP and it was lowest in the plain region. In fact, farmers were mostly dependent on the PSP for prescription to treat and vaccinate their animal.

Table 18. Prescription for treatment and vaccine

Region	Vaccine or medicine was prescribed by(% of respondent)	
	Private Service Provider	Govt. Service Provider
Plain	65	35
Haor	75	25
Coastal	70	30
All average	70	30

Source: Field Survey, 2015

4.6.4 Coverage of vaccination for cattle in the study areas

The distribution of coverage of vaccination for cattle in the study areas is analyzed in the table 19. The coverage of vaccination for large ruminant was observed highest in the haor region and that was lowest in the coastal region. About 49% of the cattle of the respondent household in the plain region was vaccinated and that was about 39% in the haor region and the coverage was 24% in the coastal region. With respect to household coverage of vaccination, it was highest in the haor region and lowest in the coastal region. It reveals that about 47% of the cattle HHs in plain region, 61% in the haor region and 27% of those was covered by vaccination in the coastal region (Table 19).

Table 19. Coverage of vaccination for cattle in the study areas

Region	Cattle								
	Cattle headed HH	Total cattle	Local	Cross	Ave. cattle /HH	Vaccinated cattle	Vaccinated HH	Unvaccinated	Unvaccinated HH
Plain	128	257	255	2	2.01	127	61	130	67
Haor	129	365	353	12	2.83	141	79	224	50
Coastal	122	315	304	11	2.58	77	33	238	89
All	379	937	912	25	2.47	401	173	592	206

Source: Field Survey, 2015

4.6.5 Coverage of vaccination for goat in the study areas

The distribution of coverage of vaccination of goat and goat households in the study areas is analyzed in the table 20. The coverage of vaccination for small ruminant was found highest in the plain region and found lowest in the haor region. About 20% of the goat of the respondent household in the plain region was vaccinated and that was only 1.4% in the haor

region and the coverage was 19% in the coastal region. With respect to household coverage of vaccination, it was highest in the plain region and lowest in the coastal region. The table reveals that only about 20% of the goat HHs in plain region, 5% goat HHs in the haor region and about 4% of the goat HHs was covered by vaccination in the coastal region.

Table 20. Coverage of vaccination for goat in the study areas

Region	Goat						
	Goat headed HH	Total goat	Ave. cattle/HH	Vaccinated goat	Vaccinated HH	Unvaccinated goat	Unvaccinated HH
Plain	66	167	2.53	34	13	133	53
Haor	19	70	3.68	1	1	69	18
Coastal	102	346	3.39	19	4	327	98
All	187	583	3.12	54	18	529	169

Source: Field Survey, 2015

4.6.6 Coverage of vaccination for poultry in the study areas

The coverage of vaccination for poultry birds was very insignificant in the haor region (Table 21). Both in the plain and coastal region no one respondent was found to have vaccinated their birds. But in the haor region only 2.85 % of the bird was vaccinated. With respect to household coverage of vaccination, about 5% household in the haor region was vaccinated (Table 21). The vaccination coverage was nil in the plain and coastal region but very negligible coverage was found in the haor region.

Table 21. Coverage of vaccination for poultry in the study areas

Region	Poultry						
	Poultry headed HH	Total poultry	Ave. Poultry	Vaccinated poultry	Vaccinated HH	Unvaccinated poultry	Unvaccinated HH
Plain	120	858	7.15	0	0	858	120
Haor	122	1402	11.49	40	6	1362	116
Coastal	121	708	5.85	0	0	708	121
All	363	2968	8.18	44	0	2924	355

Source: Field Survey, 2015

4.6.7 Ground Situation of Veterinary services for Vaccination and treatment

It is evident that the coverage of vaccination for large ruminant was observed highest in haor region and that was lowest in the coastal region (Table 22). About 49% of the cattle of the respondent household in the plain region was vaccinated and that was 38.63% in the haor region and it was only one fourth in the coastal region. Regarding the coverage of vaccination for small ruminant, 20.36% of the small ruminant in the plain region, 5.49% in the coastal region and only 1.43% in the haor region was vaccinated. Regarding the vaccination coverage for poultry birds only 2.85% birds was vaccinated in the haor region while no birds was vaccinated both in the plain and coastal region. With respect to household coverage of vaccination (for cattle), the figure was highest in the haor region and lowest in the coastal region. It reveals that 61.24% of the cattle HHs in haor, 47.66% in the plain region and 37% of the HHs were covered by vaccination. In the case of goat HHs, about 19.70% of the HHs in the plain region, 5.26% HHs in the haor region and 3.92% HHs in the coastal region were covered by vaccination. Only 4.92% HHs in the haor region was covered by poultry vaccination. The coverage of vaccination for poultry was nil both in the study areas of plain and coastal.

Table 22. Ground situation of veterinary services for vaccination and treatment

Type of animal	Plain	Haor	Coastal
Vaccinated animal			
Cattle	49.42	38.63	24.44
Goat	20.36	1.43	5.49
Poultry	0	2.85	0
Vaccinated HHs			
Cattle	47.66	61.24	27.05
Goat	19.70	5.26	3.92
Poultry	0	4.92	0

Source: Field Survey, 2015

4.6.8 Doses of vaccine given to cattle according to diseases

It was revealed that highest number of doses of vaccine against anthrax disease was used for cattle in the haor region as reported by the farmers (74 doses) followed by 69 doses in coastal and 58 doses in the Plain region. Highest number of doses of vaccine against FMD was given in the plain region (57) followed by 47 doses in haor region and 32 doses in coastal region. Highest no. of doses of vaccine against BQ and HS was also given in haor region compared to other region (Table 23).

Table 23. Doses of vaccine given to cattle according to diseases

Region	Vaccine give for the diseases				Total vaccine
	FMD	BQ	Anthrax	HS	
Plain	57	15	58	2	132
Haor	47	78	74	5	204
Coastal	32	2	69	2	105
All	136	95	201	9	441

Source: Field Survey, 2015

4.6.9 Service charge of Govt. service provider and private service provider

The table reveals that the service charge of PSP was 3.20 times higher than that of the Govt. paravet or veterinarian (Table 24) in Plain region. In haor region, the service charge of PSP was 2.20 times higher than that of the Govt. Service Provider. In coastal region, service charge of PSP was 1.20 times higher than that of the Govt. Service Provider.

Table 24. Service charge of Govt. service provider and private service provider

Region	Government charge (Tk/visit)	PSP charge (Tk/visit)
Plain	35.13	112.37
Haor	54.00	118.59
Coastal	66.25	79.83
All	46.83	109.03

Source: Field Survey, 2015

4.6.10 Average cost of vaccination for livestock incurred by the respondent

Regarding cost of vaccination for different diseases, average cost of FMD vaccination was highest in the haor region (Table 25). Cost of BQ vaccination was highest in plain region and that was lowest in the haor region. Cost of Anthrax vaccination was highest in coastal region and lowest in the haor region. Cost of HS vaccination was highest in plain region and lowest in the coastal region. Cost of PPR vaccine was highest in the haor region and that was lowest in the plain region. Among the costs of vaccine for different diseases, highest cost was incurred by the respondent for HS vaccine. The average cost incurred by the respondent HHs was Tk. 34.67 for FMD, Tk. 37.58 for BQ, Tk. 22.87 for Anthrax, Tk. 156 for HS and Tk. 16.07 for PPR.

Table 25. Average cost of vaccination for livestock incurred by the respondent

Region	FMD	N	BQ	N	Anthrax	N	HS	N	PPR	N
Plain	21.5	26	49.70	33	26.79	14	200	2	13.86	14
Haor	66.75	20	18.21	33	13.86	14	180	2	46.67	3
Coastal	17.06	17	43.14	43	46.67	3	20	1	20.71	7
All average	34.67	-	37.58	-	22.87	-	156	-	16.07	-

Source: Field Survey, 2015

4.6.11 Average cost of vaccination for poultry

Poultry vaccination was done only in haor region among all three regions against ND, FP and DP diseases (Table 26). Average cost incurred by the respondent HHs was Tk. 29.1 for ND, Tk. 8.00 for FP and Tk. 53 for DP.

Table 26. Average cost of vaccination for poultry (last year)

Region	ND	N	FC	N	DP	N
Plain	0	0	0	0	0	0
Haor	29.1	6	8	1	53	3
Coastal	0	0	0	0	0	0
All average	29.1	-	8	-	53	-

Source: Field Survey, 2015

4.6.12 Cattle vaccinated by the DLS and other service providers in the study areas

The distribution of cattle vaccination by DLS and other service providers revealed that among the vaccinated cattle in the plain region, 85% of the cattle was vaccinated by the DLS and 15% by the PSP. Among the vaccinated cattle In the haor region, 65% of the cattle was vaccinated by the PSP and 35% of that was vaccinated by DLS. . In the coastal region, 55% of the cattle was vaccinated by DLS and 45% was vaccinated by the PSP. Considering all the region, 58.33% cattle was vaccinated by DLS and 41.67% was vaccinated by the private service providers. The result implies that the farmers in the haor region are mostly dependent on PSP for vaccination of their cattle.

Table 27. Number of cattle vaccinated by the DLS and PSP in the study areas

Region	DLS	PSP	Total
Plain	112(85)	20(15)	132
Haor	58(35)	106(65)	164
Coastal	58(55)	47(45)	105
All average	77(58.33)	57.66(41.67)	133.67

Source: Field Survey, 2015; Figures in the parenthesis indicate percentage

4.6.13 Number of goat vaccinated by DLS and other service providers

The distribution of goat vaccination by DLS and other service providers revealed that among the vaccinated goat in the plain region, 80% of the goat was vaccinated by the DLS personnel. Among the vaccinated goat in the haor region 100% was vaccinated by the PSP. Among the vaccinated goat in the coastal region, 42% goat was vaccinated by the DLS personnel and 58% was vaccinated by the PSP. In the plain region, vaccination was covered mostly by the DLS personnel, on the contrary goat vaccination was mostly covered by the PSP in the other two study regions (Table 28).

Table 28. Number of goat vaccinated by DLS and other service providers

Region	Provided by DLS	Provided by PSP	Total
Plain	27(80)	7(20)	34
Haor	0	1(100)	1
Coastal	8(42)	11(58)	19
All	35	19	54

Source: Field Survey, 2015; Figures in the parenthesis indicate percentage

4.6.14 Number of poultry birds vaccinated by DLS and other service providers

The distribution of poultry birds vaccinated by the DLS and other service providers revealed that there was no vaccination coverage in the plain and coastal region for poultry. Among the vaccinated poultry birds in the haor region 63% of birds was vaccinated by PSP and 37% was vaccinated by their won arrangement and no birds was vaccinated by the DLS personnel. There was held no vaccination program for poultry in the study areas.

Table 29. Number of chicken vaccinated by DLS and other service providers

Region	PSP	Own	Total
Plain	2(100)	0	2
Haor	25(63)	15(37)	40
Coastal	2(100)	0	2
All	29	15	44

Source: Field Survey, 2015; Figures in the parenthesis indicate percentage

4.6.15 Vaccination program held for cattle and goat in the study areas

It is evident from the table that a very few number of cattle and goat vaccination program was held across the regions. In plain region two vaccination programs were held in the study areas of plain region while only one program was held both in the haor and coastal region (Table 30). It is to be mentioned here that the entire vaccination program was organized by the DLS at upazila level.

Table 30. Vaccination program held for cattle and goat in the study areas

Region	No. Program held	Organized by	Distance (Km)	Place
Plain	2	DLS	0.5	Kolkondo & Dhamur Govt. Primary School
Haor	1	DLS	2.09	Noljuri Govt. Primary School
Coastal	1	DLS	0.5	Jadhav Pur Govt. Primary School

Source: Field survey, 2015

4.6.16 Mortality and morbidity of animal in the study areas

The mortality and morbidity of animal due to different diseases as reported by the respondent households is analyzed in the table 30. It is evident that highest number of mortality in the large ruminant rose to 35 for BQ disease. It was also reported that the mortality of large ruminant due to Anthrax disease rose to 28 followed by 15 for HS and 7 for FMD during the study period.

In the case of small ruminant, PPR was identified as the only disease that caused to death of the animal. Within the three study areas the small ruminant in the coastal region was affected severely and the death toll rose to 95. The lowest mortality of goat due to PPR was registered at 9 in haor area and the death toll rose to 44 in plain area during the study period.

It is also evident that in case of poultry, New Castle Disease was identified as the most fatal disease that caused to huge losses of flocks of the respondents household in the study areas. It reveals that highest number of mortality in the poultry birds rose to 1626 for ND alone for all the regions. Within the three study areas the mortality of birds was observed highest in the plain region due to ND (386) and that was lowest in the haor region (302). There were other diseases that caused to death of birds such as FP, FT and DP. Considering all the areas the mortality of poultry birds rose to 546 for DP, 449 for FT followed by 258 for FP.

Table 31. Mortality and morbidity of livestock and poultry in the study areas

Diseases	Region	No. of affected animal due to diseases	No. of affected animal that was sold	No. of affected animal that was consumed	No. of deceased animal
FMD	Plain	8	0	1	2
	Haor	24	11	1	4
	Coastal	6	2	0	1
	All	38	13	2	7
BQ	Plain	17	4	0	6
	Haor	57	27	0	25
	Coastal	20	1	0	4
	All	94	32	0	35
Anthrax	Plain	25	9	0	13
	Haor	16	8	0	8
	Coastal	17	0	0	7
	All	58	17	0	28
HS	Plain	12	2	1	2
	Haor	10	3	0	4
	Coastal	18	0	0	9
	All	40	5	1	15
PPR	Plain	65	8	2	44
	Haor	13	3	0	9
	Coastal	106	0	0	95
	All	184	11	2	148
ND	Plain	582	11	32	386
	Haor	632	53	42	302
	Coastal	476	20	18	356
	All	1690	84	92	1044
FP	Plain	43	0	8	35
	Haor	139	35	0	98
	Coastal	151	10	0	125
	All	333	45	8	258
FT	Plain	201	2	4	146
	Haor	286	5	6	240
	Coastal	80	0	4	63
	All	567	7	14	449
DP	Plain	47	1	2	41
	Haor	362	6	2	345
	Coastal	196	15	0	160
	All	605	22	4	546

Source: Field Survey, 2015

4.6.17 Economic losses of the respondent household due to mortality

Different TAD and endemic diseases prevailed in the study areas caused heavy economic losses to the respondent farmer. It is evident that due to prevalence of disease infestation the rural poor respondent household in the study areas had to incur economic loss. In the haor area the respondent had to incur a loss of animal worth Tk. 10980.74 annually. In the

plain region it was worth of Tk. 10155.41 and that was Tk. 3738.40 in coastal region (Table 32).

Table 32. Economic losses of the respondent household due to mortality

Regions	Mortality in the animal			Economic losses (in Tk.)
	Cattle (No)	Goat (No)	Poultry (No)	
Plain	23	44	1245	10155.41
Haor	41	9	1185	10980.74
Coastal	21	95	1349	3738.40

4.7 Determinants of Participation in Livestock Vaccination Program

4.7.1 Determinants of participation in livestock vaccination program for all regions

To investigate the determinants of participation in livestock vaccination program, binary logistic regression analysis was adopted. Logistic regression analysis is used when the dependent variable is dummy. With respect to the suitability of the logit model compared to the LPM is not a very attractive model because it assumes that Yi increases linearly with Xi that is the marginal or incremental effect Xi remains constant throughout. In reality in many situations Yi does not increase linearly with Xi. In consideration of empirical data the marginal or incremental effect of X_i do not remain constant throughout. Thus the logit model suits to the empirical situation better than the LPM. In this study, "Binary logistic model' was used applying binary dependent variable i.e., value 1 is given to those household who has vaccinated their animal and otherwise zero. The independent variables are- age of the respondent, education, family size, farm size, number of cattle in the household, distance from respondent house to ULO office. It is assumed that age, education, farm size and number of cattle in the household might have positive association to provide vaccine to the animal. Similarly, it is hypothesized that distance from ULO office to the household and large family size might negatively influence in participation of vaccination program. It is apparent from the value of co-efficient that most of the predicted association was justified except education. So, it can be concluded that participation of vaccination is not influenced by education. It is interesting to note that the households those had more cattle they were likely to participate more in vaccination than that of fewer cattle holding households which was statistically significant at 1% level of significance. On the other hand, the households those were far away from ULO office were likely to participate less in the vaccination program than that of nearby households which was found statistically significant at less than one percent level (Table 33).

Table 33. Determinants of participation in vaccination program for all regions

Independent variables	Coefficients	Standard error	p-value
Age of the respondents	.006	.008	.461
Education of the respondent	-.016	.025	.519
Family size	-.125**	.064	.051
Farm size	.001	.002	.535
Number of cattle	.326***	.071	.000
Distance from ULO	-.116***	.033	.000
Constant	.339	.503	.500

***,** and * stand for significant at 1%, 5% and 10% level of significance

4.7.2 Determinants of participation in livestock vaccination program for plain region

Likewise all regions together, binary logistic model was adopted for plain region considering same variables. The households who had more cattle were likely to participate more in vaccination program than that of fewer cattle holding households and found statistically significant at less than one percent level. On the other hand, households who stayed far away from ULO office participated less in the vaccination program than that of nearby households which was found statistically significant at less than one percent level (Table 34).

Table 34. Determinants of participation in vaccination program for plain region

Independent variables	Coefficients	Standard error	p-value
Age of the respondents	-.016	.015	.279
Education of the respondent	-.112**	.057	.049
Family size	-.245*	.135	.069
Farm size	.003	.005	.570
Number of cattle	.753***	.192	.000
Distance from ULO	-.374***	.088	.000
Constant	2.465**	.990	.013

***,** and * stand for significant at 1%, 5% and 10% level

4.7.3 Determinants of participation in livestock vaccination program for haor regions

Similarly, binary logistic model was fitted for Haor region employing same variables. The households who had more cattle were likely to participate more in vaccination program than that of fewer cattle holding households and found statistically significant at less than one percent level. On the other hand, the households those stayed far away from ULO office participated less in the vaccination program than that of nearby households which was found statistically significant at less than five percent level (Table 35).

Table 35. Binary Logistic regression findings- for Cattle in the haor region

Independent variables	Coefficients (β_i)	Standard error	p-value
Age of the respondents	.017	.016	.307
Education of the respondent	.094*	.054	.082
Family size	-.152	.113	.176
Farm size	.001	.004	.696
Number of cattle	.334***	.119	.005
Distance from ULO	.142**	.069	.039
Constant	-1.880*	1.026	.067

***,** and * stand for significant at 1%, 5% and 10% level of significance.

4.7.4 Determinants of participation in livestock vaccination program for all regions

Similarly, binary logistic model was fitted for coastal region employing the same variables. The households who had more cattle were likely to participate more in vaccination program than that of fewer cattle holding households and found statistically significant at less than one percent level. On the other hand, those households stayed far away from ULO office participated less in the vaccination program than that of nearby households which was found statistically significant at less than five percent level (Table 36).

Table 36. Binary Logistic regression findings- for Cattle in the coastal region

Independent variables	Coefficients	Standard error	p-value
Age of the respondents	.018	.018	.329
Education of the respondent	.027	.053	.614
Family size	-.208	.147	.157
Farm size	-.011**	.005	.031
Number of cattle	.194	.146	.186
Distance from ULO	-.638***	.120	.000
Constant	3.327	1.271	.009

***,** and * stand for significant at 1%, 5% and 10% level .

The results of the logistic regression expressed that the vaccination services as much as the vaccination services need to the rural reach the farms. Availability of the vaccination services i.e., vaccination services should be available to the farms for better publicity.

4.8 Effectiveness of the Vaccination

To measure the effectiveness of vaccination, an attempt was made to find out the cost of treatment for animal of both vaccinated and unvaccinated households in the study areas. It

is evident (from the Table 37) that vaccinated household spent less amount of money as treatment cost for their animal than the treatment cost incurred by the unvaccinated household. The average cost of treatment incurred by the vaccinated household was Tk. 333.70 and that was Tk. 887.86 for unvaccinated households which was 2.6 times higher than the vaccinated households. There exists big difference between the treatment cost of vaccinated and unvaccinated household. The difference between the mean cost of treatment for vaccinated and unvaccinated households was highly significant at less than 1% level (Table 37). The vaccinated household had to incur less cost for treatment of the animal than that of the unvaccinated household which mplies that the effectiveness of the vaccination.

Table 37. Treatment cost for vaccinated and unvaccinated HHs

Regions	Vaccinate HH	Unvaccinated
Plain	276.08	953.17
Haor	359.34	844.81
Coastal	365.68	865.6
All average	333.70	887.86

It reveals that we have enough evidence to conclude that the treatment cost of animal of vaccinated HHs and that of unvaccinated HHs are not equal and cost of treatment of vaccinated HHs is less than that of unvaccinated HHs at 1% level of significance (Table 38).

Table 38. Paired "t" test for vaccinated and unvaccinated HH with Treatment costs

Hypothesis	Two independent sample t test		Remarks
	t-value	p-value	
Ho: Treatment cost of animal of vaccinated and unvaccinated HHs are equal	6.86	0.000	Significant difference exists between the treatment cost of animal of vaccinated and unvaccinated HHs. Null hypothesis may be rejected

4.9 Mortality of Animal of Vaccinated and Unvaccinated Households

There is a relationship with the vaccination and mortality of animal. The average mortality of animal was 8.45 for vaccinated HHs and it was 9.48 for unvaccinated HHs. There exists small difference between the mortality of animal of unvaccinated and unvaccinated HHs. With this evidence we can't make any comments on the mortality of vaccinated and unvaccinated HHs without statistical test (Table 39).

Table 39. Paired t test for vaccinated and unvaccinated HH with deceased animal

Particulars	Mean	N	Standard. Deviation	Standard. Error Mean
Deceased animal unvaccinated HHs	9.4815	216	11.55	.78616
Deceased animal of vaccinated HHs	8.4491	216	9.44	.64214

The table 40 shows that there exists no significant difference between the mortality of animal of vaccinated and unvaccinated HHs which is supported by insignificant t value (1.011). So, the hypothesis may be accepted.

Table 40. Paired "t" test for vaccinated and unvaccinated HHs with deceased

Hypothesis	Two independent sample t test		Remarks
	t-value	p-value	
H_o: There is no relationship between the mortality of animal in the vaccinated and unvaccinated households	1.011	0.313	Insignificant difference exists between the mortality of animal in the vaccinated and unvaccinated HHs. Null hypothesis may be accepted.

4.10 Reasons for Unvaccination

Farmers were asked about the reasons for unvaccinated their animal. The reasons were ranked (Table 41) on the basis of the opinion expressed by the respondent in the study areas. It is evident that 271 respondents replied that they did not vaccinate their animal since Vet Surgeon/VFA did not come on regular basis which ranks first. Unaware about vaccination was another reason for not vaccinated their animal as reported by the respondent which ranks second. Weak publicity for vaccination was one of the main reasons for unvaccinated the animal as reported by the respondent which ranks third. Unavailability of suitable vaccine was ranked fourth based on the responses by the farmers. Others reasons responsible for unvaccinated the animal are also shown in the same table.

Table 41. Reasons for unvaccination

Reasons	Plain	Haor	Coastal	Total	Rank
Vet Sergeon/VFA does not come on regular basis	86 (31.7)	85 (31.4)	100 (36.9)	271 (100)	1
Not aware	72 (27.1)	103 (38.7)	91 (34.2)	260 (100)	2
Weak Publicity for vaccination	78 (37.5)	67 (32.2)	63 (30.3)	208 (100)	3
Unavailability of suitable vaccine	63 (34.1)	61 (33)	61 (33)	185 (100)	4
Distance	40 (34.5)	42 (36.2)	34 (29.3)	116 (100)	5
Traditional treatment is enough	23 (22.8)	40 (49.6)	38 (37.6)	101 (100)	6
Vaccination cost is very high	17% (15)	40.9% (36)	42% (37)	88 (100)	7
Does not require	36 (65.5)	13 (23.6)	6 (10.9)	55 (100)	8
It is not common	6 (11.1)	6 (11.1)	42 (77.8)	54 (100)	9
If affected then slaughter/sale	6 (19.4)	19 (61.3)	6 (19.4)	31 (100)	10
Vaccine does not work	4 (18.2)	5 (22.7)	13 (59.1)	22 (100)	11
Difficult to administer	0 (0)	7 (58.3)	5 (41.7)	12 (100)	12

Field Survey, 2015, Parenthesis indicate the percentages

4.11 Supply and Cold chain of Vaccination for Livestock and Poultry

The following figure describes the distribution channels of vaccine for livestock and poultry in Bangladesh.

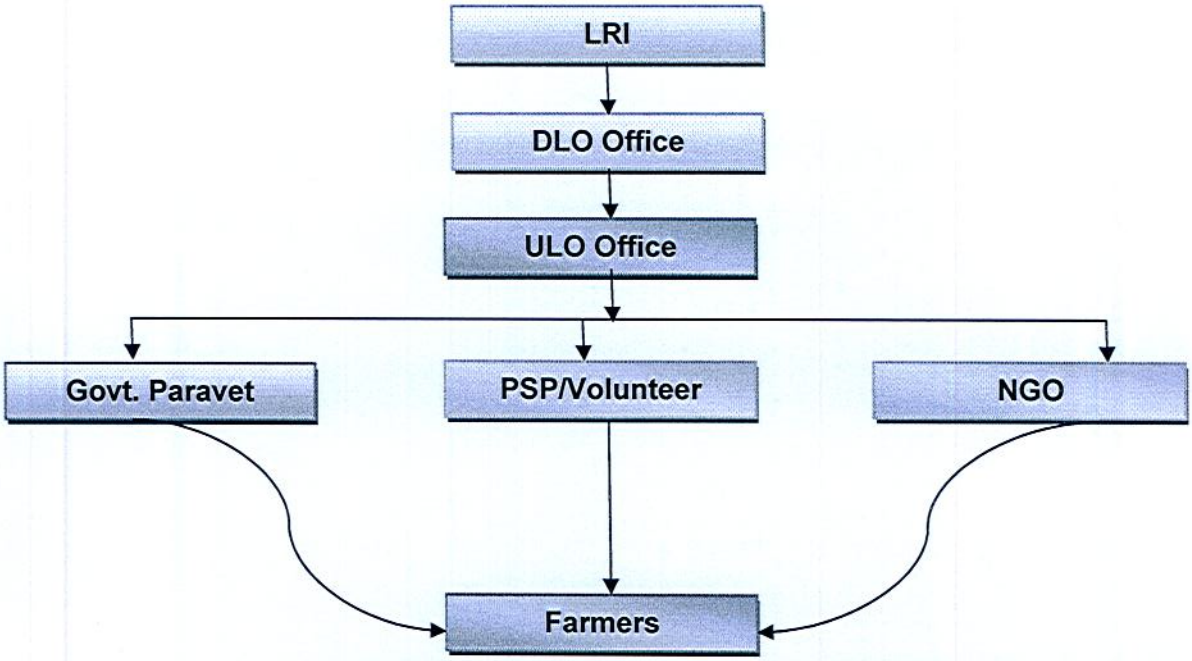

Figure 24: Supply chain of vaccination for livestock and poultry

The key player in the government vaccine supply chain is the LRI, DLS Bangladesh. The Department of Livestock Services (DLS) is the modal agency responsible for all the livestock related activities in the country. The vaccines are manufactured by the state owned LRIs in Comilla and Dhaka. The LRI in Comilla produced vaccine that to be distributed through LRI, Mohakhali Dhaka or through their own channel. From the LRI's, vaccines are delivered to the District Livestock Office by freezing van. The District Livestock Office receives the vaccines as per their demand and stored those in the fridge at their office. The respective ULO/representative collects the vaccine as per their demand from the DLO office. Then the vaccines are kept in ice filled boxes to ensure cold chain management during transport. The Upazila Livestock Office keeps vaccine in their fridge. ULO then gives it to the stakeholders such as NGO, VFA and volunteers to distribute the vaccines to the ultimate user through vaccination program or other ways.

Cold chain management: LRI has two freezing vans (one in Comilla and one in Dhaka) to dispatch the vaccine from the laboratories to the designated district with proper maintenance of cold chain. In the study areas the ULO reported to have collected the vaccines from the district livestock office as required because there was a problem of managing cold chain in village or upazilla level. The cold chain is maintained at village level with the help of thermoflask. They are concern about the management of the cold chain at the upazilla and

village level when the vaccination programs are held. Maintaining of cold chain is very difficult in rural areas. Up to the district level the cold chain was managed but beyond that it was difficult to maintain temperature because of the lack of the refrigerator or sporadic electricity supply.

4.12 Reasons for Failure of vaccine as Reported by Respondents

Farmers were asked about the causes of failure of vaccination. Reasons for failure of vaccination were identified by the respondent depicted in the following table. It reveals that 34.10%, 36.40% and 29.50% respondents respectively in the plain, haor and coastal region reported that, not following the time of vaccination was one of the causes for vaccination failure. The failure of vaccine occurred due to not considering the age of the animal. Using drug before vaccination was identified one of the causes of vaccination failure. Malnutrition of animal was identified as a cause of vaccination failure reported by 100% respondent in the haor region.

Table 42. Reasons for failure of vaccine as reported by respondents

Reasons	Regions			Total
	Plain	Haor	Coastal	
Did not follow the time of vaccination	44 (34.1)	47 (36.4)	38 (29.5)	129 (100)
Did not consider the age of animal	5 (20.8)	15 (62.5)	4 (16.7)	24 (100)
Used drug before vaccination	17 (51.5)	16 (48.5)	0 (0)	33 (100)
Malnutrition of animal	0 (0)	6 (100)	0 (0)	6 (100)
Others	2 (66.7)	1 (33.3)	0 (0)	3 (100)

Field Survey, 2015, figures in the parenthesis indicate percentage

4.13 Bio-safety and Bio-security

The respondents were asked about bio safety and bio security measures taken by them. Their concept regarding bio-security and bio-safety measure was very poor. They did not know about this. But some of the questions they replied. More than 87% of the respondent in the plain region, 72% in the haor and 86% in the coastal region replied that regular cleaning of animal shed is maintained, about one third of the respondent across the region told that the livestock and poultry population are densely in their shed. Feeding and watering is done on a regular manner replied by 79% of the respondent in the plain region, 85% in the haor and 73% in the coastal region. It revealed that about 60% of the respondent in the study areas do not have separate shed for their animal. About 50% respondent in both haor and

plain region and 39% in coastal region told that their animal shed is protected from maranding animal. The important components of bio-safety and bio-security such as proper quarantine, scientifically disposal of dead animal, scientifically design of shed and restriction of entrance of human to animal shed are no more maintained by the respondent (Table 43).

Table 43. Farm bio-safety and bio-security measures/management

Measures	Plain	Haor	Coastal
Regular sterilization or disinfection within the farms followed	1	4	0
Human entrance in the animal shed is restricted	4	3	13
Farm shed has been designed scientifically	1	0	1
Disposal of dead livestock or poultry scientifically	37	28	36
Proper quarantine method is followed before taking the animal and birds in the farm	3	3	6
Animal shed is protected from maranding animal	77	62	78
Do you have different shed for different animal	59	58	65
Feeding and watering is done on regular manner	119	127	110
Stress management (Over heating and cooling) done properly	7	23	28
The livestock and poultry population are densely in your shed	56	49	53
Regular cleaning of shed is maintained	131	108	129

4.14 Constraints Faced by the Farmers Related to Vaccination Program

The following figure explains the major constraints faced by the small holder livestock and poultry keepers across the study areas. It is evident (from Figure 25) that unavailability of suitable vaccine was identified as one of the important constraints by 279 respondents which ranked first. Many of the respondents expressed their opinion in such a way that veterinary technicians did not come to the village for vaccination. Weak publicity of vaccination was one of the important constraints reported by the respondents because most of the time they were not informed of the vaccination program. Vaccination is expensive for the farmers that were reported by 144 respondents. Unavailability of vaccine, quality of vaccine and distance had been recognized as constraints to vaccination by the respondents in the study areas.

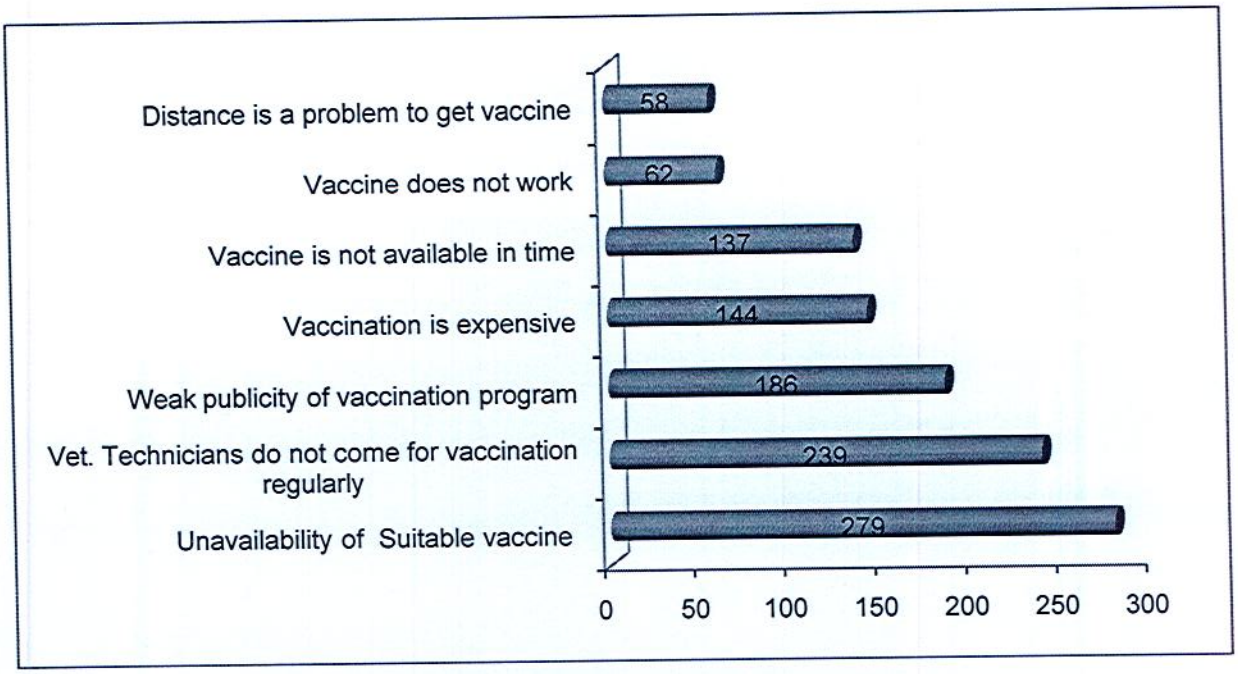

Figure 25. Constraints related to vaccination program

4.15 Proposed Solutions by the Farmers

Respondents were asked to put forward solutions to the problems what they think. Farmers wanted suitable vaccine that to be provided by the DLS. They suggested that vaccine should be supplied to the farmers at free of cost. The respondent want regular visit of doctor to livestock and poultry keepers household what they did not get. Timely delivery of vaccines might be a solution reported by the respondents. Number of Veterinary Surgeon and technician should be increased in the field level what the respondent suggested towards solving the problem. Publicity of vaccination program was very weak which was reported by the respondent and that was agreed by the ULO and government paravet in the study areas. They respondent want a wide publicity for vaccination program that to be held. The respondent opined that vaccination schedule must be maintained that is currently no more maintained in the study areas. The respondent told one thing that due to distance they did not participate in the vaccination program if held in a distance place, so they proposed that vaccination program for livestock and poultry should be organized in every village. Due to many occurrences the respondents have sometimes no trust on the effectiveness on the vaccine. They emphasized the quality of the vaccine to be provided by the government.

Table 44. Solutions to problems proposed by the respondents

Constraints	Plain	Haor	Coastal
Suitable vaccine should be provided	69	70	41
Vaccination should be provided free of cost	20	37	26
Vaccination price should be decreased	29	22	32
Doctor should visit on regular basis	30	93	18
Vaccine should be available on time	32	70	16
Number of vet. Surgeon should be increased	30	6	33
Publicity of vaccination program should be increased	37	50	23
Vaccination schedule should be maintained	0	4	0
Poultry vaccine should be provided by the government	8	6	3
Frequency of vaccination program should be increased in a year	12	25	9
Vaccination campaigning should be taken place in every village	27	59	16
Quality of vaccine should be improved	21	57	43

Source: Field Survey, 2015

4.16 SWOT Analysis

The following table presents the SWOT analysis which describes clearly the strength, weakness, opportunities and threat of administering the vaccination program. It can be summarized from SWOT analysis that there is an ample scope to increase the coverage of vaccination for livestock animal of our country although having many constraints. The following table shows that there are some weaknesses in conducting the vaccination program such as lack of front line staff, lack of skilled manpower and so on. There identified some threat which may affect the vaccination program.

Table 45. SWOT analysis for livestock and poultry vaccination

Strength :	**Weakness:**
• DLS has established set-up at the upazilla level • Strong rural network of NGOs • Agricultural universities that produce quality Vet. Surgeon • Improved rural roads network • Well established vaccination production unit • **National** Livestock Development Policy • IT Facilities and Network	• Lack of front line staff • Lack of trained and skilled manpower • Lack of coordination among stakeholders • Lack of cold chain management systems • Irregular supply of electricity at Upazilla and grass root level • No quarantine station • Lack of adequate logistic support
Opportunities	**Threats:**
• Vet. Graduates can be utilized • Youth force can be employed through providing training related to vaccination • Expansion of backyard poultry rearing • Enhance food and nutrition security at national and local level • Reducing poverty at rural level • Employment opportunity • Scope for earning foreign exchange	• Certain outbreaks of unknown diseases • Breakdown of supply chain of vaccines • Lack of suitable vaccines • Lack of sufficient budget allocation for LRI, DLS • Vaccination failure • Natural Calamities

FGD AND KII FINDINGS

Besides conducting household survey for generating quantitative findings, Focus Group Discussion (FGD) and Key Informant Interview (KII) were carried to have some qualitative findings. The qualitative findings are presented below-

5.1 Key Findings of FGDs

A total seven FGDs were carried-out in three different villages applying mix methods. The participants were the poor livestock and poultry keepers. Both male and female were participated in the events. It was lasted for about one hour to conduct each session. In fact, they warmly welcomed the facilitator and his team. The objectives of the study were explained to them by the facilitator before going to start the discussion. At the initial stage of discussion, they were little bit shy but later on they participated in a lively manner. At first, facilitator collected some basic information about the village including number of farm family, distance, and livestock & poultry population. Afterwards, the discussion was focused on the specific issues related to vaccination for livestock and poultry. There was difference of opinion among the participants but finally they come to a consensus that was noted as well as recorded using audio device. Regarding the importance of vaccination program, they reported that vaccine could protect animal from diseases and keep them healthy. However, many of them informed that they were unknown about the vaccination program due to weak publicity by the concerned authority. Accordingly, they suggested organizing more vaccination programs as well as more publicity from the relevant authorities.

Livestock vaccination was executed by two different sources i.e. Department of Livestock Service (DLS) and Private Service Provider (PSP). In most of the cases, DLS provides vaccination services in the camp or open place of a village. In contrast, PSP provide services at home upon calling by the farmers. Generally, farmers prefer to have vaccination services from DLS as it is cost effective. It is noted that among three villages (conducted FGDs), none of the vaccination program was held in Purbavoran village while one vaccination program was held in other two villages. Encouragingly, participation in vaccination program was reported around 80 per cent, if vaccination program held at open place (nearby the villages). However, they emphasized that frequency of vaccination program should be increased in a year (at least two or three programs). In addition, there should have intensive publicity before performing the vaccination program so that more farmers can avail the benefit of vaccine.

During the discussion, participants' reported that prevalence of diseases was found to be higher for un-vaccinated animal than that of vaccinated animal. Mortality due to due to disease was reported about 80 per cent for poultry while it was 5 to 10 per cent for large ruminants. They can mention names of the several diseases in their local languages and they know the symptom of the diseases. However, they sometimes confused about vaccine and medicine (treatment of animal). Vaccine is used to prevent animal from diseases that was unknown to many of FGD participants. They thought that vaccine was given while animal were affected by diseases. Hence, there should have extensive awareness program from the relevant authority.

With respect to the access to vaccination services, it was reported that they did not receive vaccination services on time and the vaccination program was organized in an irregular manner. Participants' also mentioned that they were not satisfied with the existing vaccination services in general. They opined that in order to improve the quality of services more support from government is needed, cold chain management of vaccine should be maintained and they emphasized on developing friendly relationship between farmers and the DLS personnel without bias to a particular farm family (for details please see appendix 1).

5.2 Summary of KII Findings

Three types of KII were conducted among different types of key personnel at village level, at upazila level and at national level. Key Informant Interviews (KIIs) were carried out among private service provider/paravate/technician, government VFA/technician, veterinary drug seller, Upazilla Llivestock Officers in a convenient atmosphere. Based on the successful conduction of KIIs, key findings are presented below-

5.2.1 KII Summary report of the upazilla livestock officer

It was a great pleasure for the researcher to carry out KIIs with Upazilla Livestock Officers. Before conducting the KII, the researcher contacted over telephone and seeks appointment according to their convenient schedule. In fact, the researcher found them very friendly and cooperative. They provided the overall information of their respective Upazillas. Afterwards, in-depth discussion was held in a convenient atmosphere. They frankly shared the existing situation at upazilla level particularly relevant to vaccination program. They reported that existing manpower at upazilla level is insufficient for running the vaccination program successfully. They were keen to recruit technical staff that cannot be performed without government approval. It was mentioned that although they maintained the temperature in storing vaccine in refrigerator but they were worried whether cold chain properly maintained during transportation from Dhaka to the upazilla level. They also faced several constraints in

implementation of vaccination program. These were- i). all vaccines were not available when needed; ii) no special fund for campaign of the vaccination program; iii) travelling allowance is very minimum and not remunerative, no vehicle facilities provided to serve; iv) no logistic support for the officer. Finally, they proposed some suggestions including government should take proper step to increase the level of vaccine, vaccine storage system/facilities should be developed at union level; vaccine should be given at free of cost, more manpower should be employed, vehicle facilities should be provided, special funds should be allocated for campaigning of vaccination program, there should have billboard in public places, and separate vaccination program should be organized for particular animal or diseases for successful implementation of vaccination program (Please see Table 46 and 47; Appendix 2 for details).

Table 46. Basic statistics of the study areas

Particulars	Gangachara	Mohanganj	Shyamnagar
No. of village	139	163	219
No. of Union	09	07	12
No. of farm family	45659	24400	59498
No. of VFA	03	01	03

Table 47. Livestock and poultry population in the study areas

Animal	Gangachara	Mohanganj	Shyamnagar
Cattle (no)	174020	71890	62465
Buffalo (no)	26	-	278
Goat (no)	89520	29666	57659
Sheep(no)	7800	-	2611
Poultry (no)	653590	314198	362352
Duck (no)	3435	445674	32740

5.2.2 KII Summary report of VFA /Technician

Three KIIs were conducted with three VFA (government paravet) in three upazillas of three regions. The summary outcomes of the KIIs are presented in appendix 3. It was found that VFA received 3-4 years diploma certificate from Veterinary training Institute. They got some professional training from government organization to perform their duties effectively. Having

such technical know-how, they were well known about the doses of vaccine for different species of animal. They mostly provide services during vaccination campaign sometimes at household level too. They mostly used locally produced vaccine. They also provide advocacy services to the farm families. All of them had motorbike as well as vaccine flask to carry out the vaccine. They (VFA) were experienced as they have been in the service for long time (more than 20 years). During their service tenure they provided substantial number of vaccine to the animal in their respective villages. They mostly follow the prescription of ULO. The vaccination charge slightly varies from, animal to animal as well as type of diseases. They reported several constraints such as unavailability of vaccine on time, transportation of vaccine (cold chain management), misunderstanding between service providers and the farmers regarding vaccine price etc. They also gave some suggestions to overcome the existing barrier include ensure the availability of vaccine, supply of suitable ice box, arranging regular vaccination program, provide vehicle for transporting vaccine, organizing farmers' awareness program and if possible provide vaccine with free of cost.

5.2.3 KII summary report of Private Paravet/ Technician

Three different KIIs were conducted with private paravet and technician in three different locations. The summary outcomes of the KIIs are presented in appendix 4. The KII participants were young and educated from formal institution. They also received some professional training from youth development center to perform their duties. Besides this they also received some professional training on specific vaccination technique/method. By attending these training programs, they have been able to know about the doses of vaccine for different species of animal. They mostly provide services at farm household upon calling by the farmers. They used locally produced vaccine. They also provide advocacy services to the farm families. All of them had motorbike as well as vaccine flask to carry the vaccine. The service lengths were varies between 2 to 10 years among them. During their service tenure they provided good number of vaccine to the animal in different villages of the upazillas. They mostly follow the prescription of veterinary surgeon/ULO. The vaccination charge slightly varies from, animal to animal as well as type of diseases. They reported couple of constraints such as availability of vaccine on time, transportation of vaccine (cold chain management), misunderstanding between service providers and the farmers etc. They put forward some suggestions to overcome the existing barrier include ensure the availability of vaccine, supply of suitable ice box, provide vehicle for transporting vaccine, organizing farmers' awareness training and if possible provide vaccine with free of cost.

5.3 Summary Findings for Drug Sellers

Six KIIs were conducted with animal drug sellers consisting two from each upazilla. Drug sellers were very young aged between 25-34 years old. Some of them were graduated and others completed SSC level of education. However, they were experienced in business since they have been doing drug business for a long. Some of them received training on drug chemistry for human drug. Usually they sell both animal and human drug but some of them sell solely animal drug. They kept both domestic and foreign drug but domestic vaccine dominated due to high demanded by the farmers. They thought that existing number of drug shops were good enough to serve the farm family. However, they complained about the availability of vaccine on time and lack of training for the practitioners. Thus, they recommended to the authority to ensure supply of required doses of vaccine and provide training to both government and private veterinary technician.

From the above discussion, it may be concluded that there is an immense potential of livestock sub-sector that can only be achieved through implementation of regular vaccination program with the participation of different stakeholders.

5.4 Constraints Revealed through FGDs and KIIs

The identified constraints are summarized as follows

Government office at upazila level

- Lack of sufficient no. of technical field level staff
- Supply of vaccines is inadequate
- Severely suffered by logistic support
- Cold chain management is not enough
- Weak management of publicity

Constrains at national level

- Capacity of vaccine production is far below the required level
- Unavailability of automated sealing machine
- Cool chain maintaining vehicle is not adequate to supply vaccines across the country
- Lack of specialized training of the scientist working at LRI
- Scientist engaged in vaccine production can't work for long time due to transferable job
- Lack of modern machineries and infrastructural facilities at LRIs

- Lack of supporting staffs for operating sophisticated machine at vaccine production unit of LRI like bio medical engineer
- Lack of continuous supply of raw materials for the bulk production at LRI
- Lack of policy emphasizing Vaccination issue

5.5 Way Forward

An important finding from the present study is that all the major players are keenly interested in enhancing coverage for the livestock and backyard poultry and in future will be interested in involving in the related activities within the constraints of their organizational structure. The respondent households are eager to save their animal and ready to pay for the same. The government sector also recognizes the importance of this activity. However, the issue of limited vaccine production, limited manpower for administering the vaccines and inadequate cold chain facilities cannot be overcome overnight. The donor agencies should collaborate with NGOs to support the livestock and backyard poultry sector. The potential private sector players recognize this area as a potential business opportunity and are also interested in vaccination and disease control in the livestock and backyard poultry. A strong collaboration and coordination between various institutions need to be involved to enhance coverage of vaccination for livestock and poultry of rural poor households in our country. The study suggests that a combined effort of all concerned organization is required to overcome the challenges. The next step will be to bring together all the stakeholders to outline a strategy for enhancing coverage of vaccine for the livestock and backyard poultry specifying the role of the key players. A well- planned implementation strategy should be adopted that would obviously help go a long way in meeting the aim of bringing a large share of livestock and poultry birds under vaccination which obviously would facilitate increase the population of the livestock and poultry in our country.

CONCLUSION AND RECOMMENDATION

Poor livestock and poultry keepers of Bangladesh are severely suffered from required vaccination services leading to heavy economic losses. According to the survey findings, the respondent households were willing to pay for vaccination and treatment to save their livestock and poultry, but due to unavailability of vaccines, lack of required number of veterinarian personnel, lack of knowledge on vaccination schedule they could not receive the reqired services which resulted in lower productivity in egg, meat and milk. Treatment cost incurred by the respondents of vaccinated households was lower than that of unvaccinated household implying the positive effect of vaccination. There is a negative relationship between vaccination and mortality of animal but it was not proved statistically significant the number of vaccination program was arranged by the government department was limited to one in the study areas as reported by the respondents which compelled the farmers to get vaccination services from private service provider at higher cost. The service charge of PSP is several times higher than that of government service provider. Farm households had to incur loss of several thousand Tk. due to infectious diseases. Results of Logistic Regression showed that the participation in the vaccination by the farm households are influenced by family size, farm size, herd size and distance of ULO office. Key player in the public sector supply chain is the LRI of DLS, Bangladesh

Private Service Provider was not well trained on technical aspect of livestock and poultry vaccination and primary health care. Limited number of front line staff in DLS at upazila level leads to limiting factor of the vaccination program which was strongly supported by the KII findings. Lack of required number of VFA at the grass root level, farmers had to depend on the services of private service providers. Majority of the livestock was found vaccinated by DLS while poultry vaccination was dominated by the private service providers. Vaccination coverage for poultry keepers was all most nil, but coverage of vaccination for cattle was five times higher than that for small ruminant in the study areas Due to inadequate vaccination coverage rural poor livestock keepers are placed in vulnerable situation. ND is identified as the most fatal disease wiping out sometimes entire flocks and the high mortality was associated with it, there is a dire need to support the backyard poultry sector by enhancing access to vaccines and exploring service delivery model that are suitable in rural areas of Bangladesh.

Recommendations

- Diagnostic facilities for existing, emerging, re-emerging and trans-boundary diseases of livestock and poultry should be expanded up to the union level

- Rural farmers (male and female) should bring under regular elementary and advance training
- Skilled man power and logistic supports of DLS should be increased (in relation to good health management and production practices of rural poultry and livestock)
- Advance and refreshing training programs should be designed for the veterinary personnel
- Govt. of Bangladesh should allocate more funds for strengthening vaccine production capacity LRI, DLS to fulfill the total demand for poultry and livestock vaccines in the country
- Innovative research and extension linkage among DLS, BLRI and other relevant dept. of the faculties of BAU and other agricultural universities must be strengthen
- To ensure effectiveness of the livestock and poultry vaccines (live or inactivated) cold chain system must be introduced and maintained strictly throughout vaccination program
- Govt. should take policy to create awareness of the small and medium scale farmers about vaccination program through mass media (Radio, Television and Newspaper).
- Policy support should be provided to encourage Private sector by giving them more incentives to come forward to produce highly effective and less expensive livestock and poultry vaccines and their quality control must be monitored strictly
- More fund should be allocated for strengthening the capacity of BLRI, relevant department of Agricultural Universities towards vaccine development research
- Govt. should take urgent decision right this moment to stop gradually importing any kinds of (live monovalent and polyvalent vaccines) livestock and poultry vaccines from any countries of the world in future
- To make the vaccination program success, more veterinarians/ paravet should be produced and employed at village level
- As government budget and man power is limited, vaccination program could be arranged successfully under the public private partnership at the village level. Concerned authority could take into consideration the example of the vaccination program at village level under PPP implemented by Helvetas Swiss Intercooperation with the financial assistance from Swisscontact (under the project Agribusiness Trade Competitiveness- Project).
- Govt. should take appropriate measures to enhance the coverage of vaccination for livestock and poultry in the coastal and haor regions of the country.
- Special emphasize should be given to arrange regular vaccination program for backyard poultry throughout the country.

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APPENDICES

Appendix 1. Summary findings of FGDs

Name of union	Ramjannagar (Shyamnagar)	Shoair (Mohanganj)	Kolkanda (Gangachara)
Name of village	Taranipur	Purba voran	Uttar kolkanda
Number of farm family in the village	120	120	450-500
Distance			
Upazila livestock office (km.)	14	13	6
Pharmacy	1	13	-
District HQ (km.)	60	30	18
Average Number of Animal			
Cattle	2	3	2
Buffalo	0	0	0
Goat	2	1	4
Sheep	0.5	0	0
Chicken	10	10	5
Duck	6	5	0
Importance of vaccine	To keep the animal healthy and prevent from diseases	To protect animal from diseases	Its prevent from diseases
Vaccination of animal	We care about our animal and give vaccine but sometime couldn't due to less publicity	No vaccination camp held in this village and we couldn't join nearby villages due to less publicity	We vaccinated out cattle but not goat and poultry
Maximum vaccination services availed	DLS share comparatively higher than that of PSP. However, PSP provide services at home upon calling	Maximum share came from DLS and they provide service at center/camp	DLS contribute more compared to PSP. However, PSP provide services at home upon calling
Number of vaccination program held	One program was held by DLS	None	One program was held
Participation in vaccination program (%)	80%	0	70-80%
Publicity of vaccination program	weak	very weak	Very weak- miking also absent
Cost of vaccination	Tk. 20/ cattle	-	Tk 10/ cattle
Participation in vaccination program	one	none	one
Major disease that affect the animal in your locality	Fowl pox ND	Ranikhet	Ranikhet, and chun paikhana
Morality of the poultry due to disease	60%	60%	90%
Major disease that affect the animal in your locality	Anthrax FMD	FMD PPR	FMD PPR
Morality of the livestock animal due to disease	5%	5%	10%
Economic loss due to disease	80%	80%	70%

attack			
Vaccination done by	Private technician	Private technician	Govt. paravet
Awareness about the vaccination	40%	40%	They aware but the supply was limited
Benefits of vaccinating animal	It mainly protect the animal from disease and reduce the economic loss	Prevent from disease and reduce the cost of treatment	To protect the animal from disease
Opinion about government services	Not enough or satisfied	No	Not satisfied
Constraints to access the vaccination services	We don't know about the disease	Not available, and have not enough knowledge about the vaccine	Govt services was not held on a regular basis and the publicity was very weak and don't know where the vaccine provided.
Recommendations for improvement	Want to get the service timely Timely availability of vaccines To get treatment from government	At least 2 vaccination camp in a year Ensure the supply of vaccine	Regular basis vaccine program should held Publicity should be strengthened No advocacy was given

Appendix 2 KII Summary Report of Upazila Livestock Officer

Description of Information	ULO Mohangoanj	Gangachara	Shyamnogor
Name	Dr. Shahidul	KBD Md. Saidur Rahman	-
Upazilla	Mohangoanj	Gangachara	-
District	Netrokona	Rangpur	Mohangonj
Livestock population			
Cattle	71890	174000	62527
Buffalo	X	2	110
Goat	29666	85000	51870
Sheep	1098	32000	4726
Chicken	314198	115000	498530
Duck	445674		54425
Pigeon	-	-	-
Why vaccination is important?	To protect animal from diseases and immunization	To prevent the diseases of livestock and poultry	To prevent the diseases of livestock and poultry
How frequently you conduct vaccination program in this area?	4-5 program/month	Every three month	-
What was the target and how many vaccination program were held in your area last year?	No information available	280 campaign	-
How many doses of vaccination you used in the last year in your			-

Upazila supplied by Govt. and others?			
Govt/DLS			-
Livestock (No. of Doses)	18820	42086	-
Poultry (No. of Doses)	106800	398000	-
Sources of vaccine		DLS	-
Demand for vaccines in your area (Upazila)	No information available	2945200	-
Supply of vaccines by DLS in that area	No information available	Livestock-46100 Poultry-440000	-
Supply of vaccines by the private service provider	No information available	Nil	-
Manpower			
Technical staff	09	Nil	Nil
Officer	02	02	2
VFA	01	03	3
Non technical staff	04	01	4
Logistics			
Vehicle			0
Motorbike	01	02	1
Others			
How many staff at least do you need in order to fulfill the target?			
VS	4	-	24 required 2 staff in one union
VFA	14	27 staffs for nine union	
Do you have any plan to fill the gap of manpower to provide vaccination services smoothly?		Decision have been taken by the Ministry	
How the cold chain system is maintained when the vaccine are transported to your Upazila?	Cool box	Cool box	cool box
Do you maintain the cold chain system while you conduct vaccination in the field? If yes how?	Cool box	Cool box	cool box
Do you have the freezing system to keep the vaccine in your lab? Yes or not, If yes , how	Yes, have a refrigerator	Yes, have two refrigerators	Yes, have two refrigerators
How the publicity for vaccination program is done?	Through representation, sometimes using mike of mosque and by hiring mike.	Miking by mosque	
Current supply of vaccine by DLS is enough to meet the demand in your area?	No	No	Yes
What is the percentage coverage by DLS supplied vaccine	60%	33%	100
To increase the level of vaccine production, what steps should be taken by the government?	Allocation should be increased. Manpower and instruments should be increased.	Lab facility should be increased	

Is there any plan to improve the situation from your side? Pl. explain	Suggestions from lower level	Increase man power for ward level	To increase vehicle for staffs
	-	To increase vehicle for staffs	
		Free vaccine	

Appendix 3 KII Summary Report of VFA Govt Paravet/Technician

Description of Information	Gangachara	Mohanjong	Shyamnogor
Name	Shah Md. Shamsuddin	Md. Shahidul Islam	Md. Nojrul Islam
Age	44	45	55
Education	B.Sc	Degree	HSC
Designation	VFA	VFA	VFA
Service Length	20	22	25
Village	-	-	Koikhali
Upazilla	Gangachara	Mohongonj	Shymnagor
Coverage of working area (Union/village)	09,03,110	-	Koikhali, Munshigonj, Burigoalin, Atulia
Farm HHs to cover	15000	12000	10000
Main occupation	VFA	VFA	VFA
Job experience (yrs)	20	22	25
Professional training			
Diploma in Animal Health & Production	Diploma	Diploma	Diploma
Duration	O3 years	4 years	04 years
Training received from	VTI, Mymensingh		VTI, Alamdanga
Year of training	1992 December-1993 December	1992	1991
Duration	02 years		3 months
Training received from	LTI, Gaibandha	September-June 2014	VTI, Alamdanga
Year of training	2013 September-June 2015		2013
How many no. of VFA are working in one Upazila and one Union	03, to cover 09 unions	-	03
How many no. of Private Technician or Volunteers are working in this area?	20 (volunteer+quack) are working 14 volunteers are working	25	8 in this upazila and 1 in koikhali
Who has engaged this volunteer?	DLS	DLS	DLS
Any advocacy service do you provide to the farmers for vaccination?	Yes	Yes	Yes
Go to them when they call you	-	Yes	Yes
Only at the vaccination place	yes	Yes	Yes
Vaccine used by the farmers are made locally (%)	100% Govt	80%	80%
Made in foreign (%)	0	20	20%
How many vaccination programs were held at this union/village in the last year by DLS?	75-80 per year	40 per year	30

Vaccinated Farm Households	5000	7000	5000
Poultry	120000	110000	100000
Doses of vaccine	120000	120000	100000
Livestock	15000	14000	10000
Doses of vaccine	15000	14000	20000
How many farm family and how many animal were vaccinated last year in this village?	To my consideration this information was covered in previous question	-	-
No. of Farm Family	-	--	5000
No. of animal	-	-	110000
-	No data	-	Free
FMD			
PPR	-		
Anthrax			
Poultry			
Who prescribed the vaccine?	ULO	ULO	ULO
Do you maintain cold chain system? Y/N, How?	Yes, He has a flask and maintain cold chain.	cold vaccine flask	Yes, He has a flask and maintain cold chain.
What kind of vehicle do you have to serve the farm family?	Personal motor cycle/bicycle	Motorbike	Motorbike
Livestock			
FMD			
Doses required	6 ml	6 ml	6 ml
Method	SC	SC	SC
BQ			
Doses required	5 ml	5 ml	5 ml
Method	SC	SC	SC
Anthrax			
Doses required	1 ml	1 ml	1 ml
Method	SC	SC	SC
HS			
Doses required	2 ml	2 ml	2 ml
Method	SC	SC	SC
PPR			
Doses required	1 ml	1 ml	1 ml
Method	SC	SC	SC
Poultry			
BCRDV			
Doses required	1 drop	1 drop	1 drop
Method	Eye	Eye	Eye
RDV			
Doses required	1 ml	1 ml	1 ml
Method	IM	IM	IM
DPV			
Doses required	1 ml	1 ml	1 ml
Method	IM	IM	IM
FC			
Doses required	1 ml	1 ml	1 ml
Method	SC	SC	SC
DC			
Doses required	1 ml	1 ml	1 ml
Method	SC	SC	SC

Constraints	Price charged from the farmers is a problem, because farmers are not willing to pay.	Vehicle problem	Vehicle problem
	If after vaccination disease occurs, then farmers become angry upon them	ice box	Ice box
	Vaccination schedule is not maintain, because shortage of vaccine supply and manpower	Mask, hand gloves other protective measure	Mask, hand gloves other protective measure
	No logistic support is given. Motor cycle, bicycle is not provided		Unavailability of vaccines
	-	-	Misunderstanding about vaccination charge with the farmers.
Recommendation	Supply of vehicle	-	Supply of vehicle
	Supply of ice box	Supply of ice box	Supply of Ice Box
	Cold chain maintain	regular campaign	Supply of protective measure
			Supply of vaccines on free cost, specially RDV

Appendix 4 KII Summary Report of Private Paravet/Technician

Description of Information	Gangachura	Mohangoanj	Shyamnogor
Name	Dalim Kumar Mohanta	Alamgir Kabir (Arman)	Animesh Pormanik
Age	32	-	40
Education	Degree(Graduation)	HSC	SSC
Designation	Volunteer	Volunteer	Volunteer
Service Length (years)	10	2	3
Village	Kolkondo	Kurshimul	Kokhali
Upazilla	Gangachura	Mohangoanj	Shyamnogor
Coverage of working area (Union/village)	Kolkondo, Gangachura, Barli	Check Maganshiadar, 15-16 villages	Koikhali
Farm HHs to cover	-	3000	-
Occupation			
Main	Private technicians	AI worker	Private technician
Optional	-	-	
How long you have been involved in this activities? (years)	10	2	3
Professional training Duration	3 months	3 months	
Training received from	Youth Development Center	Youth Development Center, Kishorgonj	
Year of training	2005	2012	2012
Livestock Production related training			

Duration	6 month		
Training received from	LTI		
Training name	Avian Influenza		
Duration	4 times 3 days each time		
Training received from	DLS		
Year of training	2007		
AI training			
Duration	-	3 months	3 months; Refresher-7 days
Training received from		AI center, Savar	center, location
Year of training	-	2013	2011 Refresher-2013
How many no. of VFA are working in one Upazila and one Union	3 VFA in Gangachara Upazila	1	-
How many no. of Private Technician or Volunteers are working in this area?	6 in Kolkondo	06 persons	3 in this working area.
Who has engaged this volunteer?	DLS	DLS	DLS
Any advocacy service do you provide to the farmers for vaccination?	Yes	Yes	Yes
You go to the farmer's house with your initiative	Yes		
Only at the vaccination place	-	-	Yes
Vaccine used by the farmers are made locally (%)	100%	100%	100%
How many vaccination programs were held at this union/village in the last year by DLS?		4	
Vaccinated Farm Households	5000	240	500
Poultry	8000		5000
Doses of vaccine	1200		5000
Livestock	2000	-	2000
Doses of vaccine	4000	800	2000
No. of Farm Family	5000	2400	500
No. of animal	10000	7500	7000
What fees you charged for vaccinating animal per dose?			
FMD	Tk. 5.00	Tk.10.00	0
PPR	Tk. 2.00		
Anthrax	Tk. 3.00	Tk. 10.00	
BQ		Tk. 10.00	
HS		Tk. 10.00	
Poultry	Tk. 0.05		
Who prescribed the vaccine?	VFA	VS/ULO	ULO
Do you maintain cold chain system? Y/N, How?	Yes, vaccine flask	Yes, vaccine flask with ice	Yes, Ice box
What kind of vehicle do you have to serve the farm family?	Motor bike	Own motor cycle	Motor bike
Do you know the name,	yes	yes	Yes

doses of vaccination required for animal			
Livestock			
FMD			
Doses required	Trivalent-3 cc Bivalent-5 cc	6ml	6 ml
Method	SC	SC	SC
BQ			
Doses required	5 cc	5 ml	5 ml
Method	SC	SC	SC
Anthrax			
Doses required		1 ml-cattle 0.5 ml for goat	1 ml
Method	SC	SC	SC
HS			
Doses required		2 ml	2 ml
Method	SC		SC
PPR			
Doses required	2 cc		1 ml
Method	SC		SC
Poultry			
BCRDV	-	-	-
Doses required	1 drop		1 drop
Method	Eye		Eye
RDV			
Doses required	1cc		1 ml
Method	SC		IM
DPV			
Doses required	1 cc		1 ml
Method	SC		IM
FC	-	-	-
Doses required	-	-	1 ml
Method	-	-	SC
DC	-	-	
Doses required	-	-	1 ml
Method	-	-	SC
What are the constraints do you think that limits the vaccination services in the field.	Misunderstanding of farmer	Difficult to organize the public	Unavailability of vehicle
	Unavailability of vaccine	-	Unavailability of suitable ice box
	-	Sometimes effectiveness problem due to transportation of vaccines from Dhaka to rural area	Unavailability of vaccine and not found in time.
	-	Vaccine is not available	People think that vaccines are free, that create difficulties.
	-	Disturbance of quack doctor	
What are the key recommendations you put forward for the improvement of vaccination services?	Ensure availability of vaccine	Veterinary doctor should be placed in every union	Ensure availability of vaccine
	Increase awareness of the farmers through various programs	VFA's are needed	Supply of suitable ice box
	-	Logistic support	Supply of vehicle

		needed, such as vehicle.	
	-	-	Supply vaccines free of cost

Appendix 5. Summary findings for drug sellers

Information	Shamnagor		Gangachara		Mohangonj	
Name	Md. Manef Siddique	Md. Abdur Rahim	Md. Maksudul Islam	Md. Omor Faruque	Md. Borhan Uddin	Sree Kajal Sarker
Age	28	27	32	25	25	34
Education	SSC	SSC	SSC	Degree	Fazil (B.A)	Class eight
Location of the medicine shop	Shahid Muktijodha Sorak	Shahid Muktijodha Sorak	Zero point, Gangachara, Rangpur	Zero point, Gangachara, Rangpur	Mailora, ULO road, Mohangonj	Khulsimul Bazar
How long you have been involved in animal drug selling?	16 years	5 year	5 year	5 year	1.5 years	7 years
Dou you have any training on animal drug/disease identification?	No	Yes	Yes	Yes	No	No
Name of Training	-	-	Drug and Chemist	Drug and Chemist	-	-
Training obtained from where?	-	Upazila Livestock Office	Drug and Chemist Authority	Drug and Chemist Authority	-	-
Do you sell only animal drug or human drug?	Animal drug	Animal drug	Animal drug	Both animal and human drug	Only vet drug	Both animal and human
How many no. of Vet Drug shop in this at this area and at this upazila?	12	5	2	2	8	7
What is the percentage share of sale of Human and Animal drug in your shop	100 percent Animal drug.	100% animal drug	100% animal drug	5% animal drug	100% animal	10%
What is the share of animal vaccine sold from your shop that is made in Bangladesh?	80%	80%	-	-	-	-
Give the name of the vaccines those are made in our country	Ranikhet, Gumboro, PPR, BQ, FMD and Rabies	Ranikhet, Gumboro, PPR, BQ, FMD and Rabies			FMD, BQ, Cholera, DP	
What is the share of animal vaccines sold from your shop those are made outside	20%	20%	-	-	-	-

Bangladesh						
Percentage of vaccine sold from your shop to the farmers directly And what percentage sold to the paravet directly	80% Paravet 20%	100% farmers			Medicine- 20% service provider 80% farmers	
Can farmers tell the name of vaccine	Yes	Yes	-	yes	-	-
Do you think that present no. of shop is enough to serve the farm household in this area?	Yes	Yes	Yes	Yes	Enough to serve the farm household	Enough shop to serve the farm household
Constraints	Unavailability supply of vaccines	Company do not supply vaccines to the shop	Elecrtic bil is much more compared to selling price of vaccine	Elecrtic bil is much more compared to selling price of vaccine	No training	Lacking of VS, VFA, PSP
Recommendation	Supply available vaccines respectively to diseases	Company should supply vaccines to the shop	Above mention problem	Above mention problem	Training need	Training required for the technician