ANNUAL REPORT
2014

Edited by

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Annual Report: 2014

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Photo **:** A K M Ali Hossain

PREFACE

The Bangladesh Livestock Research Institute (BLRI) has been working since late Eighties with the mandates to develop knowledge and techniques of livestock and poultry production to help poverty alleviation, women empowerment, food and nutrition security for the increasing population, employment creation and environment pollution control.

During last two and half decades BLRI has already developed 67 technologies & packages. More then ten to twelve packages & technologies are in pipeline. Hope all will be released very soon.

The institute is relentlessly working with its limited manpower and resources.The annual report 2014 will focus abstract form research results, use of techniques of technologies and dissemination activities by eight research division, research sub-centres and regional stations.

The institute gratefully acknowledges the Ministry of Fisheries and Livestock, Department of Livestock Services, Bangladesh Agricultutral Research Council for their strong support in different research and development activities.

BLRI believe in its research creations to meet the major contributions in poverty alleviation, women empowerment, food and nutrition deficiency and rural employment in the country.

Dr. Md. Nazrul Islam
Director General

Contents

Research Highlights 2014

Map of Bangladesh Showing BLRI Head Quarter and Regional Stations

BANGLADESH

India

India

India

India

Sirajganj

BLRI Headquarter

BAY OF BENGAL

Nikhongchari

Mayanmar

● (BLRI Headquarter)

● (BLRI Regional Stations)

Mandates and Organizations of the Institute

Mandates

a) To identify the basic problems affecting livestock and poultry both at the national and farm level;

b) To solve these problems through multi and inter-disciplinary and inter-institutional research;

c) To develop techniques and knowledge for livestock and poultry production to help food and nutrition security for the increasing population, poverty alleviation, employment creation and environment pollution control;

d) To train scientists in the appropriate fields of research, at home and abroad, thereby filling the gap of skilled scientists;

e) To strengthen research-extension-NGO linkage and expedite quick dissemination of the developed and introduced techniques to the end users;

f) To assist the Government and all concerned in policy decisions related to livestock and poultry research and development;

g) To impart training to trainers, farmers and 1st line extension of livestock technologies to the farmers.

Organizational Structure

BLRI has 8 research divisions, one support service division and two regional stations as mentioned below:

(A) Research divisions

- Animal Production
- Poultry Production
- Animal Health
- Goat and Sheep Production
- Biotechnology
- Socio-Economics
- System Research (On-Farm Research)
- Training, Planning and Technology Testing

(B) Support Service Division

Regional stations

- Baghabari, Sirajgonj
- Naikhongchari, Bandarban

Board of Management

The institute is administered by the Board of Management. The Board is the highest policy making body in the Institute's organizational structure and holds full responsibility to determine and execute policies and undertakings of the Institute within the framework of policy directives issued by the Ministry of Fisheries and Livestock of Bangladesh Government. The Director General is the executive head and works on behalf of the Board of Management. The Board consists of

Chairman
- Hon'ble Minister, Ministry of Fisheries and Livestock.

Vice-Chairman
- Secretary, Ministry of Fisheries and Livestock, ex-officio.

Member
- Two Members of Parliament to be nominated by the Speaker.
- Secretary, Ministry of Finance, ex-officio.
- Member (Agriculture), Planning Commission, ex-officio.
- Executive Chairman, Bangladesh Agricultural Research Council, ex-officio.
- Vice-Chancellor, Bangladesh Agricultural University, ex-officio.
- Director General, Department of Livestock Services, ex-officio.
- Two persons to be appointed by the Government from among persons having interest in livestock matters.
- Two persons to be appointed by the Government from among persons engaged in research activities in the institute.

Member Secretary
- Director General, Bangladesh Livestock Research Institute, ex-officio.

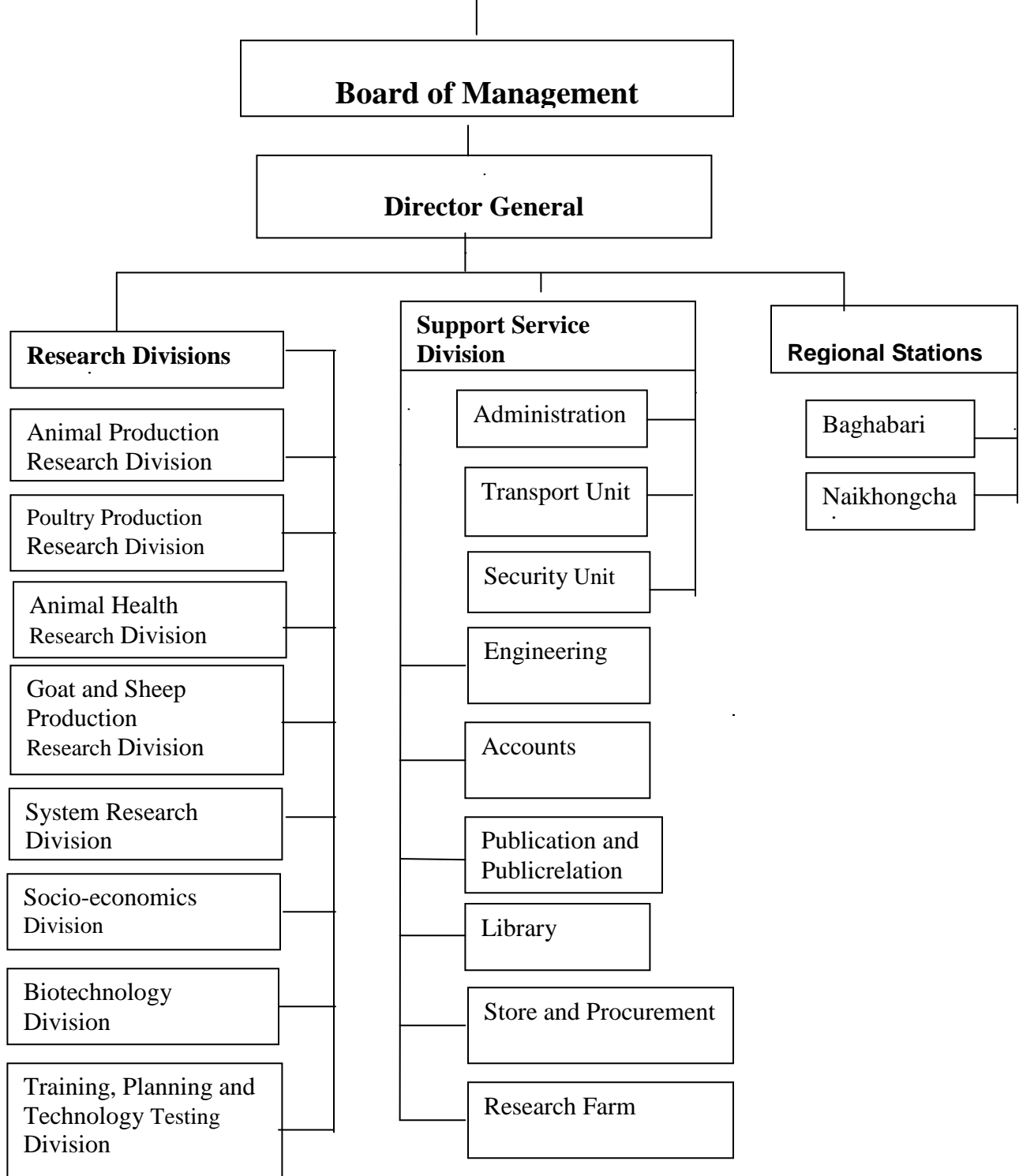View of the 39th meeting of the Board of Management of BLRI

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Technical Committee

The Technical Committee (TC) is an advisory body which provides professional inputs, scrutinize and review the technical aspects of research programs including research budget and recommend for final approval to the Board of Management. The TC is composed of multidisciplinary and inter-institutional experts with the following members:

*	**Director General** Bangladesh Livestock Research Institute	Chairman
*	**Member-Director (Livestock)** Bangladesh Agricultural Research Council	Member
*	**Representative** Faculty of Veterinary Science, Bangladesh Agricultural University	Member
*	**Representative** Faculty of Animal Husbandry, Bangladesh Agricultural University	Member
*	**Specialist representative on required subject**	Member
*	**Director (Research)** Department of Livestock Services	Member
*	**Chief Scientific Officer** Animal Production Research Division, BLRI	Member
*	**Chief Scientific Officer** Bio-Technology Division, BLRI	Member
*	**Chief Scientific Officer** Animal Health Research Division, BLRI	Member
*	**Principle Scientific Officer** Goat and Sheep Research Division, BLRI	Member
*	**Divisional Head** Poultry Production Research Division, BLRI	Member
*	**Divisional Head** **Socio-Economic** Research Division, BLRI	Member
*	**Divisional Head** System Research Division, BLRI	Member
*	**Additional Director** Support Service Division, BLRI	Member-Secretary

Organogram

Ministry of Fisheries & Livestock

Board of Management

Director General

Research Divisions	Support Service Division	Regional Stations
Animal Production Research Division	Administration	Baghabari
Poultry Production Research Division	Transport Unit	Naikhongcha
Animal Health Research Division	Security Unit	
Goat and Sheep Production Research Division	Engineering	
System Research Division	Accounts	
Socio-economics Division	Publication and Publicrelation	
Biotechnology Division	Library	
Training, Planning and Technology Testing Division	Store and Procurement	
	Research Farm	

Research Progress

Animal Production Research Division

The mandate of this division is to solve the problems of livestock production in respect to their breeding, feeding, nutrition, forage production, housing and management, production and processing of livestock products (milk, meat etc) and by products (manure, hides and skin).

Study on improving feed efficiency of Pabna and RCC bulls

Scale of ranking available roughages (Napier, Jumbo, Maize and rice straw) based on their yield, production cost, nutritional value and productivity in the country is not developed yet. Such scale may help farmers feeding their animals cost effectively. Therefore, to develop a roughage scale Napier, Jumbo, Maize, Urea molasses treated straw-whole straw (UMS-WS) & Urea molasses treated straw-stover (UMS-S) were randomly fed to 30 local growing bulls of 135±28 Kg live weight dividing into five equal groups. The results indicated that the average feed conversion efficiency (FCR) of the animals was 9.87, 32.9, 36.8, 56.4 and 63.6, respectively. Considering beef production performances, the five different roughages were ranked as Maize>Napier>UMS-S>Jumbo>UMS-WS based on their coefficient of nutritional response to growth of 1.0, 0.30, 0.27, 0.18 and 0.16, respectively. Considering the cost of beef production, the roughages may be ranked as Maize>Napier>Jumbo>UMS. However, farmers may use this roughage scale in formulating cost effective diets for making more profit of cattle production. Moreover, these data will lead further development of feeding models for beef production in the country.

Table. Nutritional and growth responses of different roughages

Parameters	Diets					Significance	
	Napier	Jumbo	Maize	UMS-WS	UMS-S	SED	Level
DM intake (Kg/d)	2.68^{ac}	2.25^{b}	2.70^{ac}	2.52^{a}	2.77^{c}	0.05	**
CP intake (Kg/d)	0.25^{b}	0.22^{c}	0.28^{a}	0.23^{c}	0.25^{b}	0.004	**
DMI (Kg, % LW)	2.08^{ad}	1.79^{c}	2.01^{bd}	1.92^{bc}	2.08^{d}	0.03	**
DM digestibility %	50.2^{ad}	53.0^{d}	58.8^{c}	45.5^{b}	44.4^{b}	0.86	**
CP digestibility %	55.7^{c}	47.8^{a}	61.4^{b}	55.2^{c}	51.0^{d}	0.73	**
DDMI (Kg/d)	1.37^{a}	1.21^{cd}	1.58^{b}	1.15^{cd}	1.23^{ad}	0.03	**
DCPI (g/d)	142^{c}	105^{b}	168^{a}	126^{d}	126^{d}	2.78	**
M E intake (MJ/d)	8.38^{b}	8.42^{b}	10.0^{a}	7.48^{c}	7.65^{bc}	0.18	**
Initial LW (Kg)	133.9	135.1	134.8	134.7	135.8	8.05	NS
Final LW (Kg)	141.2	138.7	159.4	138.3	142.6	8.52	NS
Daily gain, g	81.4^{b}	39.9^{b}	273.3^{a}	39.6^{b}	75.3^{b}	18.5	**
FCR	32.92^{a}	56.35^{b}	9.87^{c}	63.62^{d}	36.78^{e}	0.76	**

*NS= Non significant; ** P<0.01*

Selection of suitable exotic beef breed (s) and performance evaluation of their crosses with native cattle

The demand and supply mismatch of beef has been increasing its market price. The conventional beef production system coupled with intensive beef farming may help increasing beef production. Profitable beef production under intensive farming is largely depended on the productivity of beef animals. Brahma crosses are being produced to support increased productivity, but strategic approach for breed development that needs screening of multiple genotypes is ignored. Thus, along with Brahma some other exotic sires were selected to produce genotype of a cost effective beef production. The dam of native BCB-1 was selected to cross to determine genetic distance in BCB-1 animals. The mtDNAs were sequenced. It showed that BCB-1 was originated from and maintained by a pure zebu cattle genetic background. The productivity of crossbred Brahma will be compared with that of BCB-1. Finally, a suitable beef breed that will yield an average carcass weight of 150Kg by 24 months of age will be developed.

Study on candidate genes for milk production traits of Red Chittagong Cattle

Genetic improvement of production traits may be done by following suitable breeding programs. There are many selection tools for high yielding animals (such as pedigree and progeny testing) and most of them are restricted only in a laboratory practice. A DNA marker based selection tool may be developed and adopted at farm condition. This work, thus, was undertaken to develop DNA marker selection tool for dairy animals. Among 14 sets of primers 6 sets of *SCD* and 5 sets of *DGAT1* primers were standardized and amplified well and the rest 3 sets of *DGAT1* primers are on the way of standardization. Phenotypic data (production & milk characteristics) are being recorded for the development of a suitable DNA marker for marker assisted selection (MAS) of high yielding cows. Finally, genetic markers will be developed to assist the selection of high yielding dairy cows in breeding program

Study of sexual and asexual propagation of *Moringa Oleifera* for fodder production

Diversification and production of quality feeds and fodders, that are of high metabolizability & contain macro and micro nutrients; and that support animal productions cost effectively without any threats to human health are important for achieving cost-effective farm animal productions. *Moringa Oleifera* could be one of the best options, the foliage of which may replace concentrate in a diet of goats (Sultana *et al.*, 2012). It may be propagated both sexually and asexually and pruned in every 40 to 45 days. The present study was undertaken to determine asexual propagation of Moringa plant using branch cuttings of different maturities indicated by the branch diameter of i) 3-5 cm, ii) 6-8 cm or iii) 10-12 cm. In addition, the seed of local or exotic variety were collected for testing of sexual propagation. The seeds of local varieties either of freshly harvested (with an average moisture of 57%) or of sundried with 7.0% or 5.0% moisture were tested for germination for the cultivation of Moringa fodder. Twelve (12) plots each with $25\times4ft^2$ were prepared with basal doses of cow dung, Urea, TSP and MP (27000:90:30:15), and branch cuts were planted at a space of 10 x 10 cm randomly replicating each type of cut into four (4) different plots. The data on the rate of survival (%) and death (%), the number of prunes per cut and biomass yield at 63 days of cultivation were recorded. Higher maturity of branch cuts with mature cells indicated by the higher diameter (10-12 cm) of branch cuts favored a high survival rate, more prunes/cuts and an average percent of sub-soil pruning. Contrary to it, the death rate and sub-soil pruning percent of comparatively tender cuts with immature cells were affected decaying of the cells.   CP content of leaves and stem of different cuts did not very significantly. It may be concluded from the results that branch cutting with 10-12 cm diameter may be used for asexual propagation for Moringa fodder production. However, for sexual propagation the local seed with <5.0% moisture may be used, but it needs further investigation for the development of cost effective agronomical practices for fodder production using Moringa plants.

Laboratory Services

Animal Production Research Division (APRD) being mandated with the responsibility of conducting research and development (R&D) programmes on 1) Animal Breeding and Genetics, 2) AI and Animal Reproduction, 3) Feeds Feeding and Nutrition, 4) Fodder Production, 4) Dairy Production and 5) Meat Production is the gardien des laboratories of the following disciplines.

1) Animal Geneties and Breeding
2) AI and Reproduction
3) Animal Nutrition
4) Dairy Technology
5) Meat Technology

The division having the input supports from its annual research programme analyses samples of different related research projects of the institute, and that are coming from outsides, if at all inputs available in the laboratory support their analyses. The nutrition lab during the last financial year (2013-14) analyzed about 2863 feeds and fodder samples including 135feed samples from different non-government organizations, entrepreneurs of livestock farms and feed mills; public organizations; and the international organization like FAO. Detail chemical analysis of the samples (feeds & fodder) is given in Table 1. The Animal Breeding and Genetics lab mostly supports the research programmes of the related fields and it rendered DNA extraction of 200 blood samples, PCR facilities of 500, electrophoresis of 50.AI and Reproduction laboratory supports semen collection, semen evaluation, and frozen semen storage in liquid nitrogen and AI for beef breed development by using BCB-1. Similarly, the dairy lab having related equipment facilities supported analysis of 200 milk samples during the financial year.

Table 1. Chemical analysis of the Sample during July 2013 to June 2014 under Animal Nutrition Lab.

SI No	Category	Total Sample	No. of sample analysed								
			DM	Ash	CP	N	CF	ADF	NDF	EE	Silica
1	Divisional /Institutional	1863	1528	1105	1040	-	35	302	140	180	-
2	Outside	135	135	-	135	-	-	-	-	-	-

Cattle germplasm conservation and research under research farm, Pachutia, BLRI

Animal Production Research Division (APRD) deals with the research of nutrition, feeding, forage production & preservation, breed development through conservation, selective breeding, crossbreeding and molecular & reproductive biotechnologies for large animals especially cattle & buffalo. Two cattle named as BLRI cattle breed-1 (BCB-1) & Red Chittagong Cattle (RCC) and one buffalo breeding herd are maintaining to conduct such kind of above mentioned research under this division.

Background and population of BCB-1

In past several attempts were undertaken to enhance dairy production of the country through rearing pure exotic and crossing them with indigenous cattle. However, success history was not remarkable. Bangladesh Livestock Research Institute Cattle Breed-1 is a native cattle developed through selective breeding of native cattle named 'Pabna' evolved through admixture of Hariana, Tharparker and Sahiwal genetic materials. The Pabna cattle were collected by BLRI from their breeding tracts and has been conserving *ex-situ* since 1992. A selective breeding programme was undertaken with the goal of improvement of milk and meat production of thisgermplasm over the last 20 years. The lactation yield and live weight gain were selected as selection criteria. The progress in milk production potential was

very low. However, the coat color and body size of the bulls are attractive which havea great market value as a meat type cattle.

A BCB-1 cow

A BCB-1 bull

BCB-1 calves

At present breeding stock of BCB-1:

Category	Number (#)
Milking cows	24
Dry cows	30
Total cows	**54**
Adult bulls (Teaser, Brahman & breeding)	9
Heifers (Weaning to before puberty)	59
Growing bulls (Weaning to before adult)	48
Male calves	14
Female calves	15
Total	199

As a native breed BCB-1 may has lower body weight at mature age compare to most temperate beef breeds but, still they are more promising for beef production. Therefore, in addition to conservation & improvement, a crossbreeding program of BCB-1was undertaken to produce crossbred beef breeds by using some exotic beef breeds which will be economically viable with efficient FCRs to meet up the growing needs of beef of the country.

Background and population of RCC

Red Chittagong cattle (RCC) are a promising variety of Bangladesh, available in south-east part of the country. The RCC takes their name from the region of their breeding tract "Chittagong" and the term "Red" comes from their red body color.The coat color of RCC is deep red to yellowish red to whitish red. The color of other parts of the body like horn, hoof, ears, eyeball, eyebrow, color of vulva and tail switch are also red and/or near to red. Although this type of cattle are low milk producers compare to exotic dairy breeds but they are potential for remarkable heat tolerance, adapted to humid, rainfall, flooded and swampy conditions, resistance to local diseases, early puberty and yearly calving.Besides these potentialities, RCC is threatened to extinction due to haphazard crossing with exotic and other native cattle.

A RCC cow with her calf

A RCC bull

RCC calves

Therefore, *in-situ* and *ex-situ* conservations are crucial requirement to maintain and improvement of local germplasms. Bangladesh Livestock Research Institute is solely responsible for research work to improve and conserve the native animal genetic resources. Thus, BLRI started conservation and improvement program for RCC in 2002. In 2007, a national project has been launched with the vision for conservation and improvement of RCC and some cows and bulls were collected from its habitats in 2008 for increasing the present stock and preventing the inbreeding among the stocks.

At present breeding stock of RCC:

Category	Number (#)
Milking cows	24
Dry cows	23
Total cows	**47**
Adult bulls (Adults, & breeding)	7
Heifers (Weaning to before puberty)	44
Growing bulls (Weaning to before adult)	58
Male calves	18
Female calves	15
Total	189

Four breeding bulls were delivered to Central Cattle Breeding Station, under DLS to serve the *in-situ* RCC cows and heifers. There are many registered and non-registered small dairy farms in the country. These farms may have 5 to 200 cows of which 20% are local. As a local breed RCC may has lower milk production compare to most recognized dairy breeds but, still they are more promising for rural dairying as they are small in body size but producing a wider range (1 to 5 kg) of daily milk. Therefore, conservation, improvement, multiplication and dissemination of superior and/or high yielding RCC cows will be sustainable for small dairying of the country.

Animal Health Research Division

The mandate of the Animal Health Research Division is to identify the problems of the Livestock and Poultry, to conduct research in the area of existing, exotic/emergent diseases, to develop and maintain rapid appropriate diagnostic and treatment systems for different diseases develop health management techniques, develop vaccines and biologics, develop food safety procedures, provide training in emergent diseases recognition, preparedness and control techniques. Maintain the highest level of microbiological security. The following research activities were accomplished during 2014.

Laboratory Activities

Monitoring of highly pathogenic avian influenza virus circulating in Bangladesh and *in vitro* expression of viral proteins

Since 2003 the current highly pathogenic avian influenza (HPAI) viruses of H5N1 subtype panzootic has been spread from Southeast Asia across three continents affecting wild birds, commercial and domestic poultry and sporadically humans. In Bangladesh, H5N1 HPAI virus was first detected in February 2007. Since then the virus has become endemic in poultry of Bangladesh and caused six waves of outbreaks. So far, there have been seven human cases of avian influenza infection in Bangladesh with one case fatality. As of May 2014, a total 558 outbreaks have been reported from Bangladesh and as the fourth most affected country in the world. To control this disease the country adopted several measures including early detection, rapid stamping out, movement control and farm biosecurity improvement. But these measures show limited impact on spread of this disease. In this regards Government decided to use vaccine as an additional tool to reduce the disease outbreaks to a level that can be responded effectively through conventional stamping out procedure. The objectives of the present study were: Molecular characterization and phylogenetic analysis of circulating HPAI viruses from field outbreaks and Virological surveillance for avian influenza viruses in migratory and domestic poultry, including cloning and in vitro expression of structural proteins of HPAI.

A total 21 isolates from different species were sequenced which were collected from different areas of Bangladesh since 2007. Sequencing was done on HA gene. Topology of the phylogenetic tree shows that the all H5N1 viruses under these studies belong to the 2.2, 2.3.4 and 2.3.2.1 clade and similarity ranged between 97.4% and 100%. It was observed that from 2011, two new clades 2.3.2.1 and 2.3.4 viruses introduce in to Bangladesh in addition to clade 2.2 viruses that have been in circulation since 2007 (Figure 1).

Figure: 1. Phylogenetic analysis of HPAI of Bangladeshi isolates
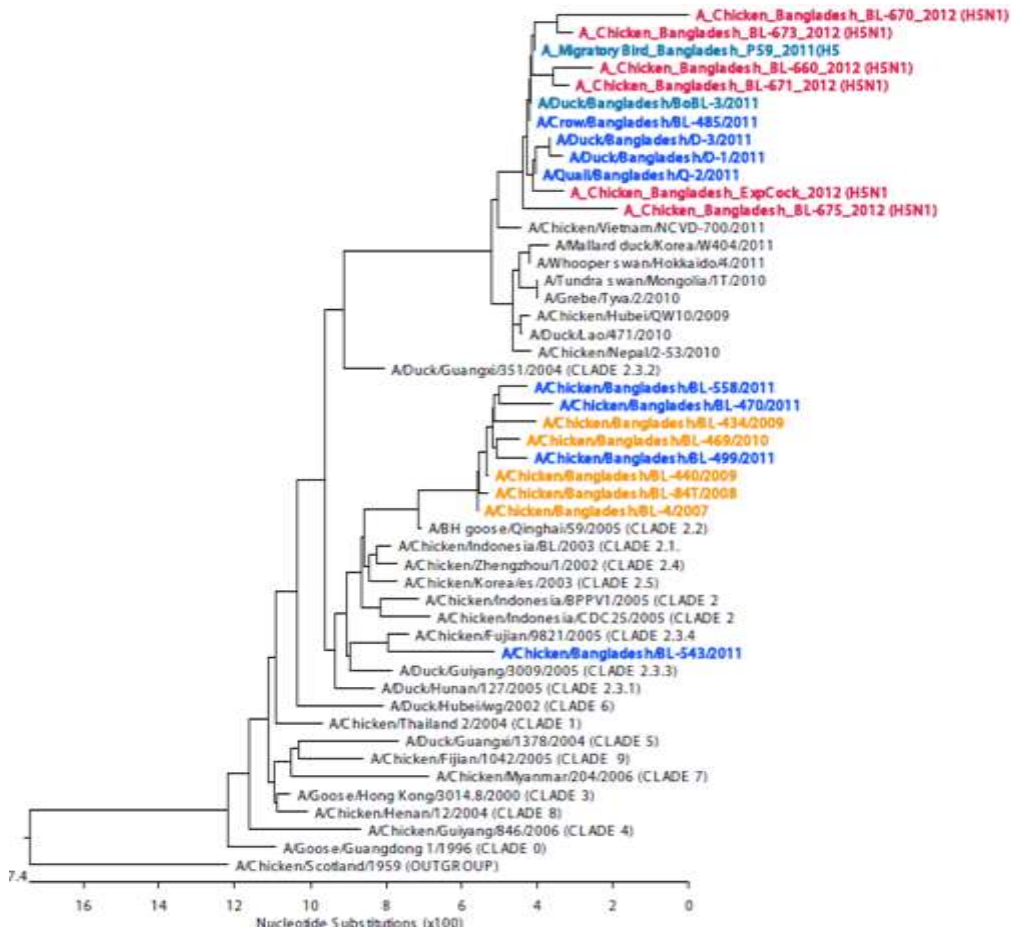
For AI monitoring purpose, a total of 1135 samples including 280 from migratory birds, 680 from live bird market (LBM) chickens, 118 from ducks and 57 from pigeons were collected from different locations of Bangladesh during the period from July 2013 to June 2014. All the samples were tested by real time RT-PCR for Type A influenza virus matrix gene. Out of 1135 samples, 69 were found positive for influenza A, of which 11 were from migratory birds (11/280; 3.93%), 48 from LBM chickens (48/680; 7.06%), 7 from ducks (7/118; 6.0%) and 3 from pigeons (3/57; 5.26%). In addition, 741 Influenza A positive samples collected by different institutes under the FAO-led surveillance program were also received at BLRI for further analysis. The real time RT-PCR positive samples were inoculated in 10-day-old embryonated chicken eggs. Out of 1135 surveillance samples 69 were positive for both HA test and influenza virus A specific real time RT-PCR (Table 1).

Table 1. Isolation and identification of Type A influenza virus from surveillance samples

Species	No. of samples	No. of isolates with HA activity	positive isolates by real time RT-PCR	(%) positive
Migratory bird	280	11	11	3.93
LBM chickens	680	48	48	7.06
Duck	118	7	7	6.0
Pigeon	57	3	3	5.26
Total	1135	69	69	6.19

The representative 110 influenza A positive samples were selected from 810 influenza A positive samples (741 from other laboratories and 69 from surveillance samples of NRL-AI) on the basis of species and region to cover the whole country and sent to the OIE reference laboratory for further detail study. The bio-molecular results revealed that in case of migratory bird samples one was H5 (HPAI), two were H9 and eight were of undetermined subtype. Among the LBM chicken samples, seven were H5 (HPAI), 51 were H9, six were mixed infection with H5 & H9 and three were of undermined subtype. In case of duck samples, one was H2, six were H4, six were H5 (HPAI), one with mixed infection with H5 & H2, one with both H5 & H4, two were H9 and one was H7N5, though H7 was genetically distinct from that of the novel H7N9 virus of China. Among quail samples, one was H5 (HPAI) and one was H9. In case of pigeon samples, all three contained H9. The bio-molecular results of OIE reference laboratory shown in table-2.

Table:2. Bio-molecular results of influenza A virus

Species	Test Results									
	Influenza A	H2	H4	H5	H5& H2	H5 & H4	H5 & H9	H7N5	H9	Total
Migratory bird	05	-	-	01	-	-	-	-	02	**08**
LBM chickens	03	-	-	07	-	-	06	-	51	**67**
Duck	12	01	06	06	01	01	-	01	02	**30**
Quail	-	-	-	01	-	-	-	-	01	**02**
Pigeon	-	-	-	-	-	-	-	-	03	**03**
Total	20	01	06	15	01	01	06	01	59	110

From this study it was revealed that HPAI (H5N1) is still circulating in our poultry population. For cloning and in vitro expression study the full length HA gene of selected HPAI isolates has been amplified by RT-PCR and cloned in plasma vector by TA cloning method. The full length sequence of the cloned insert has been established. For in vitro expression of HA protein, specific primers have been designed and synthesized. The protocol of cloning cDNA corresponding to HA coding region in expression vector is now in the process of optimization.

Study on efficacy, potency and safety of BLRI developed enterotoxaemia toxoid
Enterotoxaemia is a condition of goat and sheep caused by the absorption of a large amount *Clostridium perfringens* produced toxins from the intestines. The disease is associated with over eating and sudden change in diet of animals. These conditions favor the rapid growth of bacteria and production of high level of toxins in the intestine. It is a high economic importance disease of sheep and goat worldwide including Bangladesh due to high morbidity and mortality. Every breed and age is susceptible to this disease. Young animals are more at risk to serious consequences of both sexes, and have a mortality rate as high as 100% with a peak incidence during the dry seasons and bring huge economic losses to the sheep and goat industry. The most practical way to handle *C. perfringens* enterotoxaemia is to prevent them. But immunization against the disease in Bangladesh has not yet been practiced, though it's being intensively practiced in many developed/developing countries. In addition to, there is no local vaccine or toxoid for immunization against the disease in Bangladesh and the importation of such materials may not be effective in terms of cost, safety, potency or immunogenicity. Therefore the project was undertaken to isolate and identify the causal agent of enterotoxaemia in Bangladesh, to determine the type of the organism and their toxins and thereby, to study the efficacy, potency and safety of the developed toxoid and finally field trial of developed toxoid.

Bangladesh Livestock Research Institute (BLRI) has already completed the isolation and identification of the causal organisms, separation of toxin from the isolated organism, determination of toxicity in kids and laboratory animals (mice) and lastly development of toxoid from separated toxin. The project was further

extended to evaluate the efficacy, potency and safety of developed toxoid in the field condition by June 2014. We have so far focused the determination of the toxicity of the toxin as well as the dose of required toxoid to reach protection against that toxicity in laboratory animals. Therefore in this present study we focused on the field trial of *Clostridium perfringens* Type D toxoid against clostridial enterotoxaemia in sheep and goat.

The toxoid or vaccine was prepared from the toxins of the isolated strain of *Clostridium perfringens* type D enzootic in Bangladesh. Basically, pure culture of *Clostridium perfringens* type D grown in cooked meat media and were then filtered, and the pH of the filtrates were adjusted at 7.2. Type D filtrate was treated with 0.25% trypsin (Mark) to activate the epsilon toxin. Then filtrates were treated with formalin to a final concentration of 0.6%. The formalin-treated filtrates were thoroughly mixed and allowed to stand at 37°C for 14 days till the product became non-toxic for mice. The toxoid was then mixed in equal volumes with 2% sodium alginate (BDH Chemical Limited, London.) in deionized water. The product was stored at 4°C until used. Fresh toxin was prepared from the local toxigenic strains of *C. perfringens* type D as the toxicity of the stored toxin was lost due to long time storage. The strength of the toxin was calculated by 'Absorbance Assay' on a spectrophotometer using absorbance at 280 and 260 nm. The toxicity of the prepared toxin was tested in adult mice and the mice lethal dose (LD) was calculated. The toxoid developed from the prepared toxin. The product was tested in mice (1-2.5μl sucutaneously) to ensure its safety and certified as sterile after ensuring the absence of microbial contamination. The dose of required toxoid for mice was initially selected as 2.5μl since the LD_{100} the prepared toxin was 32μg. The toxoid or vaccine was prepared from the toxins of the isolated strain of *Clostridium perfringens* type D enzootic in Bangladesh. The product was stored at 4°C until used. Now at present phase, a field trial evaluation was confirmed by following stages. Firstly immunized sera samples were prepared from healthy goats. A total of 12 apparently healthy clostridia disease free goats (six months of age) were used in this experiment. The goats were divided in to three groups. Each group randomly allocated four in numbers. These three groups will be designated to each inoculation of epsilon toxoid diluted with phosphate buffer saline (PBS) as 1:1, 1:2 and 1:4. All these animals maintained on a clean goat farm. Blood samples were collected on day -0, 14, 21 and 28. The collected sera were stored at -20°c until used. Then Mouse Neutralization Test (MNT) was performed. Before MNT and field trail of BLRI developed toxoid the concentration of toxin was detected using Spectrophotometer. The antibody titres of immunized sera were determined by the toxin antitoxin neutralization test using mice as described by Rahaman and Rahman (1999). Purified toxins from *clostridium perfringens* type-D was used as antigens. Prepared immunized sera against toxin were used as antibodies. Mice were used as indicator host. Serum samples were diluted in PBS, pH 7.0 ranging from 1:2 to1: 256. Then 100 ul of epsilon (0.1 mg/ml) toxin was mixed with 100 μl of diluted individual serum samples. The mixture was incubated at room temperature for 1 hour. 200μl of toxin–serum (toxin-antitoxin) mixture was intraperitoneally injected into each of 5 mice and observed them. Finally field trail of developed epsilon toxoid in natural hosts (goat and sheep) was done in the selected districts e.g. Manikgonj, Jessore, Naogaon, Tangail and Sylhet. A total of 520 apparently healthy goats and 460 sheep (around six months of age) were vaccinated with different dilution of toxoid (with PBS) as 1:1, 1:2 and 1:4 subcutaneously at the rate of 2 ml/ goat. Blood samples were collected at 0, 21, 90 and 150 days from the randomly selected goats and sheep to check the efficacy of the toxoid by mouse neutralization test and agar gel immune diffusion test. It was found from results of MNT that the vaccine efficacy was 70-90% at different areas after five months of vaccination. Till today there was no adverse effect observed in the vaccinated goat and sheep in different regions. The efficacy of *clostridium perfringens* type D developed toxoid in Nigerian sheep was described by Itodo et al., (2009).

From the result it was found that BLRI developed toxin provided a significant protection to vaccinated goats in MNT as demonstrated by its high efficacy (70-90%). It showed the average mortality rate for the control group was 8 times higher than that of the vaccinated group. However, the toxoid's overall protective effect was reduced by the deaths among the vaccinated animals. The reason for this could be that these subjects developed low protective antibody due to some immunosuppressive phenomenon or

genetic variation in individual responses to vaccination. In addition, the MNT was performed after 5 months post vaccination; in some individual antibody level may reduce in course of time. Although planned, in fact, we could not characterize the *Clostridium perfringens* by this time due to some unavoidable circumstances. In agar gel immunodiffusion test, there was development of precipitin in between epsilon toxoid and antibody developed in goat or sheep. It can be concluded that the developed toxoid seems to be effective to protect enterotoxaemia.

A pilot project on Peste des Petits Ruminants (PPR) control in selected areas of Bangladesh

PPR is a highly fatal viral disease of goat and sheep which is characterized by high fever, depression, oro-nasal secretion, respiratory distress, diarrhea, high morbidity and mortality in small ruminants. In Bangladesh, this disease was first identified in the year 1993. Since then PPR is endemic all over the country causing huge economic loss. To control Peste des Petits Ruminants (PPR) in Bangladesh, a live attenuated conventional PPR vaccine was developed by Animal Health Research Division of Bangladesh Livestock Research Institute (BLRI) in 2001 and successfully used in the country. But recently farmers and field veterinarians often raise questions about the efficacy of the vaccine. One of the main reasons of reducing the potency of this vaccine may be due to the fact that the vaccine seed become too old and vaccination is not performing properly. Control of economic diseases such as PPR will increase the national productivity of the small ruminants and reduce poverty among poor farmers. Although sporadic vaccination against PPR has been practiced all over the country for a long time but no specific strategic plan was followed. Currently many PPR prevalent countries with development partner like FAO has been trying to develop strategic control plan based on piloted project, so that PPR can be controlled and eradicated effectively. Until now no such project was implemented in our country. So a small scale pilot project implementation with objective of PPR control has been undertake and its findings can be used as a basis to formulate a nationwide strategic control and eradication program. The objectives of the pilot project involves determination of goat and sheep population in the selected areas, conduct sero-surveillance and epidemiological studies of PPR, awareness campaigns on PPR recognition, prevention and control, development of control strategy, undertake phased vaccination program and assessment of conferred immunity and vaccine efficacy.

Goat population was determined in 5 selected villages (2 villages of Manikgonj and 3 villages of Jessore district) by door to door baseline survey with pre-tested questionnaire. One village (Pouly) under Sadar upazila of Manikgonj district and two villages (Misridiara and Modhukhali) under Jicorgacha upazila of Jessore district are being treated as treatment villages and one village (Chamta) of Manikgonj and one village (Bahirampur) of Jessore district are being treated as control villages. Collection of epidemiological data is going on by regular visit and communication with farmers of study areas. Awareness building campaigns with villagers have been conducting involving both men and women through meeting, regular visit of household, postering and distribution of leaflet. A colour poster about the PPR disease control was printed and distributed to villagers and pasted on strategic public places in the villages. Campaigns were included different aspects of PPR disease, how to identify PPR disease, PPR situation in the villages, aim and goal of pilot project. A mass vaccination program was carried in all goats (3+ months) of 3 treatment villages (where around 2200 goats were vaccinated) after initial sero-surveillance; subsequently regular vaccination is being carried out for kids and newly purchased goats. Five hundred and six sera samples have been collected (according OIE guidelines, based on the study population and considering age groups) for conducting sero-surveillance from the control and treatment villages and 321 sera samples were collected from vaccinated goats for post-vaccination sero monitoring. All sera samples were tested by cELISA following the instruction of the manufacturer of the kit (ID.vet, France).

Baseline study showed that a total of 952 household rear goats in selected five villages where number of goats per household is 3.03-3.45. Predominating Black Bengal breed is reared by the different catagories goat farmers, among them 73.52% are landless and marginal (<0.05-0.49 acres of land/per household),

24.58% are smallholder (0.5-2.49 acres) and only 2.73% are medium land holder (2.5-7.49 acres) farmers. Black Bengal comes in first estrous at the age of 6 to 7 months and gives first kid at the age of 12 to 13 month, usually give births two kids at first parturition. Highest kidding is found in the winter season. Conventional and mixed type goat farming systems are practiced by the farmers.

Pre-vaccination sera analysis showed that in three treatment village seropositive goats were 11.36%, 45.39% and 59.72% in Pouly, Modukhali and Misridiara, respectively, whereas in the control villages seropositive goats were 0% and 53.03% in Chamta and Bahirampur, respectively. Sera analysis from 21 days post-vaccinated goat from the treatment villages showed that 89.47%, 97.87% and 95.10% are positive in Pouly, Modukhali and Misridiara, respectively. Overall 46.53% goats were seropositive in three treated villages before vaccination but 21 days post-vaccination herd immunity rose to 95.65%.

Table 1. Sero-monitoring of pre and post vaccinated sera samples tested by cELISA

SI. No.	Name of the village	Total number of goats	Total sample tested		Results	
			Prevac	Postvac	Prevac	Postvac
Treatment village						
1	Pouly	251	49	38	4 (11.36%)	34 (89.47%)
2	Modhukhali	788	141	141	64 (45.39%)	138 (97.87%)
4	Misridiara	1363	144	143	88 (59.72%)	136 (95.10%)
Control village						
4	Chamta	208	50	0	0%	-
5	Bohirumpur	350	66	0	35 (53.03%)	-

Table 2. Persistence of maternally derived antibody in sheep and goat of BLRI farm

SI. No.	Age Group	Results (%)	
		Sheep	Goat
1	1 month of age (unvac)	12.95	22.37
2	2 months of age (unvac)	18.49	31.26
3	3 months of age (unvac)	41.14	76.39
4	4 months of age (unvac)	39.59	80.48
5	5-6 months of age (unvac)	73.67	81.24
6	3 months post-vac (mother)	19.02	13.32
7	6 months post-vac (mother)	16.64	13.86

Epidemiologically, PPR, FMD and some other non-specific diseases were recorded from February to May, 2014 in the study period. It showed new entry of goats in the household or village is most important risk factor for PPR virus circulation which was found in two outbreaks in the study areas. From the results of persistence of maternal antibody, it can be said that first vaccination in kid or lamb should be given around 3 months of age.

Comparatively sero-positive goats are more in the selected villages in Jessore district as compare to the villages of Manikgonj district. This indicated that either PPR virus circulation was more in Jessore district than that of Manikgonj or farmer hided vaccination records. It is also reflected that locally produced PPR

vaccine confers sufficient herd immunity until the study period. The control program will be designed based on small ruminant (goat/sheep) population, vaccine efficacy, disease outbreak intensity and the local economic situation, and other factors associated with transmission of PPR.

National Reference Laboratory of Avian Influenza (NRL-AI)

National Reference Laboratory of Avian Influenza (NRL-AI) received 4720 swab samples and 2708 serum samples from native ducks and pigs under the FAO project during 2013. All the swab samples were tested and found negative for influenza A. Serum samples from native ducks and pigs were found 47.36% and 27.75% seropositive respectively using ELISA against Type A influenza virus (Table 1).

Table 1. Results of RRT-PCR & ELISA from swab and serum samples of duck and pigs

Sample and test type	Species	
	Native duck	Pigs
Swabs samples	3620	1100
Real time RT-PCR for Type A influenza	Negative	Negative
Serum samples	1803	965
ELISA for Type A influenza	47.36%	27.75%

During July to September 2014, a total of 3319 virological swab samples were also received including 3066 samples from native chickens, 132 from native ducks, 65 from quail and 56 samples from pigeon. In addition 418 serum samples were received which were collected from same species under the FAO project entitled "Emergency Surveillance Response to Avian Influenza (H7N9) in China and High Risk Countries". All the swab samples were tested by real time RT-PCR for Type A influenza virus matrix gene and different subtypes viz. H5, H7 and H9 of AI virus. Serum samples were tested for determination of antibody titers against H5 AI virus using HI assay.

Table 2. Prevalence of avian influenza virus (AIV) in different species of birds

Species	Sample type	RRT-PCR Results (Positive)						Species (%)
		Sample No.	Influenza A[*]	H5	H7	H9	Total	
Native chickens	Oro. swab	1572	08	21	0	11	40	49 (1.6%)
	Cloacal swab	1494	02	05	0	02	09	
Native ducks	Oro. swab	68	0	0	0	0	0	0%
	Cloacal swab	64	0	0	0	0	0	
Quails	Oro. swab	32	0	0	0	0	0	0%
	Cloacal swab	33	0	0	0	0	0	
Pigeons	Oro. swab	28	02	01	0	0	03	3 (5.36%)
	Cloacal swab	28	0	0	0	0	0	
Total		3319	12 (0.36%)	27 (0.81%)	0%	13 (0.4%)	52 (1.6%)	

[*] Subtype not determined

The results of real time RT-PCR revealed that, a total 52 samples (1.6%) were found positive for influenza A, of which 49 were from native chickens (1.6%), 03 from pigeon (5.36%), samples from

native ducks and quails were found negative. Out of 52 influenza A positive samples, 27 (0.81%) H5 of which 26 from native chickens and one was from pigeon and 13 were (0.4%) H9 positive from native chickens and 12 (0.36%) were undetermined AI subtypes. There was no single case found for novel H7N9 avian influenza virus during this study. Serum samples from native chickens and quails were positive for presence of antibodies against H5 virus while serum from ducks and pigeon were negative for H5 avian influenza virus.

From 2007-2012 a total of 556 clinical outbreaks of HPAI H5N1 were diagnosed in samples submitted to BLRI, but the submission remarkably declined in 2013-2014. Only 05 samples submissions from suspected HPAI outbreaks were received and found H5N1 positive during the period from July 2013 to June 2014.

Avian influenza antigen development for HI test:

NRL-AI developed H5N1 (2.3.2.1 Clade) antigen for hemagglutination inhibition (HI) test and supplied to the other related laboratories for avian influenza diagnostic purpose. The laboratory also developed H9N2 avian influenza antigen for H9 influenza antibody test.

Bacteriology Laboratory

Since February 2014, bacteriology laboratory of AHRD testing the milk samples from central cattle breeding and dairy farm (CCBDF), Savar for to monitor the bacterial load in milk. A total of 24 milk samples were collected randomly and processed for quantitative analysis against Total viable counts (TCC) and Total Coliform counts (TCC). From the results it is revealed that average 3.6×10^8 cfu/ml TVC and 1.7×10^8 cfu/ml TCC in February, 1.64×10^7 cfu/ml TVC and 4.4×10^6 cfu/ml TCC in March, 0.043×10^5 cfu/ml TVC and 0.006×10^5 cfu/ml TCC in April, 0×10^5 cfu/ml TVC and TCC in May, June, July; 0.08×10^5 cfu/ml TVC and 0×10^5 cfu/ml TCC in August, 0.5×10^5 cfu/ml TVC and 0.35×10^5 cfu/ml TCC in September, 3.25×10^5 cfu/ml TVC and 0.45×10^5 cfu/ml TCC, 0×10^5 cfu/ml TVC and TCC in November, 0.05×10^5 cfu/ml TVC and 0×10^5 cfu/ml TCC were found during the year 2014.

Other activities of AHRD

1. Monitoring of poultry health status and certification for BLRI poultry research farm.
2. investigation of disease outbreak
    i. Act as a member of investigation team of horse death in Military Farm, Savar, Dhaka.
    ii. Act as a member of investigation team of bull mortality in Milk Vita, Baghabari, Sirajgonj.
    iii. Investigated the cause of Rhinoceros death in national zoo, Dhaka.
3. Support services to other research division of BLRI
    i. Provided facilities to hands on practices on cell culture to the scientists from Biotechnology research division.
    ii. Provided microbiological test support against microorganisms when moringa trees of BLRI aggressively affected by unknown agents.
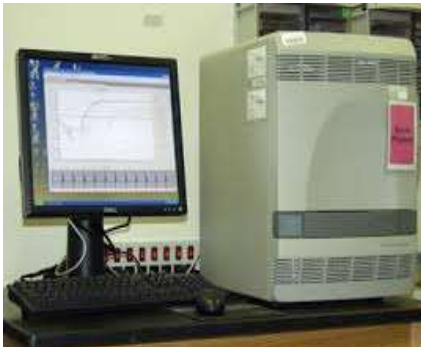   iii. Providing treatment and advisory support to the BLRI poultry, cattle and buffalo research farm.

RNA extracted from virus

Automated Nucleic Acid Extractor

Real time PCR Machine

7500 Real time Fast Machine

Nucleic Acid Sequencer

Cell culture

Group photo with USAID, FAO expert

NRL-AI visited by 4 way linking group

NRL-AI visited by USDA people

SAARC Regional Leading Diagnostic Laboratory for PPR (SAARC RLDL- PPR)

With the aim to prevent and progressively control PPR, establishment of SAARC Regional Leading Diagnostic Laboratory for PPR (PPR RLDL) in Bangladesh was approved by the 13th SAARC summit held in Bangladesh on 12-13 November 2005. Then a meeting of Taskforce on PPR laboratory establishment, formulated by ministry of Fisheries and Livestock (MoFL), was held on 26 July, 2006 with chairman, Secretary MoFL and a decision was taken to establish the PPR RLDL at Bangladesh Livestock Research Institute (BLRI), Savar, Dhaka. Finally on 12.09.2011, Govt. of the People's Republic of Bangladesh designated the Virology Laboratory of BLRI as PPR RLDL (MoFL/L-2/Bird flu/Misc-10/2006(part-1)/366 Dated: 12.09.2011).

Molecular diagnostic facilities:
Facilities for molecular techniques includes, Conventional RT-PCR, real-time RT-PCR and Electrophoresis & gel documentation apparatus.

Cell culture facilities:
The lab has primary cell culture and cell line facilities. Vero cell (African Green Monkey Kidney Cell) is used to culture PPR virus.
Serological facilities:
PPR RLDL has facilities for the detection of antibodies against PPRV by using competitive ELISA kit and microplate reader.
Bacteriological culture and Biochemical test facilities:
PPR is a viral disease. However, it requires differential diagnosis from other disease including Pasteurellosis. So, the lab has facilities for bacterial culture and biochemical tests.
Routine activities related to PPR on RLDL:
1. Diagnosis of clinical field sample by PCR and real-time PCR.
2. Serological examination of serum against PPRV in goats and sheep.
3. Epidemiological study of PPR.

Summary of PPR related activities

Different types of clinical samples have been collected from PPR affected sheep and goat in different location of the country. e.g. Gazipur, Rangpur, Khulna, Manikgonj, Jessore, Dhaka, and Bhola. In this year (up to December, 2014) total no. of collected sample are 51. Forty two clinical samples have also been received from 2 SAARC countries (Bhutan and Maldives). These were tested both in classical and real-time RT-PCR. Besides these, 281 serum samples from different areas of Bangladesh and 164 serum samples from Bhutan and Maldives have received and tested by cELISA. However, 1593 serum samples have been collected and tested for monitoring of PPR vaccine efficacy under pilot project of PPR in two districts (Jessore and Manikgonj). Besides this activities, continuous cell passage of Vero cell in running in the cell culture laboratory for virus culture and isolation. Lamb kidney cell line has been prepared from lamb (first time in Bangladesh) and 2 local isolates were cultured and passaged for 7 times. PPR diagnostics development is going on. Recently, SAARC RLDL-PPR has been participated in PPR Proficiency Test (PT) 2014 (PT2014) organized by Animal Production and Health Laboratory (APHL), FAO/IAEA Agriculture and Biotechnology Laboratory (ABL), IAEA Laboratories, Vienna, Austria.

Figure. Cell culture performing in the PPR-RLDL

Figure. Conventional PCR machine in the PPR-RLDL

Poultry Production Research Division

The mandate of this division are to solve the problems related to the i) production of chicken, duck, pigeon, quail, geese and rabbit ii) breeding ,feeding, nutrition, housing and management of those species' iii) processing of poultry products and by-products like meat egg, feather, droppings, offal's and iv) training of trainers (TOT), training of farmers and NGO workers, technology development, dissemination, verification and transfer to the end users directed towards the development of poultry production. The following researches were accomplished during 2014.

Maintenance and conservation of Shuvra parent & promotion of Shuvra

Highlights: The research was aimed to maintain and conserve pure lines of Shuvra parents and motivation of farmers for Shuvra rearing.Body weight, egg production and egg weight at 38 weeks of age was increased while age at sexual maturity was decreased than the pure lines of previous generation. In conclusion, the maintenance and conservation program of pure lines at BLRI seems to be in right direction as performances of the pure lines are gradually improving. The promotional activities of Shuvra should be continued giving emphasis on vent sexing so that the farmers could get smooth supply of Shuvra DOC.

Shuvra (BLRI Layer- 1)

Table: Performance of BLRI layer-1 (Shuvra)

Parameter	Performance
Live weight at 30 wks (g/bird)	1700
Feed intake (g/bird/day)	115-120
Age at first egg (week)	19
Annual egg production	280-295
Egg weight at 38 weeks (g)	62

Field trial of BLRI layer-2 (Shorna)

Highlights: BLRI has developed a new layer strain named BLRI layer-2 or "Shorna" that can produce brown shelled eggs. The on station performance found satisfactory and the layer need to be judged under field condition before releasing for commercial production. For that purpose, about 3000 female chicks distributed among the three pre-selected farmers in 3 areas of the country e.g. Shorishabari, Jamalpur; Babuganj, Barisal and Kalihati,Tangail. The live weight, feed intake, sexual maturity and mortality count was appreciable. Performance of BLRI layer-2 seems to be promising until this period but finally we will compile all the information as a brown shelled commercial layer.

Shorna (BLRI Layer-2)

Table: On station performance of BLRI layer-2 (Shorna)

Parameter	Average performance
Egg production	295-300 no/yr
Egg weight	64-65 g/egg
Body weight	1700-1800 g
Feed intake	115-120 g/d
FCR	2.3-2.31
Age at first egg (day)	135.33
Mortality (%)	5.67
Auto sexing	At day old
Egg color	Brown

Conservation and improvement of native chicken

Highlights: The study was conducted with a total of 1278-day-old chicks comprising of 3 types of chicken namely Naked Neck (NN), Hilly (H) and Non-descript Deshi (ND) considering the following objectives (i) to assess the performances of three indigenous chicken genotypes under intensive management (ii) to estimate co-variance components and genetic parameters of economic traits of Indigenous Chicken genotypes and (iii) to estimate realized responses to selection to improve 3 Indigenous Chicken genotypes. Significant body weight differences among the genotypes were observed at the age of first egg lay, with the highest body weight observed for H (1499.0±9.5g) genotype. In terms of body weight, H genotype was superior. Based on the performance of produced generations, the study revealed H genotype to be a good starting material for improving meat production. Response findings in different traits indicated an impetus for continuing the pure breeding selection program for more generations.

Common deshi	Hilly	Naked naked

Conservation and improvement of Quail

Highlights: The study was conducted with four genotypes of quail like Japanese (J), White (W), Black (Bl) and Brown (Br) quail are being maintained at BLRI with the objective to develop a suitable meat type quail genotype for our existing farming.Significantly higher body weight was found in W and Bl followed by Br and J quail genotypes at different period of age. Significantly more number of eggs was obtained in Bl (97.31) followed by J, Br and W respectively. Based on the performances W and Bl quail were superior for body weight and Bl quail for egg production. These findings give us more attention for continuing the quail breeding research for producing a suitable meat type quail genotype in our country.

| Japanese | White | Brown | Black |

Study on moringa leaf meal (MLM) as natural feed additives on the growth performance and meat quality of commercial broiler chicken

**Highlights:** A study was conducted to investigate the effect of moringa leaf meal as an alternative to antibiotic and natural feed additives on the growth performance, meat quality and carcass yield of broilers. Broilers were assigned to 6 different inclusion levels of MLM diets; control, antibiotic, 0.5%, 1.0%, 1.5% and 2.0%. The birds were fed the experimental diets and water was provided without restriction throughout the experimental period. The results showed that significance (p<0.05) effect on final body weight and weight gain in dietary supplementation of 1.5% MLM as compared to that control group. Moreover meat quality has also positive response in moringa added group. MLM in broiler diets can be used for enhancing growth performance of broilers.

| Experimental feed | Broiler chicks | Vaccination | Dressing yield (%) |
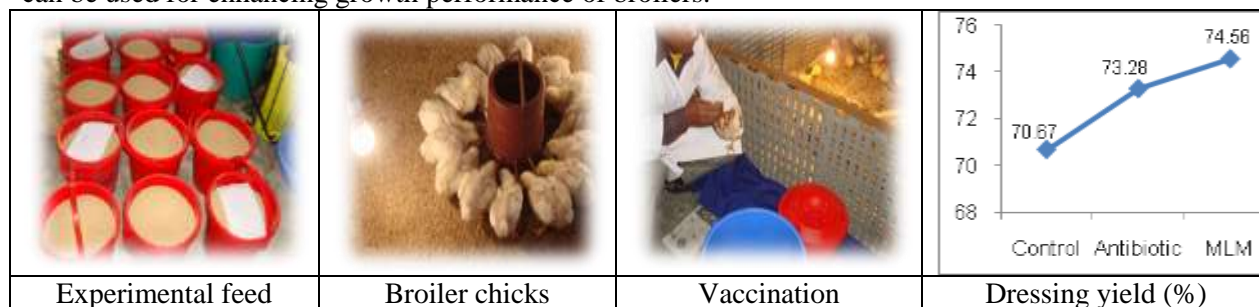
Study on screening and development of vitamin mineral premix suitable for poultry

Highlights: A study with broiler chicken was conducted to test the efficacy of developed vitamin mineral premix contrast with commercial vitamin mineral premix and control group. A total of 270 day-old broiler chicks were randomly weighed and assigned to six dietary treatments (Control, DVMP1, DVMP2, DVMP3, CVMP1 and CVMP2) in a group of 45 birds each treatment. FCR reduced significantly in different levels of VMP in both developed and commercial VMP contained diet compared to control diet. The result of the current study reveals that the low to medium levels of DVMP are suitable combination of the developed vitamin mineral premix which obviously could be reduced dependency of imported VMP in Bangladesh.

| FCR (%) | Weight gain (%) | Experimental pan | Tagging |
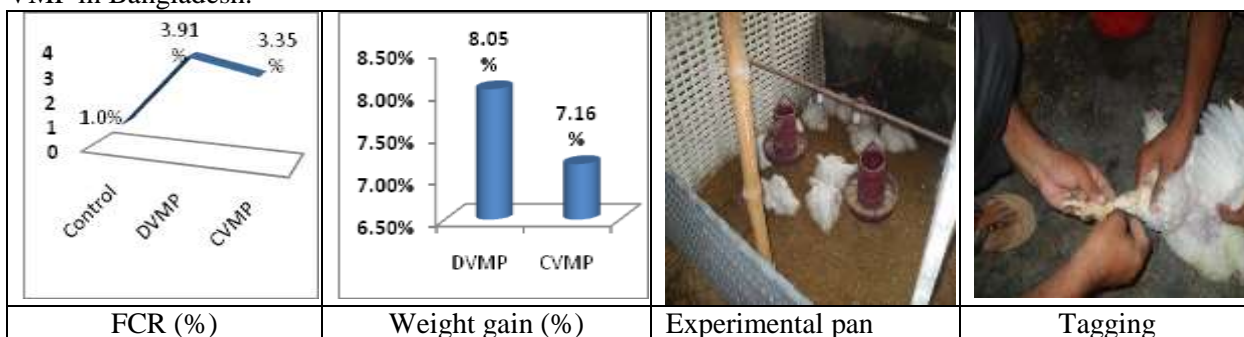
Conservation and improvement of duck germplasm of BLRI

Highlights: This study was taken to evaluate the reproduction and growth traits of BLRI developed native duck germplasm. A total of 504-day-old ducklings comprising of 2 native ducks namely Rupali and Nageswari were hatched for this study. Hatching data and growth rate data were recorded. Collected data were analyzed by t test. Fertility and hatchability rate of Rupali duck is higher than Nageswari duck. Egg, duckling weight and egg duckling weight ratio was better in Rupali duck. At 4th week of age Nageswari duck had higher body weight but at 12th weeks of age rupali duck had higher body weight. There was no significant variation in feed intake and FCR among the duck genotypes. As a result of selection, body weight at 12th weeks of age was expected to improve by 49.43 vs 20.01; 53.10 vs 18.08 g respectively for Rupali and Nageswari males and females. The study will be continued for selection of superior parents from 1st generation (based on egg production and egg weight) to produce progenies for next generation.

Rupali Duck

Nageswari Duck

Table: Average performance of BLRI developed native duck

Parameter	Performance	
	Rupali	Nageswari
Fertility %	77	67
Hatchability %	81	77
Egg weight (g)	61	58
Feed intake (g)	152	150
Egg production (no.)	180-200	200-220

Omega-3 enriched chicken egg production through dietary manipulation

Highlights: This study was taken to production of n-3 enriched chicken egg. A total 160 White Rock layers, 56 weeks of age were used. The treatments were containing 0 (T1), 5 (T2), 10 (T3) and 15% (T4) linseed with basal diet. Number of egg production almost similar for all dietary treatment groups but higher egg mass found in T3 group. T2 found lower feed intake but get higher egg mass/ bird/week. T2 and T3 dietary group found better FCR then other group. Egg lipids were enriched in the n-3 fatty acids of α-linolenic acid and DHA, in the 10% and 15% linseed-fed groups compared with the other groups. The result also showed that different dietary level of linseed in layer ration did not influence the egg albumen quality and yolk index. The inclusion of linseed in layer diet increase n-3 fatty acid content in eggs which is highly encouraging particularly for the health conscious people. The study will be continued for investigating n-3 and other fatty acid in eggs.

Table. Poultry population dynamics at PPRD

Sl. No.	Species	Bird no
1	Pure line (male and female)	962
2	Shuvra (growing chicks)	545
3	Shorna (growing chicks)	600
4	Shuvra (layer)	264
5	Shorna (layer)	45
6	Commercial strain (layer)	48
7	Native Chicken	1048
8	Assel	12
9	Duck	407
10	Quail	2644
Total		6575

Field day at Hizlarpul, Babugonj, Barisal

Bangladesh Livestock Research Institute (BLRI) has developed a new variety of layer chickens "BLRI Layer Strain-2". The institute has developed this variety with the technical support of Japan International Cooperation Agency (JICA). The new variety is named as "Shorna" which lay brown shelled eggs.The special trait of the new variety is that male and female chicks can be differentiated from birth.The white chicks are male, while the brown ones are female. This variety will lay 292 eggs in a year with bigger size. The institute has successfully completed on farm trial and has found promising results. To validate the performance of Shorna, BLRI has distributed this layer strain at three regions of Tangail, Jamalpur and Barisal district of the country. During the last month, Poultry Production Research Division was arranged a field day at Hizlarpul, Babugonj, Barisal on 11th December, 2014 by the presence of Director General, BLRI, university teachers, BLRI and DLS officials, poultry scientist and experts, farmers etc.Director General of BLRI visited Shorna farm and express his opinion in the media. Shorna rearing farmer Md. Kholilur Rahman commented that they have benefited by rearing this layer variety, which laid bigger eggs with higher production efficiency. Therefore, "We will officially hand over the variety through a programmesoon," said Md Nazrul Islam, director general of BLRI.Dr. Islam also added that it is an emerging need to spread this variety through Department of Livestock Services and different breeding companies of the country then will save foreign currencies.

List of poultry feed analysis that has been done during 2013-14

Sl.no	Source of Sample	Sample number	Feed sample	Sample number	Nutrient contents	Total test
1.	Commercial feed company	03	Mixed feed	7	DM, Mo, CP, CF, EE, Ash	45
			Individual feed ingredients	4	DM, Mo, CP, CF, EE, Ash	20
2.	Small scale farmers	10	Mixed feed	6	DM, Mo, CP, CF, EE, Ash	15
			Individual feed ingredients	6	Mo, CP, Ash, P	8
3.	BLRI research sample	-	Mixed feed	37	DM, Mo, CP, CF, EE, Ash	109
			Meat sample	14	CP, EE, Ash, Mo	56
4	Other organization	1		5	DM, Mo, CP, CF, EE, Ash	20
	Total	14		79		273

Lab Equipment's at Poultry Feed Analysis Lab

Oven

Crude fiber analyzer

Crude protein analyzer

Muffle furnace

Ether extract analyzer

Atomic absorption
spectrophotometer

Spectrophotometer

Amino acid analyzer

ELISA Reader

Sample analysis

Goat and Sheep Production Research Division

Mandates of Goat and Sheep Research Division are: i) to generate goat and sheep production technology in relation to their breeding, feeding, healthcare management for improving their productivity in relation to goat and sheep production for socio-economic improvement of farmers. Researches accomplished in this division during 2014 are as follows:

Study on Development of Boer goat at BLRI

The objective of the study is to evaluate the productive and reproductive performances of pure Boer goats and their progenies in Bangladesh conditions. The research was started at Goat Research Station of Bangladesh Livestock Research Institute (BLRI), Savar, Dhaka from January 2014. All the does and buck were kept in permanent house with slated floor raised above the ground level with sufficient space to keep them comfortable. Animals were supplied green grass *adlibitum* and concentrate (17% CP, 11MJ/kg DM) were offered twice daily (morning and evening) at the rate of 300g per head per day. Milk yield was recorded and composition was analyzed throughout the lactation period. The birth weight (kg) of newborn kids was taken by digital weighing balance within one hour after the birth. The subsequent weights of kids were recorded in the morning before feeding up to fortnightly throughout the year. The pure breeding (Boer goat male × Boer goat female) program was conducted initially at BLRI was design such way, which resist inbreeding. Subsequently, data on productive and reproductive performances was recorded. The average birth weight of Boer kids at Goat and Sheep production Research Farm of BLRI was 3.78 ±0.60 kg. The average weaning weight and weaning age of Boer kids were 19.83±0.68 kg and 88.0±1.92 days, respectively. The average growth rate of Boer kids was 0.180±0.003 kg/d. The average milk yield of Boer 'does' was 0.867 ±0.48 kg/day. Milk composition such as dry matter, fat, crude protein and ash were16.34 %±0.53, 5.63% ±0.20, 4.08% ±0.14 and 0.775%±0.04, respectively. The days open and weight of 'does' at post partum heat were 108.50±3.50 days and 46.18±4.93 kg, respectively.

Figure 1: Boer goat Buck and Doe

Bio-technology Division

The mandates of Biotechnology Division are

1. To conduct R&D using biotechnological tools applicable for increasing productivity of livestock and poultry species.

2. Technology development, demonstration, verification and transfer to the end users directed towards the development of livestock and poultry industry.

3. To provide policy support related to application of biotechnological tools in livestock and poultry development for improving socio-economic conditions, ensuring food-security and employment generation for the common people.

4. To set up a Centre of Excellencies for R&D of livestock and poultry biotechnology

Multiplication of Red Chittagong Cow using Ovum Pick Up (OPU) Approach

Establishment of embryo culture system maintaining genetic identity of embryos

In vitro embryo production (IVP) technology is used for multiplication of high yielding dairy and beef cows in many developed and developing countries. Application of this tool in the traditional cattle breeding requires oocyte aspiration protocol from donor's ovaries and a consistent embryo culture, storage and transfer system to recipient cows/heifer. By this time, *in vitro* embryo culture system with slaughterhouse bovine ovaries was adopted. Therefore, this study was aimed to i) develop a culture system suitable for culture of smaller number of cumulus-oocyte-complexes (COC) (less than 10 COC), ii) to adopt embryo cryopreservation and iii) to evaluate *Brucella abortus* contamination risk of *in vitro* produced bovine embryos. To achieve above objectives, slaughterhouse bovine ovaries were used for this study. Oocytes were aspirated using a 10-mL disposable syringe attached with 21G needle and searched under stereomicroscope. Oocyte possessing an even cytoplasm and covered with minimum 3 layers of compact cumulus cell were subjected to maturation *in vitro*. The matured COC were fertilized *in vitro* (IVF) using fresh semen capacitated by treating with heparin. After IVF, cumulus cells were removed by gentle pipetting and denuded zygotes were subjected to *in vitro* culture (IVC) for blastocyst development. Cleavage rates were evaluated at day 3 (day 0= day of IVF) and blastocyst rate at day 8 as a proportion of the presumed zygote transferred into IVC-I medium. Mean and standard deviation was calculated using Microsoft Office Excel. Results show that duration of treatment of spermatozoa with heparin had no significant effect (P> 0.05) on capacitation of spermatozoa as evaluated by cleavage and blastocyst development rates. The effect of COC density on embryo development efficiency was evaluated in another experiment. Results show that development rate up to cleavage did not affect by COC densities. Single COC did not reach to the blastocyst stage when cultured individually. The development rate to the blastocyst stage was 13.9±9.0 %, 10.8±4.9% and 16.6±3.9% for 3, 5, and 10 embryo groups respectively (Table 1). Alternatively, the GPS group culture allowed the smaller numbers of COC (1, 2, 3 and 4 COC per chamber) to develop at blastocyst stage (Table 2). In third experiment, research was carried out to adopt bovine embryo cryopreservation protocol. This experiment was conducted two times but preserved embryos did not survive after post thaw culture. This experiment is continuing for standardization of the protocol. In fourth experiment, the risk of *Brucella abortus* contamination status of *in vitro* produced embryos was evaluated. No *Brucella abortus* organism was detected in blastocyst, laboratory water, semen and different culture media. In conclusion, the GPS group culture system may be used for production of *Brucella abortus* free blastocyst with small number (<10 COC) of bovine oocytes.

Table 1. *In vitro* embryo development efficiency in conventional droplet culture system (P>0.01)

Group	% Cleaved	% Blastocyst
A (1 COC under 120µ droplet)	50.0±22.4	0.0[b]±0.0
B (3 COC under 120µ droplet)	72.2±10.2	13.9[a]±9.0
C (5 COC under 120µ droplet)	71.7±3.8	10.8[a]±4.9
D (10 COC under 120µ droplet)	75.5±2.7	16.6[a]±3.9
GPS (10 COC under 120µ droplet)	72.6±6.1	22.6[a]±5.2

Table 2. *In vitro* embryo development efficiency (Mean±SE) in GPS group culture system

Group	% Cleaved	% Blastocyst
GPS-1 (1 COC in one chamber under 120 µL droplet)	66.7± 21.1	16.7±16.7
GPS-2 (2 COC in one chamber under 120 µL droplet)	75.0±11.2	25.0±11.2
GPS-3 (3 COC in one chamber under 120 µL droplet)	75.0±8.3	25.0±8.3
GPS-4 (4 COC in one chamber under 120 µL droplet)	73.6±6.6	23.6±5.0
GPS (10 COC in four chamber under 120 µL droplet)	72.6±6.1	22.6±5.2

Multiplication of Red Chittagong Cow using Ovum Pick Up (OPU) Approach

Establishment of Ovum Pick up (OPU) protocol for Multiplication of Red Chittagong cattle

This research program was designed to generate baseline information on follicular statistics of Red Chittagong Cattle (RCC) and to establish an oocyte aspiration protocol from donor cow. Ten heifers and ten regular breeder RCC cows were selected randomly from BLRI Research Herd. The ovary was grasped by inserting left hand through the rectum and the follicles were visualized by inserting a sectorial probe through the vagina. Before inserting the probe through vagina, it was disinfected by swabbing with 70% alcohol. Ovarian follicles were visualized using ultrasonography machine (Figure 1). Follicle numbers were recorded by counting on the screen of ultasonography machine. The diameters of follicles were recorded by measuring length and breadth of each follicle on the screen of ultrasound machine. All visible follicles (>2.0mm) were counted and graded as small (<3.0 mm), medium (3.0 to 8.0mm) and large (>8.0mm). The follicles were measured 3 times at a 3-day interval period without considering the stage of the reproductive cycle of the experimental animals. The statistical analysis was done using 'SPSS-11.5' statistical package. During this experiment, a total of 137 follicles (66 in Heifers and 71in cows) were observed from 10 heifers and 10 cows. The corpus luteum was observed either in the left or right ovary of 25.0% heifers and 35.0% cows. In heifer, 40.91, 45.45 and 13.64 % of the studied follicles were belonged to small, medium and large groups respectively. The percentages of small, medium and large follicles in the cow ovaries were 54.93, 39.44 and 5.63 % accordingly (Table 1). The number of follicles in an ovary did not vary (P<0.05) between right and left ovary of a heifer or cow. The diameter of the largest follicle of each ovary was recorded during this study. The diameter was smaller (P>0.05) in the heifer (9.43±0.34mm) compared to the cows (11.2±0.73mm). The experiment on standardization of oocytes aspiration protocol from donor cows is going on. In conclusion, the present study developed base line information on ovarian follicular statistics of RCC heifers and cows. This information will be helpful during aspiration of ovarian follicle from donor cows.

Figure 1. Ultrasonographic visualization of ovarian follicle of Red Chittagong Cow. The arrow showing enlarged part of Ultrasonographic view. A large follicle was marked by white circle.

Table 1. Ovarian follicular statistics of heifers and cows of Red Chittagong Cattle

	Follicle per ovary	Right ovary	Left ovary	Overall
Heifer	Number of follicles per ovary (no.)	3.60±0.30	3.00±0.46	3.30
	Small	1.25^b±0.28	1.45^a±0.20	40.91 %
	Medium	1.75^a±0.31	1.25^a±0.29	45.45%
	Large	0.60^b±0.15	0.30^b±0.11	13.64%
	Significance	0.05	0.01	-
Cow	Number of follicles per ovary (no.)	3.80±0.42	3.30±0.58	3.55
	Small	2.30^a±0.50	1.60^a±0.41	54.93%
	Medium	1.40^a±0.24	1.40^a±0.27	39.44%
	Large	0.24^b±0.08	0.26^b±0.08	5.63
	Significance	0.01	0.01	-

Socio-Economics Research Division

Mandate of this division is to undertake studies on socio-economic aspects of livestock and poultry, impact study of different technologies, evaluation of different livestock development projects, economic studies on different livestock species, feeds and fodder marketing of livestock, their products and by-products.

Socioeconomic Research Division is one of the important Research Division among Eight Research Division of Bangladesh Livestock Research Institute.

Socioeconomic Research Division pertains Economic Analysis of livestock production system, socioeconomic evaluation of livestock development programmes and identification of marketing problems of livestock and poultry products and by-products. In addition to routine analyses of socioeconomic impact of new technologies developed in livestock sectors. It also engaged in conducting cost and return analysis of livestock products and by-products under different management system. Besides, the division takes part various research projects according to national demand and situation.
In 2013-2014 financial year, the division undertaken the following research projects and the research highlights of these two projects are given below:

Fodder Production and Marketing system in some selected areas of Bangladesh

The study determined the income coefficient of various fodder farm households, fodder production, processing and marketing system, estimated profitability of fodder farmers and constrains to its production. In this regard, four study areas were selected from four districts viz: Dinajpur, Jessore, Kurigram and Rangpur purposively considering the concentration of fodder production and marketing. A purposive sampling technique was followed for collecting primary data from the field. In the study 3 categories of sample farmers were selected namely: i) Fodder Producer cum seller; ii) Fodder Producer cum Dairy owner having 1-2 dairy cows as small, 3-4 dairy cows as medium and 5 and above dairy cows as large farmer and iii) Fodder Middleman. A total of 200 fodder farmers were interviewed. Field survey method and focus group discussions were followed to collect necessary data and information. Descriptive statistics and Cobb Douglas type revenue function were applied to meet the objectives and to get the desirable outputs. The study revealed that99 per cent fodder producer cum seller cultivated napier (Pennisetumpur-pureum), whereas fodder producer 90 per cent. The ratio of land under fodder production and farm size was 0.10 and 0.29 for producer and producer cum seller, respectively. In case of cattle holdings fodder farmers reared more cross-bred cattle than the local cattle. The highest number cross-bred cattle (22.95/ farm) were found in Dinajpur district for producer, whereas producer cum seller was 9.88 number per farm in Jessore district. The production cost of fodder for producer was estimated the highest (Tk 1,87,598/ha) in Kurigram district and the lowest (Tk 1,71,883/ha) for producer cum seller in Kurigram district. The bio-mass yield was the highest (214.05 t/ha) for producer in Dinajpur district and the lowest was (201.45 t/ha) for producer cum seller in kurigram district. Annual net return from fodder production was estimated the highest (Tk 2,12,272/ha) for producer cum seller in Jessore district and the lowest (Tk 1,29,806/ha) for producer cum seller in Kurigram district. The BCR was the highest 2.18 for producer cum seller in Jessore district and the lowest was 1.75 for producer cum seller in Kurigram district. The value of income coefficient of the explanatory variable fodder sale for producer cum seller was 0.472, livestock sector was 0.312 for fodder producer and fodder business was 0.770 for fodder middleman. In the study, the owner having 1-2, 3-4 and 4-5 cross-bred dairy cattle earned Tk. 1,20,227, Tk. 1,91,728 and Tk. 4,17,287, respectively, whereas local cattle earned Tk. 33, 658, Tk. 51,601 and Tk. 1,13,558, respectively from milk sell annually.It was found that fodder middleman's income from fodder business highest in Kurigram district was Tk.1,40,400 and lowest in Jessore district was Tk. 1,23,000. The share of fodder business to annual income was highest in Rangpur was 84.94 per cent and lowest in

Kurigram was Tk. 66.64 per cent. Farmers sold surplus green fodder to middleman or to dairy owners. Fodder processing was not happened and fodder markets were unorganized in the study areas. Main marketing channels were: (i) Producer cum seller-Dairy owner and (ii) Producer cum seller-Fodder Middleman-Dairy owner. Problems faced by the fodder farmers were lack of HYV fodder species, lack of knowledge, lack of input facilities, and underdeveloped marketing facilities. The study suggested supply of HYV fodder, provide training on fodder cultivation and preservation, availability of more milk producing cattle breed and create organized marketing structure in surplus fodder production areas.

Fig. 1 After selling milk farmer purchased fodder and carrying it in milk carrying pot.

Fig. 2 Middleman carrying fodder to nearby market.

Impact assessment of GO-NGO interventions on dairy farming vis-à-vis self-managed dairy farming in a selected area of Bangladesh

With a view to address the present status of intervention received by dairy farmers from different government and non-government organizations and its impact on farmers' livelihood pattern in relation to self-managed farmers, this present study was performed in two districts of Bangladesh namely, Manikganj and Sirajganj. The specific objectives of the study were as: to estimate comparative productivity and profitability between intervention and self-managed dairy farmers; to assess impacts of interventions on farmers' employment, income and livelihood pattern; and to identify major constraints and recommend solutions for necessary improvement. Altogether 165 dairy farmers were selected from two districts. A combination of descriptive, statistical and mathematical techniques was applied to achieve the objectives and to get the meaningful result. The BCR were 2.2 for NGO supported and 2.3 for GO supported farmers which indicates that the dairy farming is more profitable under intervention in Sirajganj district. In Manikganj district, BCR is higher for dairy farmers with intervention than self-managed farmers. The productivity in terms of physical volume was higher in case of supported dairy farmers for both the areas which were tested by t-statistics. Financial profitability was enhanced by the amount of Tk. 26731.3 in Sirajgonj district and it was also significant. On the other hand, profitability was enhanced by the amount of Tk. 8932.6 under Manikganj district. In determining the effects of the different variable inputs, four out of six variables (i.e., labor cost, paddy straw cost, green grass cost and concentrate feed cost) were found to have significant impact on gross returns from milk production for

both supported and self-managed farmers. All types of dairy farmers have scope to attain full efficiency in milk production by reallocating the resources. The differences in employment creation were 24.7 for male and 6.2 for female labor under Sirajganj. In Manikganj district, differences in employment were 26.2 for male and 3.4 for female labor. Ravallion test results showed that the income was increased by the amount of Tk. 25400.6 in Sirajganj and Tk. 27133.7 in Manikganj district due to intervention. Expenditure elasticity was also estimated at 0.40% and 0.27% for Sirajganj and Manikganj district respectively which means that expenditure increased by 0.40% and 0.27% respectively, on an average, due to 1% increase in income, other things remaining the same. The asset pentagon approach shows that there is a noteworthy improvement based on different capitals namely, human capital, social capital, natural capital, physical capital and financial capital of supported dairy farming. Although dairy farmers reported problems of lack of adequate capital, unavailability of feeds and fodder, these could be minimized if both government and non-government organizations take proper measures in this regard, which will ultimately lead to improve in farmers' socioeconomic conditions.

System Research Division

Mandate of this division is to identification of problems and prospects related to livestock and poultry production systems, conducting adaptive trials on new technologies development in the major research disciplines of the institute, technology testing and 1st line extension to the real users are the major mandates of the division. The following research was completed during 2014.

Accelerating technology transfer through farmer's training and field demonstration

The study was conducted at Baghabari and Naikhongchari Regional Stations of BLRI with a view to Promotion, adoption and sustainable use of newly emerged BLRI technologies to augment production and income and also to measure knowledge build-up and awareness creation through training and demonstration to induce large-scale adoption of technology. For this 200 farmers were trained on transferable technologies developed by BLRI in 4 batches taking 40-60 in each batch at Baghabari and Naikhongchari Regional Stations .. During training, a few important technologies (UMS preparation and its feeding, wet straw and fodder preservation, silage preparation technique etc) was demonstrated among the participants as practical orientation. Farmer's post-training evaluation results reflected remarkable achievement of score in knowledge build-up through training and their commitment for adoption of technologies.

Training, Planning and Technology Testing Division

Different technology based farmers training courses; scientist training, seminar, workshop, internship and study visit programare arranged by this division. The main vision of planning is to support all kinds of administrative and logistic supports or works to accomplishedproper planning of Bangladesh livestock Research Institute (BLRI). Other than scheduled ones BLRI receives request from ministries and other organizations to incorporate new issues under this divisional activities and alsoto maintain the national and international linkage of Research-Extension-NGO for collaborative research, transfer of technology and capacity building development program. The following activities were accomplished during the financial year 2013-14.

The mandates of this division are to -

a) To train scientists in the appropriate fields of research, at home and aboard, training of trainers (TOT),training of farmers GOand NGO workers;
b) Harmonization of research planning, management and evaluation
c) Strengthen Research-Extension-NGO linkage and explore quick dissemination of locally developed and introduced techniques to the end users;
d) Assists BLRI and all other concerned stakeholdersfor policy making decisions related to livestock and poultry research and development;
e) Co-ordinate the inter and intra-institutional/divisional activities achieving of institutional goal

Activity chart of Training, Planning and Technology Testing Division (TPTTD)

TPTTD

Planning	Training	Technology Testing

1.0
    esearch Management
    (Planning and Evaluation)
	1.0 Training	1.0 Research

(Planning-Institutional evaluation- Approval by technical committee- Budgeting- Midterm evaluation- Reporting)	- In country (Core and Development) - Foreign	**2.0 Technology testing /dissemination**
2.0 ADP management	**2.0 Workshop/ Seminar**	**3.0 Technology Handover/Transfer**
A) Annual work plan/ Procurement plan/ Time based work pla	- In country (Annual workshop and other)	
B) Monthly report	- Foreign	
C) Quarterly report	**3.0 MoU** (GO, NGO, University, Research institute)	
D) Cabinet report (Proposed DPP/TPP/Programme progress)	**4.0 Internship programme**	
E) ADP Meeting(Institutional/Ministry)	**5.0 BLRI visit**	
3.0 Reporting	**6.0 TMIS data update**	
A) Ministry (MOFL, Information department, Cabinet, Finance ministry)		

B) Institutional (Annual Research Review Workshop, Annual report, Newsletter, Proceeding)		
C) Other organization		
4.0 Annual work plan		
5.0 RMIS data update		
6.0 Intra-institutional/division activities management		
7.0 Statementof different Policy (Organogram, BOM, Other policy)		
8.0 Research Monitoring		

Planning

1. **Research Management**

a) Planning & Evaluation encompasses a series of activities are being performed as
- **Policy Planning:** Determination of goals, objectives, priorities, strategies and policy   measures for development plans.
- **Sectorial Planning:** Identification the role of various sectors is required to play in the context of the Plan objectives and goals.
- **Programme Planning:** Formulation of detailed resource allocation to realize the Plan objectives and goals.
- **Project Planning:** Appraisal of projects embodying investment decisions for the implementation of the sectorial plans.
- **Evaluation:** impact analysis of projects, programme and technology by institutional and evaluation committee.

b) Approval: Last 2013-14 fiscal year a total 45 research project were approved by technical committee

c) Budgeting: Allocation of total Tk. 17.5 million for implementation of the approved research project

d) Midterm evaluation: It is a regular basis work and usually arranged in middle of the respective fiscal year

e) Reporting: Accumulate all approved project reports and compiled those reports according to four disciplines in every year.

Photo-1: Technical committee meeting

Photo-2: Midterm evaluation Meeting

2. ADP Management (Both for Institutional and Ministerial)

    a) Monthly report: During 2013-14 near about total 60 reports from five running GoB Projects were submitted to the respective ministry at monthly basis as per ministrydirection.

    b) Quarterly report: Submitted4 quarterly reports during 2013-14year.

    c) Cabinet report:12 progress report were prepared based on cabinet meeting decision

    d) ADP Meeting: Arranged total 12 number of ADP meeting round the year atInstitutional and Ministerial level.

3**. Reporting**

a) **Ministry:**In 2013-14, division submitted total 13 reports to the Ministry of fisheries and livestock which is given the following table

	Subject	Date
1.	Progress report according to guidelines of Prime Minister at secretariat meeting that was held on 19th September, 2012.	20 August, 2013
2.	Campaigning of development program	18 September, 2013
3.	Provide information to include into the speech of Honorable President during the first parliamentary session of 2014 at national parliament.	13 November, 2013
4.	Providing of information and opinion for the midterm evaluation of 6th Five Years Plan.	25 November, 2013
5.	Express opinion about national nutrition policy 2013.	27 January, 2014
6.	Provide information to estimate the costing of implementation of national women development policy 2011 based national work plan.	11 Feb. 2014
7.	To approve the MoU between BLRI and Harbin Veterinary Research Institute of CAAS, China	6 Feb. 2014
8.	Provide report along with statistical data for including into the Bengali form of Bangladesh Economic Census 2014	5 March 2014
9.	Provide information to entry into the budget discussion of fiscal year 2014-15.	25 March, 2014
10.	Provide information to explain the opinion of Bangladesh at 2nd SAARC cabinet meeting.	10 April, 2014
11.	Provide information for gender budget report	13 April, 2014
12.	Opinion about the discussion of eligible possibility, constrains and recommendations at district commissioner conference 2014.	15 June, 2014
13.	Illustrated report about the achievement of ministry of fisheries and livestock during 2009-13.	24 June, 2014

b) Institutional: In 2013-14, division coordinated and formulated the following reports

Annual Research Review Workshop: Held on 19-20 June, 2014.
Annual Report: OneAnnual Report published like other years.
Newsletter: Newsletter published half yearly covering BLRI remarkable news and events. TwoNewsletter
        was published last year.
Proceedings: Proceedings of Annual Research Review Workshop 2012-2013was published.
c) Other Institutional
Memorandum of Understanding (MoU): In 2014, BLRI signed MoU with two International Institutes
    namely Chonbuk National University and Harbin Veterinary Research Institute of CAAS. P.R. China.
    Besides these, MoU with Oxfam, Winrock International, LalTeer livestock LTD, PKSF etc. are in
    under process.
4. **Annual work plan**: Commencementof everyfiscal year BLRI work plan, procurement plan is prepared
    following revenue and development budget to run the research program, infrastructure and
    administrative work smoothly. Progress of activities was evaluatedbased on plan.

5. **Update of TMIS and RMIS data**: To update TMIS and RMIS data base, this division imputed total
    155 research documents in last year
6. **Intra-institutional division management**: Co-ordinate the inter and intra-institutional/divisional
    activities for achievement of institutional goal e.g. Provide scientific updated data to BANSDOC
    database, formulate key personal indicator (KPI) accordingly
7. **Interpretation of Different policy**: BLRI comments were given to develop Livestock and other
    development policy. Manpower shortage it's a great concerned to flourished institutional capacity
    potentials .To overcome this problem a 595 no. of manpower strength was send to respective ministry
    as organogram of BLRI for approval. Besides these every two years later BOM meeting is arranged by
    this division incorporating new things to BLRI rules and regulation.
8. **Research Monitoring**: For preparation and processing of development projects and inquiries on any of
    the subjects allotted to the research division are to be monitored by a scheduled committee.

Training

Training programs are conducted in the institute for enhancing working capacity and skill developmentof the trainees. The training activities are implemented at three levels: local academic, foreign academicand in-service professional.

The training programs conducted by BLRI can be categorized into- (1) Short term training (STT)
(2) Long term training (LTT)
(3) Career development courses
(4) Internship program and Study
       tour
(5)Foreign training program
(6) Workshop/Seminar

Fig-1: Training Program arranged by BLRI during 2014

(1) Short term training program

Short term training program has been arranged for farmers and scientist/officer/staff on technologies and techniques developed by BLRI. This division arranged 4 courses of short term training for farmer, 7 courses for Scientists and 5 courses for staff training in this year. Total participants were 337 numbers (female- 62 and male-275) and total no of short term training were 16 (Table-1).

Table 1. Short term training programs of BLRI for the year 2014

Sl.No.	Name of courses	Duration (days)	No. of participants		Total partici pant	Source of fund	Location
			Male	Female			
Officer's training							
1.	Service rules and office management	15-20 March, 2014	15	14	29	Revenue	BLRI
2.	Inventory Management Information System (IMIS)	09 April, 2014	4	-	4	Revenue	BLRI
3.	Research Management Information System (RMIS)	23 April, 2014	3	1	4	Revenue	BLRI
4.	Training Management Information System (TMIS)	09 April, 2014	2	2	4	Revenue	BLRI
5.	Data Bank	24 April, 2014	2	1	3	Revenue	BLRI
6.	General User Training	24 March, 2014	50	15	65	Revenue	BLRI
7.	Hands on Training on Laboratory of Animal Nutrition	20-22 June, 2014	8	1	9	Revenue	BLRI
Total			**84**	**34**	**118**		
Staff training							
1.	Human Resource Management Information System (HRMIS)	09 April, 2014	3	1	4	Revenue	BLRI
2.	Financial Management Information System (FMIS)	27 April, 2014	2	2	4	Revenue	BLRI
3.	Vehicle Management Information System (VMIS)	09 April, 2014	3	-	3	Revenue	BLRI
4.	Library Management Information System (LMIS)	22 April, 2014	4	-	4	Revenue	BLRI
5.	Procurement Management Information System (PMIS)	28 April, 2014	3	-	3	Revenue	BLRI
Total			**15**	**3**	**18**		
Farmer's training							
1.	Duck rearing and management	27-28 April, 2014	51	01	52	Revenue	Nasirnagar, B.Baria
2.	Cow rearing and management	06-07 June, 2014	39	08	47	Revenue	Sripur, Gazipur
3.	Cow rearing and management	10-11 May, 2014	41	09	50	Revenue	Madhupur, Tangail
4.	Cow rearing and management	25-26 May, 2014	45	7	52	Revenue	Dumuria, Khulna
Total			**176**	**25**	**201**		
Grand Total			**275**	**62**	**337**		

(2) Long term training program

Different PhD (Foreign and In-county) and MS program are included in long term training program. Total 12 numbers of Ph.D. scholars are studying in different universities (Table-2).

Table-2. Information about long term training program (Foreign and Local scholarship) of BLRI

Sl No	Name and Designation	Title	University and Country	Remarks
1	Dr. Sadek Ahmed, SO	Assessment of some factors affecting ruminal fermentation and consequences of rumen acidosis on gut permeability and inflammation appearance	Instito Di zootecnica University Cattolica del sacro-Cuore Piacenza, Italy	Completed
2.	Dr. Md. Rakibul Hassan, SO	To evaluate the effect of retinal and Extra retinal photo stimulation by LED light and tress response of poultry.	Chonbuk National University, South Korea	Completed
3.	Dr. RaziaKhatun, SSO	Detection and Analysis of Antimicrobial Drugs and Feed Additives Residues in Table Chicken	JahangirnagarUniversity	Completed
4.	Mrs. Nasrin Sultana, SSO	Nutritional evaluation of MoringaOleifera as supplementation for goats	University Putra, Malaysia	On-going
5.	Md. AbdusSamad, SO	Nano engineered drug delivery system in ischemia-reperfusion injury of heart	Department of BIN fusion technology, Chonbuk National University, S.Korea	On-going
6.	Hasan Al Faruque, SSO	Molecular Technique for Bio-Medical Research	Kyungpook National University, South Korea	On-going
7.	SardarMdAm anullah, SSO	Effects of fermented persimmon extract supplements on chemical composition and fermentation characteristics of barley silage	Gyeungsang National University, South Korea	On-going
8.	SM Jahangir, SSO	Evaluation of a community based RCC development program	BAU, RCC conservation project	On-going
9.	Md. Asaduzzaman, SSO	Exploration of potential productivity of RCC cows through improve feeding system	BAU, RCC conservation project	On-going
10.	Mrs. ShakilaFaruqe SSO	Breeding to improve some economic traits of indigenous chickens in Bangladesh	BAU, BARC funding	On-going
11.	Mrs. Karun NaharMonira, SSO	Characterization of Indigenous Chicken and Assessing Their Potentiality	BAU, NATP project.	On-going

(3) Career development courses

This is the participatory professional training which is offered by other organizations e.g. GTI, BARI. BARC, PATC, BPATC, BARD. BLRI arranged total 22 numbers of career development courses in 2014 (Table-3).

Table 3. Career development courses for the year 2014

Sl. no.	Date/ Duration	Title	Name of Participants & Designation	Venue	Remarks
1.	6-10 October, 2013	12th human resource planning course	Ali Akbar Buiyan, SO & AD	PATC	Training
2.	4-7/11/2013	Bio-fartilizar production & preservation	Md.Sukkur Ali, Attendant Md.Abdur Rob, Attendant	PalliUnnan Academi, Bogra	Training
3.	16-21/11/2013	RPP and SR writting	Dr. ParvinMostari, SSO Mrs. Halima Khatun, SO	BRAC-CDM, Gazipur	Training
4.	28/11/2013	Procurement MIS	Mrs. RaziaKhatun, SSO	BARC	Training
5.	27/12/2013	Research MIS	Dr.EbadulHuque,SSO Mrs. RaziaKhatun, SSO	BARC	Training
6.	24/9/2013	Dev. Of an electronic compendium…institute	Md. LutfulHuque, SA Md. Shah Alam, IO	BARC	Training
7.	January, 2014	Financial and Economic Aspect of Climatic Change	Dr. MahfuzarRahman, PSO	Dhaka	Training
8.	January, 2014	Role of Information and Communication Technology (ICT) in Climatic Change Adaptation	Dr. Md. Sazedul Karim Sarkar, SSO	Dhaka	Training
9.	January, 2014	Mainstreaming Climatic Change in Development Planning and Management	Dr. Biplob Kumar Roy, SSO	Dhaka	Training
10.	January, 2014	Gender and Social Dimension of Climatic Change	Most. MahfuzaKhatun, SO	Dhaka	Training
11.	11-12 March, 2014	16th Project Management Course	Dr. RaziaKhatun, SSO	BPATC	Training
12.	23-27 March, 2014	Governance, Sustainable Development and Poverty Reduction	Md. Abu Hemayet, SO	BARD, Comilla	Training
13	15 May, 2014	Workshop on Project Planning and Establishment of Biotechnology Incubator	Dr. MahfuzarRahman, PSO	NIB	Training
14.	15-28, April, 2014	Administrative and Financial Management	Dr. Gautam Kumar Deb, SSO	BARD	Training
15.	19/04/2014-01/05/2014	Research Methodology	DR. HafizurRahman, SO Md. PanirChowdhury, SO Md. MasudRana, SO	GTI, Mymensing	Training
16.	11-15 May, 2014	Technical Training on MIS Software	Md.LutfulHaque, System Analyst and Ms. ShakilaFaruk	BARC	Training
17.	03-12 May, 2014	Cisco Certified Nerwork Association (CCNA) (Routing & Switching)	Md.LutfulHaque, System Analyst	BARC	Training

Sl. no.	Date/ Duration	Title	Name of Participants & Designation	Venue	Remarks
18.	22-27 June, 2014	Research Proposal Preparation and Scientific Paper Writing	Md. MukhlesurRahman, SO Md. Obayed Al Rahman, SO	BRAC – CDM, Gazipur	Training
19.	5-6 June, 2014	Financial Management and Project Accounting Procedures For NARS Account personnel	Md. AnamulHaqueKhondakar, Cashier Miss Rekha Sultana, Cashier	BARC	Training
20.	22 June, 2014	Annual NATP National Workshop	Dr. Ershaduzzaman, SSO Ms. ShakilaFaruk, SSO	BARC	Training
21.	25 June, 2014	NATP Second Phase Preparation Workshop	Dr. NathuramSarkar, SSO Dr. Md. Giasuddin, SSO	KrishiKhamar, Dhaka	Training
22.	26 June, 2014	Review of Economic Research Program (2013-14) and Future Research Program (2014-15) of NARS Institute	Md. Saiful Islam, SO Most. MahfuzaKhatun, SO and Begum Sabina Yasmin, SO	BARC	Training

(4) **Internship program and Study tour**

The internship program and study visit of different college/universities were arranged by this division at BLRI Head Quarter. Total 248 number of students of different universities were completed their scheduled internship program at BLRI,(Table-4). In this current year 602 visitors from 9 different institutes visit BLRI. Details are described at Table-5.

Table 4. Study visit programs of others Institute atBLRI for the year of 2014

SL. No.	Name of College	Date of visit	No. of participants
1.	Inter University for Business Agriculture Technology (IUBAT), Uttara, Dhaka	23/07/2013	85
2.	Abul Bashar Agricultural College, Dhamrai, Dhaka	29/08/2013	80
3.	Bangabandhu Sheikh MujiburRahman Agricultural University, Gazipur	12/09/2013	105
4.	Dhaka College	30/01/2014	44
5.	Govt. Debendra College, Manikganj.	02/02/2014	30
6.	Eden Mohila College, Azimpur, Dhaka	16/03/2014	100
7.	MawlanaBhashani Science and Technology University	30/04/2014	35
8.	National Youth Training Academy (NYTA), Savar, Dhaka	17/06/2014	120
9.	IUBAT	10/06/2014	03
	Total		602

Table 5. Internship programs of BLRI for the 2014

SL. No.	Name of University	Duration	No. of participants
1.	Sylhet Agricultural University, Sylhet	01/09/2013-27/10/2013	72
2.	Chittagong Veterinary & Animal Science University, Khulshi, Chittagong.	12/03/2014 -16/04/2014	49
3.	Bangladesh Agricultural University, Mymensingh	20/03/2014-23/04/2014	56
4.	Faculty of Animal Husbandry and Veterinary Science, Rajshahi University	06/04/2014–09/04/2014	13
5.	Sylhet Agricultural University, Sylhet	15/05/2014 -09/07/2014	58
Total			248

(5) Foreign training programs

BLRI arranged foreign training program for development of the skill of respective scientist and officer in regular basis. In 2014, 9 scientists of BLRI participated in 7 numbers of foreign training programs(Table- 6).

Table 6. Foreign Training Programs of BLRI for the 2014

Program Type	Program Title	Venue	Program Focus	Duration	Name of Participant	Conducted By
Skill development	Applied Veterinary Bioinformatics	Foreign	Bangkok, Thailand	Laboratory expertise	26/06/2013-1/07/2013	Dr. ShahinAlam, SO
Seminar	Project Planning Meeting on AnGR	Foreign	Mongolia	Breeding	6/05/2013 1-/05/2013	Dr. Md. Nazrul Islam, DG
Workshop	Inception workshop for FAO technical cooperation project	Foreign	Bangkok Thailand	Laboratory expertise	19/09/2013-20/09/2013	Dr. Md. Giasuddin, SSO
Meeting	Discussion meeting on collaboration and study tour	Foreign	Nairobi Kenya	Breeding	8/10/2013-12/10/2013	Dr. Md. NazrulIslam,DG Dr. Nathu Ram Sarkar, SSO
Workshop	5th World waterfowl conference	Foreign	Vietnam	Breeding	6/11/2013-8/11/2013	Md. Sirazul Islam, SO
Meeting			Vietnam		4/11/2013-10/11/2013	Dr. Md. Nazrul Islam, DG
Workshop	Progressive control of Peste des Petists (PCP-PPR)	Foreign	Nepal	Laboratory expertise	19/12/13-20/12/13	Dr. MJFA Taimur, PSO Dr.Md. Rafiqul Islam, SSO

(6) Workshop/Seminar

Generally this institute organizes the Annual Research Review workshop, to review the completed and ongoing research programs and plan for future agenda of research. The workshop is attended by senior executives and policy makers, NARS scientists and academicians, field-level senior officials of the Department of Livestock Services including NGO's with relevant professional background and interest in livestock research and development. Progress of research is also reviewed in a day-long workshop in the institute and comments and contemplated changes are incorporated to minimize shortfall and ensure right direction of research. Sometimes this division conducts different workshop, seminar to focus the new theme/new entrants. In 2014, total 172 numbers of participants have been participated in 4 different workshops including annual workshop (Table-7).

Table 7. Workshopof BLRI for the 2014

Sl. No.	Date/Duration	Title	No. of participant/Name of participant	Venue	Remarks
1.	6 March, 2014	11th Scientific Research Workshop	Dr. M.J.F.A Taimur, CSO Mrs. ShakilaFaruk, SSO	CVASU	Workshop
2.	26 May, 2014	Workshop on Climatic Change Research	Dr. Md. Sazedul Karim Sarkar, SSO	Mahakhali, Dhaka	Workshop
3.	18-19 June, 2014	Annual Research Review Workshop	168	BLRI HQ	Workshop

Technology Testing

a) **Research:** Along with planning and administrativeworks thisdivision take 2-3 research work targeting need based adaptive research also. In connection with this last year threeresearches were undertake and implement documented in the form of Annual research review workshop proceedings properly.

Livestock marketing in most peripheral areas of Bangladesh: A baseline study

Livestock is a key source of supplementary family incomes andgenerating a gainful employment for livelihood and provides balanced cheap animal food. It is reported that about three million cattle per year is needed in Bangladesh where majority of Muslim population enjoy taking beef. Reported from local market that supply can only about one million cattle, for this the shortfall of two million cattle per year is met by illegal trade primarily at the West-Bengal and Bangladesh border especially North and south part through 17 routes. Bangladesh is a big market for Indian cattle. Thousands of traders are involved in cattle marketing and they used various route avoiding land port which are situated in the most peripheral areas of Bangladesh. There are 68 corridors and 149 sensitive villages on the West Bengal border besides, the riverside borders, the char areas, vast patches of dry land also become convenient for smuggling. More than 2 million cows are smuggled from India to Bangladesh every year.Indiscriminately, imported Indian cattle are sold in various markets in Bangladeshwithout any examination stated by trader and livestock official. Most cases unproductive old aged cow or diseased cattle especially FMD being entered in the market. Money under this business is returned to India through hundi, hand cash, mobile, banking system or other some smuggled goods. Though it looks Bangladesh is benefited but in the long run it will create a drastic bad effect on our livestock resources as well as our total economy. Keeping this mind this research program is taken to find out the problem and prospect of cattle marketing in most peripheral areas as well as to find out the remedies of our local livestock resources avoiding unauthorized and unwanted livestock species from India to Bangladesh. Finding of this research helps to generate a data base, act as guideline of our policy maker, researchersfor formulating an effective national livestock

policy. Considering this 11 land ports is taken such as Hilli, Benapole, Banglabandha, Bhurimari, Sonamasjid, Bibir Bazar, Birol, Meherpur, Bhomra, Bilonia, Baliadungiareas of Bangladesh. From each land port 23respondents (Direct importer, local market trader, ULO officials, Customs and BGB officials, local people and authority a total of 253 responded wererandomlyselected those areinvolved in livestock marketing directly or indirectly. For data collection questionnaire or survey schedule were designed so that the objectives of the study are met and it was pretested.The field level primary data were collected from the respondents following face-to-face interview through the pretested questionnaire. The cost and return of the traders and their marketing chain, factors identify for constraints and prospects of livestock marketing in selected regions, disease pattern, hygienic& quarantine issues, type and population of livestock respective area, nature of involving traders transportation facilities and so on parameters were studied in this study. Simple statistical tools like percentage, mean, tabular data presentation is applied for analysis of data.

The data obtained following survey found that only 30-40 % cattle are brought through legal ways while the rest are brought illegally via different border points. Considering average age of traders among 11 borders were found 28-45 years, family size about5-6 members, education level were 98-99% for illiterate, and 1-2% for primary level education. Besides this for land holding cases average 235 decimal par traders were found and among them 90% were cattle business 10% were in agriculture and fisheries as secondary business.Imported Livestock and marketing information in selected peripheral areas of Bangladesh were shown intable 1& 2. Rate of disease prevalence was observed and found 88.18% for FMD 5.0% for diarrhoea; 4.33% for parasite infestation and 2.28%for BQ. There was no Anthrax cases found out of total surveyed area .Considering the origin of cattle 98% were found Indian and 2% were Nepali. Out of 98% Indian cattle 88.90% were Indian local 8.73% Hariana and 2.1% Shindirespectively. Imported cattle for age cases 4-5 year old found in majority except 2-2.5 years in Meherpur. In fattening program 2-2.5 year's age of cattle are used in Meherpur is observed. For type of species average found 89% cattle and 11% buffaloes. This business is a two way mutual benefit between India and Bangladeshi traders. Irrespective for middleman involvement 4/5 no. found in Indian side 3/4 no. in Bangladesh side and for no. route average7numbers are used for cattle for illegal importation.

Table 1. Imported Livestock information in peripheral areas of Bangladesh

Location	Parameters										
	Species (%)		Age (yrs)	Type (%)			Disease				
	Cattle	Buffalo		Deshi	Hariana	Shindi	FMD	Parasite	BQ	Diarrhea	Other /Facile
Bibir Bazar	75	25	4-5	85	12	3	90	6	-	-	4
Benapole	80	20	5-6	85	18	2	90	5	-	3	3
Vomra	85	15	3-5	90	7	3	95	-	-	-	5
Baliadungi	88	12	5-6	91	7	2	95	-	3	-	2
Banglabandha	96	4	5-6	89	8	3	90	8		-	2
Hilli	95	5	4-5	93	6	1	88	2	2	5	3
Bhurimari	87	13	5-6	75	12	3	80	4	3	6	7
Birol	92	8	5-6	93	6	1	85	2	2	7	4
Sonamasjid	85	15	3-4	88	10	2	90	3	1	3	3
Meherpur	98	2	2-2.5	98	2	-	82	5	2	6	5
Bilonia	94	6	4-5	91	8	1	85	4	3	5	3
Average	88.64	11.36	4-5	88.91	8.73	2.10	88.18	4.33	2.29	5.00	3.73

Basically most of the cattle imported from border areas found illegal way when paid revenue by the trader Tk 500, 200 and 6000 following for each cattle/ buffalo, sheep/ goat and horse is regarded as legal. During 2013 total amount of revenues was collected 200 lac taka from 11 surveyed area and last3 years was higher compare to 2013.Now-a-days smuggling of drug, gold, oil, fuel becomes more profitable and convenient in replace of cattle importation. As a result yearly average no. of traders shifted their business to other business avoiding risk incidence.Based on no of cattle imported by the traders were categorized as small, medium and large where 44.72% found for medium 39.45% small and 15.81% large trader. Suitable time and season for cattle importation by the trader was found 71.63% cases at 3-5 a.m. and 28.36% cases at 10-12a.m. and 63.45% for winter and37.45% for summer.

Table 2. Livestock marketing information in most peripheral areas of Bangladesh

| Location | Parameters | | | | | | | | | | |
| | Imported time | | Middle man | | Imported point/ port | Trade r/ port | Animal/ year (Thousand) | | | | |
	3-5 AM	10-12 PM	India	Bang			2009	2010	2011	2012	2013
Bibir Bazar	76	24	4	4	5	140	21.20	17.25	13.12	9.45	7.89
Benapole	21	79	4	5	9	250	78.25	85.02	90.21	80.32	75.13
Vomra	65	35	4	5	7	260	82.04	80.65	85.65	95.48	90.00
Baliadungi	76	24	4	5	9	245	68.00	52.12	47.03	45.92	40.56
Banglabandha	82	18	4	5	4	40	18.50	16.20	14.02	12.42	10.23
Hilli	80	20	3	4	5	45	45.00	40.72	37.77	32.38	25.90
Bhurimari	78	22	4	4	11	270	10.20	87.34	82.30	72.35	56.23
Birol	76	24	3	5	5	35	17.23	15.78	13.24	12.34	11.02
Sonamasjid	79	21	4	5	9	250	89.63	86.45	83.45	77.65	55.09
Meherpur	74	26	4	5	5	150	70.12	62.45	53.10	87.00	16.50
Bilonia	81	19	3	4	4	120	15.99	13.46	11.23	10.43	11.23
Average	71.64	28.36	3	5	6.64	164	516.16	557.44	531.12	535.74	399.78

The results obtained through this research clearly shows that if there is provision restriction on import of cow from India, local production will increase simultaneously the Bangladeshi farmers will be benefited. For saving our own cattle resource from trans-boundary disease like FMDneed to be controlled of livestock movement from India to Bangladesh along with effective ring vaccination, proper quarantine procedures and establishment of a buffer zone. That would make the trade legal, facilitate health check-ups of animal and generate revenue resulting in the long term both countries well be convinced about mutual benefits.

Value Chain Analysis of Processed Poultry Products (egg and meat) in some selected areas of Bangladesh

Bangladesh is producing more than 400 million of broilers and 6600 million pieces of eggs in her commercial sector representing 60-70% of total poultry meat and 30-40% is being added from scavenging native chicken. Both egg and chicken meat have huge domestic demand. Commercial broilers are also sold as live birds to the middleman on weight basis and eggs are marketed by fixing a rate for 100 eggs. Still the farmers are not well organized and having no regulatory body for them resulting deprived of fair prices of their products most frequently. Driven by economic growth, rising incomes and urbanization, demand is shifting away from traditional staples toward high-value food commoditiesand have been increasing demand of food animal origin. Poultry meat and eggs are the accepted protein sources for all class of people irrespective of race and religion. The benefits of supply chain for this sectors are getting numerous through increased knowledge, higher quality and food safety, reduced costs and losses, higher

sales and value-added in production at farmers level on the other hand for consumers level getting benefit from safer high quality and lower priced products. The development of supply chain can lead to access to new markets and opportunities for smallholders.

The poultry industry is not only meeting local needs very substantially; it has also found newer opportunities from value addition. Some of these local poultry-based value-added products and some have found for export markets as well. Owing to the greater labor intensity characteristic provides an opportunity to generate rural employment and raise rural incomes to reduce poverty in the country. There are many organization in Bangladesh like BRAC, CP Bangladesh, Aftab farm are involve in this kinds of agribusiness and earning a great profit which is contribute in our GDP. This paper will try to come across the insides of the total industry (chickens and eggs value chain actors) from production to end users. There is a lack of reliable data on the nature of high-value poultry commodities (meat and egg) are produced, problem and prospects of this sectors addressing our policy makers, planners, and investors. Systematically benchmarking and monitoring this sector helps to nourishing through information will enable planners to identify, document, and scale-up best practices in high value agriculture and related value chains markets for upcoming days.

For two Districts Dhaka and Chittagong were considered to meet up the aforesaid objectives. A total of 170 from 8 categories of stakeholders taking 10 broiler and10 layer farmers; 10 Chain shop; 10 Fast food shops; 10 Chinese restaurants; 10 Hotel;10Marketer/Buyer;10Consumer and 5 Poultry product processing industries were randomly selected from each Districts and interviewed for information collection through pretested questionnaire. In the research simple statistical tools is applied for analysis of data .Value addition refers to the difference between the total value of product and total cost of production provide margin of profit. The Value chain map of poultry products in the study area are shown in Fig- 1. From surveyed result revealed that for achieving margin of profit considering all production cost along with management activities cost farmers added 10-11% and 12-15% value for meat/kg and eggs/no to whole seller whereas whole seller/aratdar added value 3-4% and 2-3% to retailers and retailers added value 6-7% and 7-8% to the consumers. But whole seller to consumer's added value found 5-6% and 4-5% for meat and egg respectively

There are about thousands of fast food and hotel; 45 premium Chinese restaurants; 27 chain super chain shop; and 4-5 poultry processors are doing their business in our country especially in metropolitan city. Some of them produced processed or further processed products either from own farm or nominated supplier or direct purchase from market. When consider for item of poultry meat and eggs are produced by the said supply chain actors for hotel average 5-6 no. meat type item and 3-4 egg type item were found, whereas Chinese restaurant 17-18 meat products and 8-9 no. egg products, for fast food shop cases 28-30 no. meat products and 6-8 egg products and for chain super market found 40-45no. meat products and 7-8 no. egg products found. The surveyed findings showed about 40-45% and 20-25% value added on meat and egg in fast food shop owners whereas 35-40% and 25-30% in hotel; 48-52% and 32-35% in Chinese restaurant ; 23-25% and 12-15% in chain super shop on meat and egg respectively.For ensuring available safe and quality food and also consumers demand value chain actors are come forward to run processed or further processed business .Keeping this mind a few numbers (BRAC, Aftab,Kazi, White chicken, CP, Paragon,Rich, Golden Harvest) of poultry meat and egg processing entrepreneurs' are working to deliver the value added poultry meat and egg in different form either processed or further processed. BRAC and Aftab is the two main key organization those are starting this business since last 10-15 years. BRAC and Aftab main clients are in different dimension such as five star hotel (RaddisonRupashi; Pan pacific;Westinn; Dhaka regency) Super chain shop (Agora;Sopno;Meena Bazar;Nanadan; Prince Bazar; PQS)Hospital (Square; United; Appolo; Sikder; Labaid) School (American; Sholastica and STD) Fast food shop (KFC; BFC; CFC; SFC; Halvatia; Luncheon; Pizza hut ; Boishaki; Kastauri and star kabab) etc

From processors or further processor statement, their average value addition level on processed poultry meat 25-30% and further processed meat 120-125%. When live market will be stopped then the rate of value addition will also decrease due to reduce production cost ultimately is being made easy access to consumers with low price. Processed business is not flourished up to the mark due to production cost for open market was found 4-6% whereas for structured or processed market 38-42%.To gear-up processed or further processed poultry products business need to set up a structured in replace of wet market.

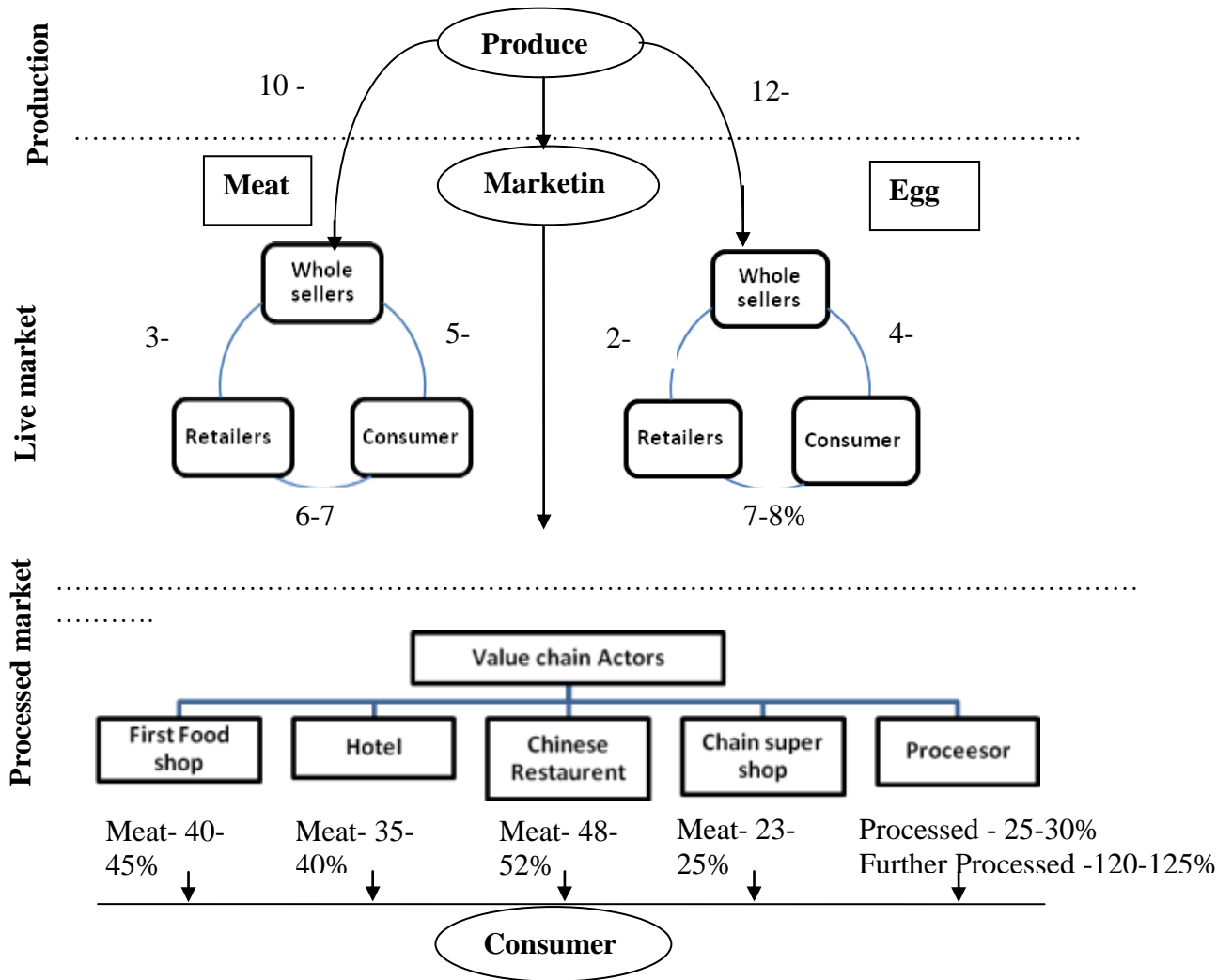**Fig.1. Value chain map of poultry products in the study area**

For the greater interest of the poultry industry and the economy of the country the supply chain should be integrated. To flourish this sector private coordination alone may not be enough to meet the situation, public involvement, government initiatives may be necessary to capture all of the potential returns to improve supply chain.

Evaluation of Existing Livestock and Poultry Policies and Provide Guidelines for Development in Bangladesh

This study was undertaken for the evaluation of existing livestock and poultry policies. The objectives of the study is to know the views of the different stakeholders involved with livestock production and to identify the gaps between existing policies and expectations from the perspectives of stakeholders. At this stage animal slaughter act, feed act and poultry development policies were considered for investigation. Initially, data were collected from three divisions out of seven divisions through a structured questionnaire which was pre-tested. Different stakeholder like butchers (21), meat processor (22), farmers (43), input dealers/distributors (28), feed mill owner (5), parentstock/hatchery owner (4), ULO/VS (14) were asked personally to provide information related to relevant livestock act and policies.

Collected data were put in SPSS software for statistical analyses. Descriptive statistics like percentage, mean were used for different variables. Parameters related to slaughter act, feed act and poultry development policies are given in Table1.

When implementation on slaughter act practices observed in studied area 100% negative cases found for knowledge about slaughter act and have modern slaughter house,100% positive cases found for practice of halal slaughter method and proper bleeding and rest of other parameters were mixed practiced. In feed and poultry development policies 100% negative cases found in farm registered by Govt; knowledge about feed and poultry act; implementation of feed act; initiative of DLS and maintain practitioner act and for 100% positive cases found in have trade license; drug used in feed; use of banned feed; bone TSE and sale of quality feed and related other parameters found in mixed practiced also.

Table 1. Parameters related to slaughter act, feed act and poultry development policies in three divisions

Parameters	Stakeholder Practiced (%)		
	Dhaka	Chittagong	Rajshahi
(A) Slaughter act			
Knowledge about slaughter act	0.00	0.00	0.00
Training of butcher	33.33	33.33	0.00
Slaughter house license	100	100	100
Practice of Halal slaughter method	100	100	100
Practice of proper bleeding	100	100	100
Visits of meat inspector	33.33	100	66.67
Ante-mortem and postmortem	66.67	0.00	66.67
Have modern slaughterhouse	0.00	0.00	0.00
Disposal of waste material:			
Open space (%)	33.33	0.00	33.33
Composting place (%)	33.33	0.00	33.33
Besides the road (%)	0.00	100	0.00
Sell to other persons (%)	33.33	0.00	33.33
(B) Feed act and poultry development policies			
Farm registered by Govt.	0.00	33.33	0.00
Knowledge about feed and poultry act	0.00	0.00	0.00
Have trade license	100	100	100
Implementation of feed act	0.00	0.00	0.00
Initiative of DLS	0.00	0.00	0.00
Drug used in feed	100	100	100
Use of banned feed	100	100	100
Addition of probiotics, antibiotics	100	100	100

Bone TSE	100	100	100
Use of tannery waste	33.33	66.67	66.67
Sale of expired feed	0.00	0.00	0.00
Sale of quality feed	100	100	100
Maintain withdrawal period	33.33	100	66.67
Maintain practitioner act	0.00	100	0.00
Maintain of cool chain	100	100	66.67
Surveilance	33.33	100	0.00
Follow of Govt act by ULO/VS:			
Veterinary practitioner act (%)	66.67	33.33	33.33
Feed act (%)	33.33	0.00	66.67
Slaughter act (%)	0.00	66.67	0.00

It can be concluded that there is a large gap between the regulations and their implementations in the field level due to lack of awareness, communication and enforcement of law and order. Proper implementation of act and policies will ensure livestock sector development in Bangladesh.

a) Technology Testing/Dissemination: Fields day,Field demonstration works under these areas. A number of programshave been set towards the next year.

b) Technology Handover/transfer: Three maturedtechnologies were handed overto DLS and Public sector all sorts of activities are performed under this divisional active initiation.

Photo-4: Hon'ble minister of MoFL is handing over Thermostable PPR vaccine to DLS

Photo-5: Hon'ble minister of MoFL is handing over High yielding fodder Napier-4 to Milk vita

Photo-5: Hon'ble minister of MoFL is handing over Milk replacer to DLS BRAC.

Buffalo development project

Buffaloes were observed scatterly throughout the country. The farmers and government in the resent past are showing interest to utilize the native species to increase milk and meat supply for human consumption and to alleviate poverty through creation of employment. In our country there are different types of buffalo. It is important to find out the genetic differentiation, in different types of buffalo available in the country. Prerequisite for taking germplasm conservation and development programmed is very important to know the population size, detail performance and actual genetic makeup of the livestock resources available in different regions of the country. Considering the above said importance it is necessary to undertake research program on phenotypic and genetic study of buffalo available in different selected regions of the country. To fulfill the above target Buffalo Development Project is running to achieve the following objectives

Objectives

i) To know the morphometric, productive and reproductive performance of different types of buffalo.

ii) To know the geographical distribution of different types of buffalo.

iii)   To make documentation of the buffalo genetic resources available in the selected regions.

The project is running in 39 upazila of different districts. These selected district and upazila are as follows:

Sl. No	District	Upazila
1.	Jamalpur	Madarigang, Jamalpur Sadar and Bakshigang
2.	Tangail	Ghatail, Dhonbari and Bhuapur
3.	Rangpur	Pirgang, Badargang and Mithapukur
4.	Bagerhat	Kachua, Rampal and Monolgang
5.	Potuakhali	Galachipa, Kolapara and Patuakhali Sadar
6.	Laxmipur	Kamalnagar, Laxmipur Sadar and Ramgoti
7.	Moulovi Bazar	Borolekha, Rajnagar & Kamalgang
8.	Feni	Sonagazi, Daganbhuia & Porshuram
9.	Mymensingh	Trishal, Fulbaria & Haluaghat
10.	Sirajgong	Tarash, Belkuchi and Chouhali
11.	Bhola	Charfashan, Monpura & Bhola Sadar
12.	Noakhali	Companigang, Subornochar & hatia
13.	Chittagong	Anowara, Mirshari & Sandip

The following research work was completed by the funding of Buffalo Development project during the year of 2012-2013

1. Morphometric characterization of buffalo in some selected regions of Bangladesh- Characterization of buffalo has completed in 30 upazilas

2. Molecular characterization of indigenous buffalo using Microsatellites Markers-

   - Cross breeding program of buffalo has started at BLRI buffalo development farm.
   - 300 blood sample has collected from different regions of Bangladesh.
   - DNA has got from 30 sample. PCR of 20 sample has done, but no band is found.

3. Identification and documentation of available feeds and feeding practices- Proximate analysis of 19 sample has documented.

Fig: Grass sample from different areas

4. Study on feed intake and growth performance of local growing male buffalo using different diets- A feeding trail was performed

Feeding trail pictureat BLRI buffalo development farm

5. Fixed time AI of buffalo by using murrah buffalo semen to get crossbred buffalo calf at BLRI buffalo herd-

Fig: Thawing of frozen semen   Fig: AI of buffalo at BLRI buffalo herd

Under this experiment 12 buffalo cow were synchronized. Among them AI were done 8 buffalo cows.

Summeries of different research work

Morphometric and Phenotypic characterization of indigenous buffalo in some selected district of Bangladesh.

The study was conducted in Noakhali, Laxmipur, Feni, Mymensingh, Bhola & Moulvibazar district. A total of 360 farmers, 60 from each region were selected who have indigenous buffalo producing more than 1.5 liter milk/day/cow.The data on different viz. body length, and body weight at different stages of age such as 3-month, 6-month, heifer, cow, growing bull and adult bull; Coat color, Horn pattern, White mark on tail; milk production, lactation length, total milk yield; and age at first heat (year); Post partum heat period (days); Calving Interval (days) were collected. All morphometric characteristics were measured with the help of a measuring tape in inch. The collected data were compiled using computer Microsoft Excel Spreadsheet Programme and analyzed by using (SPSS-11.5) version. 3- month and 6-month body weight were not differ significantly by sex and region. However, in both the age group heighest body weight were found in Feni and lowest on Bhola district. Growing and adult body weight were differ significantly ($p<0.05$) due to regional variation. Coat color of buffaloes varies from light black, black to grey and horn pattern differ from curved, spiral and cresent. White marks in tail also found in some region. Daily milk yield, lactation length and total milk production of buffaloes were differ significantly ($p<0.01$) due to regional variation. Per day milk production was heighest ($p<0.01$) in Mymensingh and lowest in Bhola district (4.11 ± 0.11 and 1.59 ± 0.5 L/cow/day respectively). Reproductive traits of buffaloes were observed to be differed significantly in the selected districts. Age at first heat ranges from 39.42 to 54.45 months. Post partum heat period and Calving Interval were heighest in Bhola district and lowest in Feni district and it was 185.84 ± 7.63, 495.84 ± 7.63 and 128.41 ± 3.63, 430.55 ± 1.76 days respectively.

Identification and documentation of available feeds and feeding practices
three types of local fodders namely *Helli*, *Burba* and *Bogra* were collected from Bhloa district for first time (March, 2013 to May, 2013). Second time (December, 2013 to March, 2014) nine types (*Pine apple leaf* from Mymensingh, *Chechor* from Golachipa, Patuakhali, *Parua, Parua nola* and *Jongra* from Rajnagar, Moulovibazar, *Erail* and *Tentena* from Kamalgonj, Moulovibazar, *Uri* from Noakhali, Kompanigonj and *Uri* from Subarnachor, Noakhali) of local fodder varieties were collected from four selected district (Mymensingh, Patuakhali, Moulovibazar and Noakhali) out of fourteen districts and then proximate composition were calculated. Only seven types of local fodders namely *Shama & Garoa* from feni *Panilata, Jora-tatu & Jora-erali,* from Moulovibazar and *Jhol vodra & Voro-durba* from Bagerhat district were collected for3rd time (January, 2014 to May, 2014) and then proximate composition were analysed.

Study on feed intake and growth performance of local growing male buffalo using different diets
This study was aimed to compare growth and feeding performances as well as economic returns from feeding male dairy, beef cattle and swamp buffalo for quality beef. This study was conducted to compare the effect of feeding green fodder at the stall (cut and carry system), urea molasses straw (UMS) and silage on the growth of male buffalo. Fifteen local male buffalo calves (18-22 months of age) with average body weight of about 225 kg were divided into three, having 5 no. in each group. The calves were kept on these treatments for 3 months. Live body weight of the calves was recorded at the start of trial and then fortnightly. The total DM, OM and CP intake from roughage, roughage and concentrate ratio, DMI from Roughage of % LW, and Total DMI on % LW were significantly differ ($p<0.05$). Feed conversion (8.03 ± 3.02) was better for green grass group than UMS and silage group. No significant differences were found regarding DMI from Concentrate of % LW, DMI g/kg ($W^{0.75}$/d), metabolic body wt and growth (kg/d) of all group. It is concluded that, stall feeding may have better result in growth of male buffalo calves comparable to that after feeding them UMS and silage.

Other Activities:

During this year training was completed in the following upazillas in which sixty buffalo rearing farmers were selected from each region who has at least one milking buffalo

Sl. No	District	Upazila
1.	Laxmipur	Ramgoti
2.	Bhola	Charfashion

Blood sample were collected from different areas for molecular characterization. Animals were tagged by ear tag record keeping card were also distributed among farmers to record actual data of different parameters.

Some pictorial photograps of these activities:

Training at Ramgoti, Laxmipur

Training at Charfashion, Bhola

AI of buffalo at Bhola region

Filled up record keeping card

Bood sample collection at Bhola

Conservation and Improvement of Native Sheep through Community Farming and Commercial Farming (component A-research 2nd Phase)

Establishment of health management package for native sheep of Bangladesh

Abstract

The present study was designed to explore the disease status of sheep in Bangladesh with the aim of developing health management package for sheep for better and efficient sheep production in Bangladesh. Both retrospective and prospective investigations on the incidence and prevalence of different diseases of sheep have been conducted in the study areas. Information on the disease related factors like health status, sex and age, vaccination, deworming, etc. were collected. Samples (faeces, blood, etc.) were collected from the diseased/dead animal and preserved following the standard procedure. Faecal samples were examined following the standard procedure to determine the parasitic loads and faecal as well as blood samples were examined following the standard procedure to determine any protozoan infection present in the study animals. Samples from diarrhoeic animal were studied to isolate and identify causal organism. Antibiotic resistance and sensitivity studies of the aetiological agents responsible for common infectious diseases in sheep were also conducted in order to suggest the most suitable antibiotic to treat the concerned diseases in the field. Since helminthic infections, diarrhea and pneumonia were found to be the mostly occurring health hazards in sheep of all ages, especial attempts were made to develop herbal based novel approaches to treat and control major intestinal helminthic infestations of sheep. However, gentamicin and ciprofloxacin were found most effective antibiotics and recommended to use in diarrhoeal cases in the field. On the other hand, mahogany (100 mg), betel leaf (100 mg) and dodder (100 mg) were found significantly effective against 100% worms in 2 hours *in vitro* and thus recommended to be used in the field against helminthic infection in sheep.

Selection of best performing exotic sheep breed (s) and performance evaluation of their crosses with indigenous sheep

Abstract

This study was conducted to evaluate the genetic relationship among indigenous sheep populations of Bangladesh (Barind, Jamuna river basin, Coastal and Garole sheep) using microsatellite markers. A total of 96 blood samples were collected from adult sheep of (i) Barind (24), (ii) Jamuna River Basin (24), (iii) Coastal (24), iv) Garole (10) and (vi) Chotanagpuri (10) sheep of India. Chotanagpuri sheep are available in the Meherpur district of Bangladesh. Chotanagpuri sheep breed was used as a reference breed for this study. Blood samples of these sheep populations were collected from different regions of Bangladesh and BLRI Sheep Research Farm. DNA was extracted and quantified from blood samples using commercially available DNA extraction kit as per manufacturers' protocol. DNA was quantified using a nanodrop machine. FAO recommended 13 labeled microsattelite markers were used for this study. Polymerase chain reaction (PCR) was performed with thirteen sets microsattelite marker. PCR products from each sample were confirmed by running on 2% high resolution agarose gel and visualized by staining with ethidium bromide. The exact allele sizes in each primer were determined by GeneMaker V1.85 demo. Allele frequency, the mean number of alleles per locus, observed heterozygosity, and heterozygosity expected from Hardy-Weinberg assumptions for each locus, and genetic distances (D_A) were computed using the Microsatellite tool kit and Dispan software package. The Dispan Computer program was used to calculate inter-individual

genetic distances, based on the proportion of shared alleles. These distance values were used to construct an UPGMA tree using the NEIGHBOR module of the Dispan software package. Results showed that average number of polymorphic alleles per locus was 4 in HUJ616 to 12 in MAF70. Observed heterozygosity was also varied from 0.5481 ± 0.0488 in coastal to 0.6313 ± 0.0303 in Barind sheep population. Genetic distance between Jamuna river basin and Barind was lowest (0.0891) and between Garole and Costal was highest (0.1786). Garole and Chotonagpuri sheep has higher genetic distance from other three sheep populations. Phylogenetic dendogram showed that sheep of Jamuna river basin and barind belong to same genetic group. Whereas, coastal, garole and Nagpur sheeps were shown higher genetic distances from Jamuna river basin and coastal sheep. Considering finding of the present study on average allele numbers, heterozygosity and standard genetic distances and dendrogram, it may be concluded that the Barind and Jamuna river basin sheep are belonging to a similar genetic group while, Garole and coastal sheep are belonging to two distinct genetic groups.

Fodder Research & Development Project

Conservation, **multiplication of high yielding fodder and development of fodder production, utilization & preservation technologies**

Effect of feeding different types of Ca-salts of fatty acids on milk yield, milk composition and digestibility of nutrients in dairy cows

Executive summary

The use of dietary fat may continue to increase as the genetic potential for milk production of dairy cows. Feeding large amounts of saturated and unsaturated fat, however, has detrimental effects on rumen metabolism and fiber digestibility, especially when intake is near, or slightly higher than, maintenance **.** The development of Ca salts of fatty acids (CaFA), which are considered inert in the rumen, offers a method of increasing production and efficiency without impairing fermentative digestion**.** Nutrition greatly affects productive and reproductive functions , nutritional strategies that promote milk production and concurrently benefit, or at least sustain, reproductive efficiency of dairy cows and heifers are warranted. So, to determine the effect of feeding different types of calcium salt of fatty acids on feed intake, digestibility, milk yield, milk composition, an experiment was carried out at the Pachutia Dairy farm, Bangladesh Livestock Research Institute (BLRI), Savar, Dhaka for a period of 30 days by using twenty lactating Pabna cows. There were four groups in the experiment and each group contains five cows. The experimental diets were formulated using German grass and concentrate mixture with or without calcium salt of fatty acid. The concentrate mixture consisted of Wheat Bran (45%), Maize crushed (10%), Wheat broken (10%), Soybean meal (5%), Til oil cake (10%), Kheshari (15%) and Fish meal (2%). In addition to green German grass and concentrate of control diet T_0, animals on diet T_1, T_2 and T_3 were supplemented with calcium salt of fatty acid at 2.5% soybean based calcium salt of fatty acid, 2.5% mustard based calcium salt of fatty acid and 2.5% palm oil based calcium salt of fatty acid of total concentrate, respectively. Feed intake of cows was determined by subtracting the amount of feed refused from the amount of feed supplied on the previous day. Feed refusals were collected every morning before feeding and weighed out to find out daily feed intake. During the experimental period, the animals consumed all concentrates but refused a small quantity of German grass every day. In order to find out the digestibility of feed nutrients, a conventional digestion trial was conducted for a period of 5 days towards the end of feeding experiment. The amount of feed intake of each animal during 24 hours was recorded.

Representative feed and refusal samples were collected daily and stored in polythene bags for proximate analysis. Representative sample of German grass was collected daily and taken into laboratory for DM determination. The total quantity of feces voided daily was recorded against each animal for five days. Faeces were collected separately in plastic bucket and then kept in polythene bags to avoid loss of moisture and volatile nitrogen and also to avoid contamination of feces with dirt and urine. About 5% of well mixed faeces of each animal was collected every day, the feces were stored at -20°C in a deep freeze. Milk samples were collected from each cow at 15 days interval and were analyzed for fat, protein, lactose, SNF and total ash contents by milk analyzer (lactostar, Funk Gurbar). Respective samples of feed, leftover and faeces were subjected to chemical analysis for determination of crude protein (CP) , organic matter (OM),dry matter (DM) ,ash and Neutral detergent fibre (NDF) , Acid detergent fibre (ADF) following the methods of AOAC (2003) and Van Soest *et al.*, (1991), respectively. The data were analyzed using "MSTAT-C" statistical program to compute analysis of variance (ANOVA) for a Complete Randomized Design (CRD) and the mean values with standard error of difference (SED) were recorded. The difference among the treatment means were determined by Duncan's Multiple Range Test (Steel and Torrie, 1980).

The results (Table 1) revealed that the average daily milk yield was 2.44, 3.53, 3.33, and 2.24 kg in treatment groups T_0, T_1, T_2 and T_3, respectively. The result indicated that there was a highly significant improvement in milk yields in T_1 and T_2 treatment groups. The average milk fat content of T_0, T_1, T_2 and T_3 groups were 4.01, 3.35, 3.55 and 3.73%, respectively. There was no significant (p>0.05) difference among the treatment groups for milk fat content of cows fed different diets. The average milk protein and lactose contents of T_0, T_1, T_2 and T_3 groups were 3.65, 3.61, 3.70 and 3.71 and, 4.95, 5.21, 5.33 and 5.34 %, respectively. The average total minerals and SNF contents of T_0, T_1, T_2 and T_3 groups were 0.65, 0.62, 0.67 and 0.72 and 9.67, 9.60, 9.83 and 9.84%, respectively (Table 2) . There was no significant (p>0.05) difference for the parameters milk protein, lactose, total minerals and SNF contents of milk. Statistical analysis showed that there were no significant differences for all parameters except milk yield and it was indicated that there was highly significant (***=P<0.001) improvement in milk yields in T_1 and T_2 treatment groups. Further, it was observed that there was no significant (p<0.05) difference among the dietary treatments in terms of digestibility of DM, OM, CP, ADF and NDF with different type of calcium salt of fatty acid (Table 3).

Table 1. Milk yield before and after feeding of calcium salt of fatty acids under different treatment groups

Parameter	Mean(±SE) of different treatment group				Overall (140)	Sig.
	$T_0(35)$	$T_1(35)$	$T_2(35)$	$T_3(35)$		
Milk yield before trial	2.86±.21	2.9±.22	2.84±.48	2.94±.29	2.93±.60	NS
Milk yield after trial	2.44[b]±.15	3.53[a]±.13	3.33[a]±.21	2.24[b]±.28	2.88±.11	***

***=P<0.001;

Table 2. Effect of different type of calcium salt of fatty acid on milk composition for different treatment groups

Parameter	Mean (±SE) of different treatment group				Overall (40)	Sig.
	$T_0(10)$	$T_1(10)$	$T_2(10)$	$T_3(10)$		
Fat (%)	4.01±.21	3.35±.19	3.55±.19	3.73±.26	3.66±.11	NS
Protein (%)	3.65±.02	3.61±.05	3.70±.05	3.71±.04	3.67±.02	NS
Lactose (%)	4.95±.30	5.21±.07	5.33±.07	5.34±.06	5.21±.08	NS
Solids not fat (%)	9.67±.06	9.60±.14	9.83±.13	9.84±.11	9.73±.05	NS

| Estm. mineral (%) | 0.65±.02 | 0.62±.06 | 0.67±.02 | 0.72±.03 | 0.67±.02 | NS |

Table 3. Effect of different type of calcium salt of fatty acid on (%) digestibility of nutrients

Parameter	Mean(±SE) of different treatment group					Sig.
	T_0 (n=5)	T_1 (n=5)	T_2 (n=5)	T_3 (n=5)	Overall (n=20)	
DM	71.68±2.08	69.31±1.65	71.05±1.81	71.24±1.17	70.81±.81	NS
OM	69.05±1.18	66.74±1.57	69.05±1.18	69.05±1.18	68.47±.63	NS
CP	72.04±2.21	69.23±1.44	71.29±1.14	71.39±1.07	70.98±.74	NS
ADF	68.26±1.21	65.89±1.61	68.26±1.21	68.26±1.21	67.67±.64	NS
NDF	71.60±.60	72.70±.51	71.40±.76	71.90±.58	71.90±.30	NS

Therefore, it may be concluded that calcium salt of fatty acid may be recommended (diet T_1 and T_2 contain 2.5% soybean and mustard based calcium salt of fatty acid) for better milk yield.

Conservation, multiplication of high yielding fodder and development of fodder production, utilization & preservation technologies

Development of fodder production model for sustainable year round fodder availability for five dairy cows (RCC)

Executive summary

Fodder production model is the demand for small scale and large scale dairy and fattening farmers of Bangladesh. Very recently, fodder production get momentum as an income generating and employment opportunity in certain areas of Bangladesh, especially where small scale dairying, fattening and milk marketing facilities are prevails. Price fluctuation of concentrate feeds is a great problem in commercial dairying and fattening farming which cuts off profit margin. Therefore, sustainable availability of year round green fodder production may be a solution for the farmers to reduce the production cost. Hence, this activity was conducted under on-station condition to develop a fodder production model for small scale dairy farmers. For this purpose, five 5 RCC dairy cows (having 600-700 L milk yield/lactation) were selected. For rearing five cattle about 66 decimal (2 Bigha) of land was selected from existing fodder plots under Pachutia Research Farm. The selected land has been divided into two parts i.e. 33 decimal in each. One part (33 decimal) has been brought under perennial (Napier-4) and the 2nd part of land for seasonal (Maize & Matikalai) fodder production. Data on live weight & live weight gain of cows, birth weight of calves, feed intake, milk production, actual biomass yield for both perennial & seasonal fodder, yearly manure production were recorded & calculated. Economics of the model was also calculated.

Napier-4 grass, maize, straw, silage were supplied to the experimental cows according to the seasonal availability in different months. Concentrate mixture were also supplied consisting of wheat bran, kheshari,soybean, maize crushed, Til oil cake, DCP & common salt. The chemical composition of the concentrate contained 18.09 % CP and 89.24% dry matter. Seasonal feeding pattern is shown in Fig.1.

Fig.1. Monthly feeding pattern of RCC cows (kg)
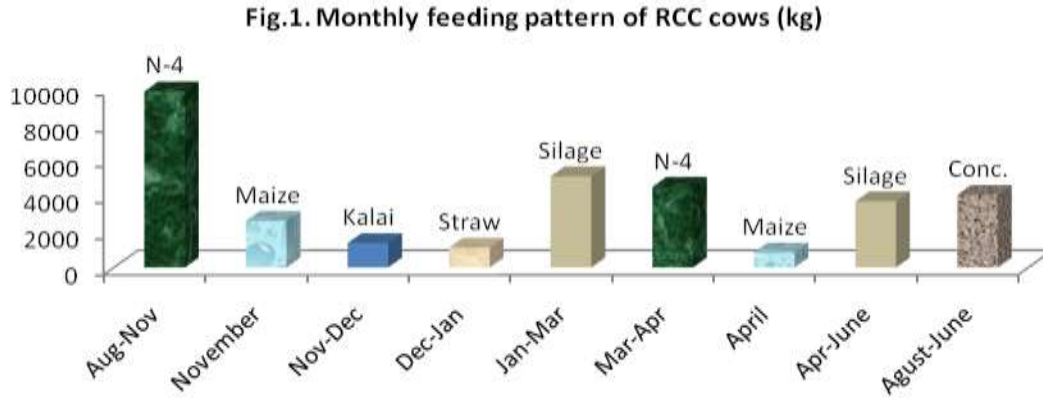
About 14.34 tons of perennial and 4.8 tons of seasonal fodder were produced from 66 decimal of land which has been supplied to the research animals. The intake was determined by subtracting the amount of leftover from the amount of feed supplied on the previous day in case of grasses, straw & silage. But in concentrate total amount was taken under consideration. Table 1, shows the live weight and birth weight of calves under above seasonal feeding.

Table 1. Live weight gain of cows & Birth weight of calves

Parameter	Cow 1	Cow 2	Cow 3	Cow 4	Cow 5
Initial weight(Kg)	228.0	198.0	208.0	200.0	222.0
Final weight(Kg)	280.0	243.0	243.0	239.0	242.0
Average live weight(Kg)	52.0	45.0	35.0	39.0	20.0
Daily weight gain(g/d)	185	160	125	139	71
Calf birth weight(Kg)	15.50	12.50	11.50	11.50	13.50

A total 2866 L of milk has been collected from five (5) animals for the period of 200 days with an average of 2.9 litres /h/day. Data of milk production are given below in Table 2.

Table 2 . Milk Production Record of Cows

Month	01	068	123	175	182	Total(L)	Avg.
August	155	170.5	139.5	139.5	155	759.5	151.9
September	135	150	108	120	120	633	126.6
October	108.5	124	77.5	108.5	108.5	521	104.2
November	90	90	60	90	901	420	84
December	62	77.5	46.5	80.6	83.7	350.3	70.06
January	30	46.5		30	62	168.5	33.7
Total	580.5	658.5	431.5	568.6	627.2	2866	
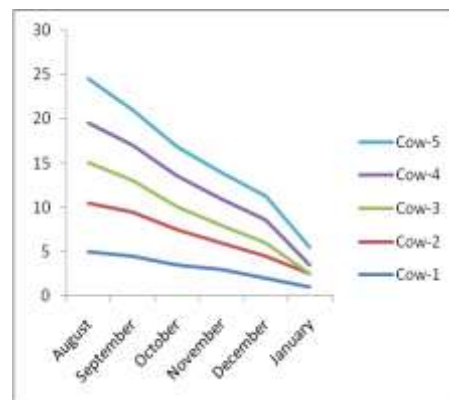
Profit is the main goal of any enterprise and it can be manipulated either by reducing inputs or increasing the output to an optimum level. The cost-benefit analysis of the present research work is shown in the Table 3 & 4. However, in the current model income was derived from the sale of milk, calves & manure and cost include only feed & land leased. This calculation did not considered the daily labour ways, but it is assumed that a family member can rear 5 dairy cows with his/her family works and could earn Tk.97,691.00 /year on full cost basis. The benefit cost ratio on TVC and TC were 1.86 and 1.66, respectively.

Table 3. Cost of production for rearing five dairy cows

Cost items	Amount (Kg)	Tk/Kg	Total Cost (Tk)
Concentrates	4050	25	1,01,250.00
Perennial grass	14340	0.75	10,755.00
Seasonal grass	4800	1.5	7,200.00
Silage	8800	1.5	13,200.00
Straw	1100	-	-
Total Variable cost (TVC)			1,32,405.00
Fixed cost (Tk.)			
Land use cost (Tk. 8,000/33decimal/year)			16,000.00
Sub-total			16,000.00
Total Cost (TVC+FC)			1,48,405.00

Table 4. Total income of five dairy cattle

Items	Amount (Kg)	Tk./Kg	Total Income (Tk.)
Milk	2866.00	50.00	1,43,300.00
Cow dung	12796	1.00	12,796.00
Calf (No.)	6	15,000	90,000.00
Gross Return			2,46,096.00
Net Return (Variable cost basis)			1,13,691.00
Net return (Full cost basis)			97,691.00
BCR (On TVC)			1.86
BCR (On TC)			1.66

In conclusion, based on data so far obtained, it may be recommended that a farmer having 5 RCC with 66 decimal of land may earn substantial share of his/her family income as smallscale rural dairying. Further, on-farm indepth trial is needed considering the socio-economic perspective of the farmers and land availability for fodder production in the respective areas.

Seasonal dynamics feed resources utilization and management as influenced by different coastal and river basin areas of Bangladesh

According to Bangladesh Economic Review, (2012), the contribution of livestock sector in GDP in 2006-07 was 2.88 and the present contribution was little bit decreased in 2010-11 which was 2.58%. However, the growth rate of livestock sector in 2010-11 was 3.48 % and crop sector was 1.19%. These changes have been prompted by a rapid growth in demand for livestock products due to increase in income, rising population, and urban growth. The acute shortage of feeds and fodder is one of the single most important obstacles to livestock development in Bangladesh. Animal feeding systems in this country is mainly based on crop residue and native pasture, which are deteriorating in production and quality, which vary seasonally resulting in poor animal performance.. In spite of the rising dependence on fibrous crop residues as animal feeds, there are still certain constraints to their efficient utilization. Sustainable efforts will be made so far to resolve the feed shortage problem in our country. The aiming at improving the feed availability and thereby improve livestock productivity. However, the impact was so little to cope with the problem that animal is still subjected to long period of nutritional stress. More efficient management and utilization of available feed resources may help to improve livestock production in sustainable manner. The results of our study may contribute to identify the existing practices of utilization of feed and to find ways and means to improve these practices. In addition, the study has been helped to define the prospects for future interventions in developing livestock feeding systems to enhance productivity and viable integration of the crop and livestock sectors in the certain reason among the coastal region of Bangladesh. Prior to the actual survey, visit has been made to the each probable district and secondary information relevant to the study has been gathered from all possible sources. Informal survey and group discussions has been conducted to gather information about the district and to get insights from community members before going to final selection. Group discussion was held with elders, key informants, and development agents working on the sites and district administrative officers. The group discussion was focused on types of major feed resources, their utilization, seasonal availability and management and associated constraints in relation to livestock production in the respective areas. For this study, 10 coastal districts (Satkhira, Khulna, Bagerhat, Pirojpur, Barguna, Bhola, Noakhali, Feni, and Chittagong & Cox's Bazar) were selected to know the existing seasonal dynamics of feed resources prevailing in the respective locations of Bangladesh. From each districts 2 (Two) Upazilla has been selected on the basis of livestock density. Fifty farmers (50) in each Upazilla were selected purposively according to land category (BBS, 2010) and data were collected by direct interviewing from the respondents. There are ten (10) districts under this study and a total number of Upazillas were 20. All collected surveyed data checked for any mistakes and were corrected according if any and compiled it for analyzing by using SPSS 17.0 statistical software in windows.

Table 1. Overall livestock ownership according farm category

Livestock species	Farmer's categories according land holding (decimal)									
	Landless (0-49 dec.)		Marginal (50-125 dec.)		Small (126-249 dec.)		Medium (250-749 dec.)		Large (>750 dec.)	
	%	Av.	%	Av.	%	Av.	%	Av.	%	Av.
Cattle	89.9	2.79	89.9	2.80	86.7	3.99	64.1	3.59	90.0	7.8
Buffalo	01.1	0.03	01.4	0.05	01.2	0.02	10.3	0.62	00.0	-
Goat	17.2	0.53	20.7	0.61	16.9	0.70	12.8	0.69	20.0	0.8
Sheep	01.4	0.01	00.0	-	00.0	-	02.6	0.26	00.0	-

Table 2. Feeding status of roughage in all upazilas

Type of roughage	Amount of roughage supplied to animals in different season (kg/d/head)			% of HHs supplied in different seasons		
	Summer	Rainy	Winter	Summer	Rainy	Winter
Rice straw	5.3	5.76	5.88	80.6	80.6	88.2
Green grass (cut and carry)	9.58	10.0	8.99	58.2	68.4	58.8
Green grass (cultivated)	13.2	9.0	7.4	2.4	0.70	0.70

Table 3. Rearing system of cattle around the year

Different rearing system	Duration per day (hours)			% of HHs followed the systems in different seasons		
	Summer	Rainy	Winter	Summer	Rainy	Winter
Tethering	5.73	5.14	5.59	30.0	26.5	21.3
Extensive/range	8.68	5.10	7.66	20.8	10.2	18.1
Semi-extensive	5.50	5.71	5.33	0.8	1.0	0.8

Table 1 shows that irrespective of locations, livestock , specially cattle ownership were belonged to small & medium farmers though the larger farmers had on an average 7.8 cattle /household. Feeding status and & feeding system of cattle are shown in Table 2 & 3 . Table 2 shows that feeding straw as feed was almost similar in all season but the availability of green grass bit higher in summer followed by rainy and winter. It is noted that in the surveyed areas irrespective of locations, only 2.4 % farmers were cultivated fodder during summer compared to rainy and winter seasons. The relationship between land holdings and fodder cultivation is shown in Fig.1.
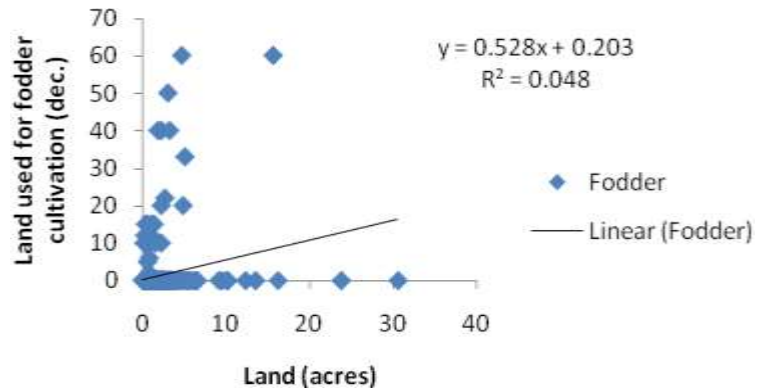
Fig. 1: Relation between total land holding and land used for fodder cultivation

Irrespective of locations, tethering was common practice was found in surveyed areas but in range system farmers usually reared more than 8 hrs/day during summer season (Table 3). Further, through this investigation it was tried to find out the relationship between number of cattle with land area under fodder cultivation. It's observed from Fig.2 that the concentration of fodder cultivation was more between 10 decimal land & below 20 cattle, where, $R^2 = 0.002$. Therefore , data so far analysed revealed that the number of cattle was found higher in all categories of farmers cattle followed by goat and straw is most commonly used as cattle feed in all farm categories.
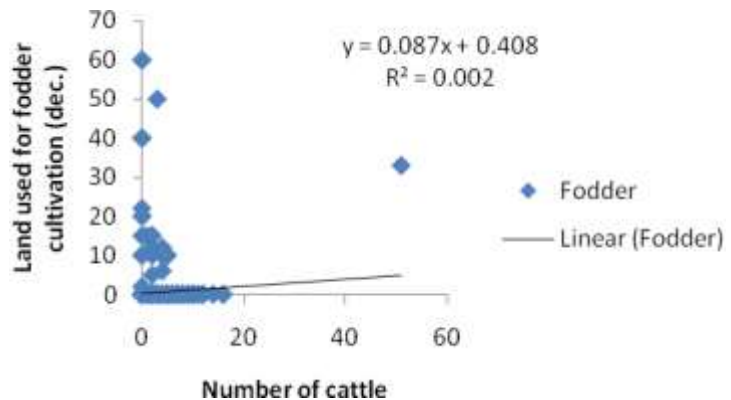
Development of community based fodder production model in Haor areas of Bangladesh (Draft)

Investigation and identification of existing feed resources and their utilization pattern in haor areas

Livestock is a potential income source for ecosystem inhabitants (Millar and Photakoun, 2008), livestock products can be sold or bartered to meet normal consumption expenditure while livestock investments extend the ono-farm labour market, surpplies nutrients for the human diet and generates cash income assets. The haor basin is a low lying bowl-shaped basin covering about 6,000 sq. km in Sylhet Division**,** mostly in Sunamganj district in Bangladesh. The topography of haor regions is uneven. Furthermore in terms of geographical elevation they are lower than the normal plain lands. Virtually all of this land is below 8 meters and is flooded for 7- 8 months to depths of 5 meters or more during the monsoon. The north eastern part of Bangladesh is known locally as the haor area of Bangladesh and consists of mainly the districts of Sunamganj, Moulovibazar, Sylhet, Kishorganj and Netrokona. These wetlands area very important habitats for the unique and dynamic ecosystems, which have immense productive and ecological value e.g. storage of rainfall-runoff, groundwater recharge, providing habitats for fish, wildlife, aquatic plants and animals, resort to migratory birds, support biodiversity, haor area plant based socioeconomic activities, fishing and recreation. The water bodies and land inside the haor are owned by Government (Khas land) and leased out every year or every three years for fishing. During the winter season when the water level is lower, marginal land of the haor are cultivated with paddy. Apart from it the levees and the fallow land are used for cattle grazing. Community based fodder model is the present demand in haor areas for our nation to meet-up the protein requirement (Animal protein). Recently, fodder production and preservation gets momentum as an income generation and employment opportunity in certain areas of Bangladesh, especially where small scale dairying, fattening and milk marketing facilities are prevails. Cattle are an inseparable and integrated part of small holder subsistence farming system. Water loving fodder or forges or those grown in watershed areas should be adopted as an alternative approach. Hence, the present investigation was carried with the objectives to identify feeds and fodders availability in different seasons and based on the findings a community based fodder production model with native or other suitable varieties of fodder in haor embankment and to introduce fodder preservation technologies for better use of local feed resources in the haor areas. To identify the existing feeds and fodder availability and feeding systems in haor areas, 4 Upazillas were selected from two districts, namely, Sunamgonj and Khishorgonj having two Upazillas in each. From Sunamgonj district, Taherpur and Bishambarpur and Khishorgonj, Itna and Mitamoian uUpazillas were selected under this investigation in consultation with District Livestock Officers of the respective districts, Upazilla Livestock Officer and the executive engineer of water development board. Before going to detailed data collection, a focus group discussion (FGD) with the local leaders, innovative farmers in the respective Upazilla was carried to know the information about livestock situation including smallscale dairying and their feeding systems. After collection of data through questionnaires, it was rechecked for any mistakes and finally all data collected were analyzed statistically using computer package of SPSS. It is noted that due to shortage of time, data from two Upazillas namely Taherpur and Bishambarpur were analyzed and presented below.

The results so far obtained revealed that the landless farmers were more in Bishambarpur (58.7%) and average land holdings was 0.24 acre . On the other hand, the numbers of medium farmers were found more (54.2%) in Taherpur, where the average land holdings was 4.00 acres (Table 1). In respect to livestock rearing, almost all categories of farmers were reared. It is interested to note that buffaloes were found among the surveyed farmers in both the Upazillas (Table 2). The relationship between landholdings and No.s of cattle is shown in Fig.1.

Table 1. Farm category according to land (decimal) holding of households

Location of survey	Farmer's categories according land holding (decimal)									
	Landless (0-0.49acre .)		Marginal (0 .50-1.25 acre.)		Small (1.26-2.49 acre.)		Medium (2.50-7.49 acre.)		Large (>7.50 acre.)	
	%	Av.	%	Av.	%	Av.	%	Av.	%	Av.
Bishambarpur	58.7	0.24	04.3	0.97	0.15	188.4	21.7	4.56	-	-
Taherpur	2.1	0.30	14.6	0.94	0.23	199.1	54.2	4.00	6.3	8.83
Overall	29.8	0.25	09.6	0.95	0.19	193.2	38.3	4.12	3.2	8.83

Table 2. Livestock keeping status according farm category

Livestock species	Farmer's categories according land holding (decimal)									
	Landless (0-0.49 acre.)		Marginal (0.50-1.25 acre.)		Small (1.26-2.49 acre.)		Medium (2.50-7.49 acre.)		Large (>7.50 acre.)	
	%	Av.	%	Av.	%	Av.	%	Av.	%	Av.
Cattle	96.4	4.39	100	3.11	100	4.11	97.2	5.69	100	15.0
Buffalo	Not found in the surveyed area									
Goat	07.1	0.25	0	-	05.6	0.06	0	-	0	-
Sheep	Not found in the surveyed area									
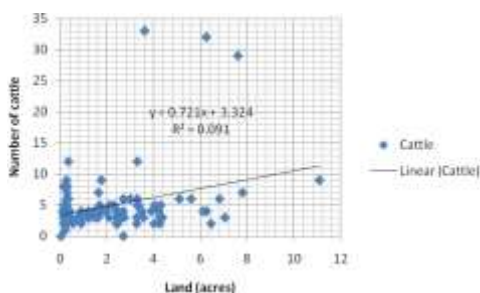
Rice-straw was supplied more in rainy season by maximum farmers whereas green grass was supplied more in summer season by the maximum farmers. Available local species of green grasses Chaila, Durba, Chon, Paura. The study revealed that thre was no cultivated fodder available to the cattle in the study areas (Table 3). The above (Fig. 1 &2) revealed that the situation of existing fodder cultivation in relation to landholdings and no.s of cattle were non

Figure 1. Relationship between landholdins & No.s of cattle

Table 3. Feeding status of roughage in all upazilas

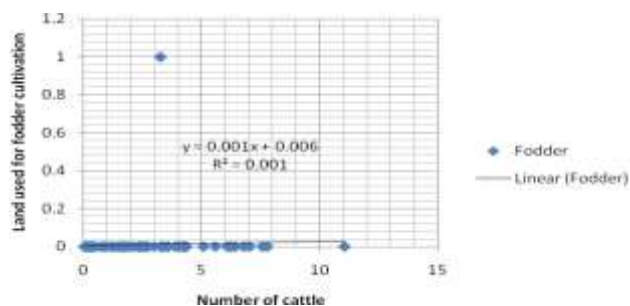| Type of roughage | Amount of roughage supplied to animals in different season (kg/d/head) | | | % of HHs supplied in different seasons | | |
	Summer	Rainy	Winter	Summer	Rainy	Winter
Rice straw	2.5	4.8	2.3	88.3	93.6	91.5
Green grass (cut and carry)	15.6	14.5	07.9	78.7	74.5	77.7
Green grass (cultivated)	Not found in the surveyed areas					

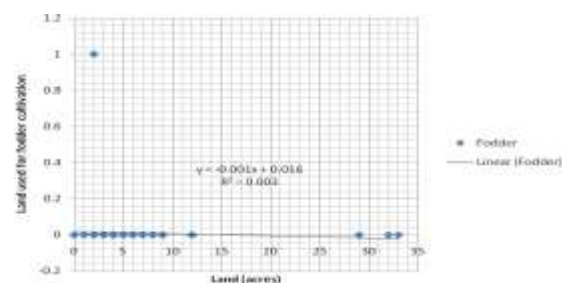Fig. 2. Relation between number of cattle population cultivation

Fig. 3. Relation between land holding and land used for fodder fodder cultivation

Conservation, multiplication of high yielding fodder and development of fodder production, utilization & preservation technologies

Development of low cost silage technology for the rural farmers

The standard silage-making system, practiced on a limited scale in Bangladesh, is the fixed, pit silo model but it has a high initial establishment cost & only suitable for medium dairy farms reared 8–10 cattle. The pit silo cannot be suitable in low-lying areas at risk of flooding it requires higher volume of green grasses. It's also noted that farmers living in Char areas needs low cost, portable silo systems, so that it can be shifted to a safer place in case of severe floods and/or any emergency period. The low-cost techniques can be installed within the small homestead of farmers area and that can be used during scarce and /or lean period usually July-October in bathan areas but its depend on the agro-ecological zones of Bangladesh. Other than hand , peoples' living in the Char areas who are also demanding economically suitable silage techniques for preservation of produced and/or natural forages for feeding their livestock during lean period. Therefore, to solve farmers' existing problem, the above study was conducted with the objectives to develop suitable silage making systems for small and medium scale dairy farmers in Bangladesh. To achieve the objectives, four different type materials (Silo's) such as were selected as treatment groups were considered having four replications in each. The treatments were Bamboo made doll (inside sealed with polythene), Bamboo made doll (outside sealed with rice husk, mud & cow dung without polythene), Plastic container & Polythene made like doll. The storage duration was 3 and 6 months. Therefore, a total of 32 silos were (4x2x4) were used for this experiment. For making silage, 40-day-old BLRI Napier –hybrid grass was harvested and chopped through grass copper machine. The chopped grass was stored in different types of silos, layer by layer, and compacted with manual pressure to remove air as much as possible. When the silo chamber was almost full with green grass, it was kept as it is with lids and/or covered with polythene sheet for 3 days for further compaction. After 3 days all the treatment groups were opened and the vacant portion of the silos' filled again with green grasses and finally covered with the polythene sheet tightly under bamboo treatment groups. The plastic containers were covered with lids and polythene doll was tight with rope. Finally, a total of 15.32 tons of fodder (BLRI- Napier-hybrid 3) was used for silage making which contains 12 tons in doll, 3.2 tons in plastic bags & 0.32 ton in plastic containers. The storage duration of silo's were 3 & 6 months. After 3 months and 6 months respective treatment groups were opened and dry matter (before & after), silage quality (colour, smell),rottenness, p^H were measured and yeast & moulds were visually observed as per methods of integrated evaluation (BAPH, 1996). Silage samples were collected from the different

types of silos for nutritional analysis was done in the Laboratory as per (AOAC,2005). The chemical composition fresh grass before making silage is shown in Fig.1

There is a change in chemical composition of grass before & after silage making, change in also observed in different duration which is shown in Table 1 & 2. All the treatment groups posses yellowish color & sweet& sour odor except doll rice husk, mud & cow dung with polythene which is blackish in color & pungent odor. p^H of the silage was gradually reduced in 6 months comparatively to 3 months. A small layer of yeasts & moulds were observed on the surface of the each treatment except plastic containers in all treatments for both duration.

Parameters	BLRI Napier-3
DM (% of fresh Biomass)	16.99
OM (%)	90.14
CP (%DM)	9.35
Ash (%DM)	9.86

Fig-1. Chemical composition BLRI Napier-4 (Fresh basis)

Table 1. Integrated evaluation of silage from different silos by physical observation

Parameters	Treatments (3 month duration)			
	A	B	C	D
Colour	Yellowish	Blackish	Yellowish	Yellowish
Smell	Sweet & acidic	Rancid & musty smell	Sweet & acidic	Sweet & acdic
Rottenness	Slightly on Upper (1-2%)	Rotten (90%)	No	Slightly on Upper (1-2%)
Yeast/ Mould	Little on surface	Found	Very little	Similar to A
pH	**6.67ab±0.480**	**5.92b±0. 248**	**6.05a±0.108**	**5.22ab±0.150**
Comments	**Good**	**Bad**	**Very good**	**Good**
Parameters	**Treatments (6 months duration)**			
	A	**B**	**C**	**D**
Colour	Yellowish	Blackish	Yellowish	Yellowish
Smell	Sweet & acidic	Rancid & musty smell	Sweet & acidic	Sweet & acidic
Rottenness	Slightly on Upper (5-6%)	Rotten (100%)	Slightly on Upper (1-2%)	Slightly on Upper (1-2%)
Yeast/ Mould	Found little	Found	Very little on surface layer	Similar to A
pH	**5.23b±0.548**	**5.45b±0.254**	**4.22a±0.167**	**3.57a±0.052**
Comments	**Good**	**Bad**	**Very good**	**Good**

A=Doll + Polythene, B= Doll Mixture (Rice husk, Mud, Cow dung) + Polythene, C=Plastic Container & D= Polythene bag

Table1 shows that almost all (about 90%) of silage was rotten in the treatment of B in both duration, which may be due to the absence of anaerobic environment inside the silo. Integrated evaluation revealed that the plastic containers were preserved the Napier grass well followed by Doll with polythene, polythene doll, respectively. The cost production of different silos is shown in Table 2. It shows that the cost of production per kg silage under polythene alone was lower followed by Doll with polythene, plastic containers, respectively (2.31, 3.31 and 11.65 Tk./kg). Though the cost of polythene alone was lower it

can used only one time but incase of Doll with polythene, the Doll may be used for at least three years and plastic containers, the initial invest was higher.

Table 2. Cost of production of silage making under different treatment groups

Treat.	Amount (Kg/treat.)	Cost grass (Tk/Kg)	Total cost of grass (Tk)/treat.	Durability	Labour cost (Tk.)	Material cost(Polythene, Doll, Plastic container) (Tk.)	Total cost
A	750	0.75	562.5	3 year	400	1525.00	2487.00
B	750	0.75	562.5	1 year	400	1800.00	2762.00
C	55	0.75	41.0	10 year	100	500.00	641.00
D	400	0.75	300.0	One time	300	325.00	925.00

In conclusion, farmers may be used polythene and Doll with polythene for making smallscale silage in Char and/or other locations where smallscale dairying is prevailing and/ scarcity of feeds during lean period. It mentioned here that plastic container is more suitable compared to polythene alone and Doll with polythene but due to volume of container is low, the initial investment for numbers of plastic containers would be more.

Effect of modified feeding practice on milk production of cross bred dairy cows in Baghabari milk shed area

Baghabari area is situated in Shahjadpur upazila which is commonly known as Milk Vita area (AEZ-4) and the country's only large scale dairy co-operative union is situated here. Baghabari area was selected as study area as the area is one of the most important milk pocket area of the country, where the cattle are mostly crossbred of local cows with Holstein-Friesian. There are two types of feeding system- bathan and non bathan (stall feeding) feeding system. In bathan feedig system, legume forages–matikalai (*Vigna mungo*) and khesari (*Lathyrus sativus)* were cultivated just after receding flood and the animals grazed on these forages up to middle of February. Thereafter, they were fed napier, jumbo, baksha or maize which were cultivated just after the flood receded. Feeding of these non-leguminous forages to cows was continued until late July when rainy season started. The rainy season commences from July and continues till October. The area is crisscrossed with several rivers and thus the land is inundated with floodwater about four months in a year, from July to October and the land covered with a high layer of silt after the floodwater recedes. During the rainy season of the year, cattle are stall-fed at home and this period generally shows the scarcity of cattle feeds specially roughages. Farmers usually give some concentrates to their dairy cows during this period to supplement rice straw both of which are expensive during this lean period. The animals in this season remain deficient protein intake. Finally milk production of dairies has drastically reduced this season. In winter season supply of green forage *Lathyrus sativus* was the highest since there were plenty of legume forages available in bathan area. Surplus legumes and napier grass can be preserved as hay and silage, respectively for feeding when deficiency of nutrients prevails during rainy season. To consider the above existing farmers situation BLRI regional station set a trial within the surrounding village (Alokdiar) with the objectives to find out alternative feeding practices for dairy cows.

For this purpose twenty cross lactating dairy cows of about average 320 (±15.5) kg live weight were used for the trial. The experiment was conducted in completely randomized design (CRD). The length of the trial was 75 days having 14 days of adjustment period. Animals were equally and randomly allocated dietary into four groups, T_0(rice straw+concentrate), T_1(silage+concentrate), T_2(Khesari hay+concentrate)

and T$_3$(UMS+concentrate). The concentrate part of the ration consisted of wheat bran (14%), Khesari bran (13%(), lentil bran (19%), rice polish 15%), pea bran (11%), matikali bran (18%) til oil cake (9%) and salt (1%).The concentrate mixture contains 18% CP and 10.31MJ ME/kg DM. No refusal of concentrate mixture was found in any case. Feces and urine were collected individually during the last 7 days of the digestion trial. The statistical analysis was done using 'SPSS-11.5' statistical program to compute analysis of variance (ANOVA) in completely randomized design (Steel and Torrie, 1980). Differences among the treatment means were determined by Duncan′s Multiple range Test (DMRT) (Duncan, 1955).

Table 1. Chemical composition of feed stuffs

Feed ingredients	%DM fresh basis	% DM basis			
		OM	Ash	CP	ADF
Napier silage	17.65	88.77	11.23	11.43	46.88
Khesari hay	89.35	93.68	6.32	15.24	61.11
UMS	66.34	87.79	12.21	8.11	47.23
Straw	89.23	86.74	13.26	3.11	65.21
Concentrate mixture	91.43	91.15	8.85	18.00	28.48

Table 2. Feed intake and milk yield of cross bred dairy cows fed different diets

Intake and production	Dietary treatments				Level of sig.
	T$_0$	T$_1$	T$_2$	T$_3$	
Rice straw DM (kg/d)	7.10	-	-	-	
Concentrate mixture DM (kg/d)	5.20	5.00	4.70	4.82	
Silage DM (kg/d)	-	7.56	-	-	
Hay DM (kg/d)	-	-	7.76	-	
UMS DM (kg/d)	-	-	-	7.54	
Total DM (kg/d)	12.30±0.91	12.56±0.56	12.46±0.43	12.36±0.65	NS
DMI/100kgLW	3.43±0.51	3.50±0.43	3.47±0.72	3.44±0.56	NS
DCP (kg/d)	0.510^c±0.38	0.739^b±0.94	0.824^a±0.76	0.707^b±0.62	**
ME (MJ/d)	77.56^b±0.89	88.92^a±0.69	93.46^a±0.67	92.21^a±0.87	*
Milk yield (l/d)	7.31^b±0.65	9.86^a±0.88	10.76^a±0.88	10.13^a±0.87	**

^{abc}Mean values in a row with different superscripts differ significantly; NS= Not significant, *P<0.05; **P<0.01

The chemical composition of feeds used in the trial is given in Table 1. The average values for nutrient intakes (DM, DCP and ME) in different treatment group are shown in Table 2. The study revealed that there was no significant difference in total DM intake among the four groups. The DCP (kg/d) intake was significantly (P<0.01) difference among the treatment group. The highest DCP (kg/d) intake was observed in T$_2$(0.824) followed by T$_1$ (0.739), T$_3$ (0.707) and T$_0$ (0.510). The Khesari hay content higher CP which reflect DCP intake. The ME (MJ/d) intake was also significant (P<0.05) difference among the dietary groups. ME (MJ/d) was the highest 93.46 in T$_2$ afterward 92.21 in T$_3$ and lowest 77.56 in T0. The average milk yield (l/d) was the highest in T$_2$ (10.76) followed by T$_3$ (10.13), T$_1$ (9.86) and T$_0$ (7.31), respectively. The results showed that milk yield was related to feed intake. It is interesting to note that

although concentrates were supplied in higher quantities in all group, yet milk yield was lower in T0. This may due to the difference in basal diet.

Table 3. Digestibility (%) of different nutrient

Parameter	T_0	T_1	T_2	T_3	Level of sig.
Digestibility (%)					
DM	$53.00^b \pm 0.97$	$70.00^a \pm 1.23$	$74.00^a \pm 1.54$	$73.11^a \pm 1.33$	*
CP	$58.00^b \pm 0.98$	$77.00^a \pm 0.89$	$79.00^a \pm 1.11$	$74.12^a \pm 0.14$	*
OM	$53.50^c \pm 0.99$	$78.60^a \pm 0.67$	$69.70^b \pm 1.32$	$76.79^a \pm 1.22$	*

[abcd]Mean values in a row with different superscripts differ significantly, *$P<0.05$

Digestibility of different nutrients is shown in Table 3. Apparent digestibility values showed that these were significant ($P<0.05$) variation among the dietary groups of animals in case of DM, OM and CP. The highest DM digestibility was observed in Khasari based diet (74.00 ± 1.54) followed by UMS (73.11 ± 1.33), Napier silage (70.00 ± 1.23) and rice straw (53.00 ± 0.97) based diet, respectively.
In conclusion, introduction of legume hay as modified feeding practice may be an alternative feeding system to sustain milk production during lean period.

Effect of different type organic manure on biomass yield, morphological characteristic's and nutritive value of BLRI Napier-4 under Baghabari milk shed area

The scarcity of fodder is one of the important problems in Bangladesh for rearing dairy cows. To mitigate this problem, BLRI introduced BLRI Napier-4 grass (*Pennisetum purpureum*) in the Pabna and sirajgonj districts, known as milk shed areas. Despite of increased milk production farmers complained that fertilizer cost is high and its affect on their profit. Fodder cultivators has a good opportunity to use biogas slurry, broiler litter and layer litter, because a good number of biogas plant, broiler and layer farms are already established in the milk shed areas as well as in the country. From the existing biogas plants and farms a lot of slurry and litter are produced in the area. To consider the farmer's situation BLRI regional station set a agronomic trial with the objectives to determine the biomass yield, morphological characteristics and nutritive value with the effect of different sources of organic manure such as biogas slurry, broiler litter and layer litter for fodder production in Baghabari milk shed areas.

The trial was conducted at BLRI regional station, Baghabari, Shajadpur, Sirajgonj from 15 March 2014, taking 16 trial plots of each size 5m X 5m and arranged in 4 blocks having homogenous soil characteristics. The plots were prepared by ploughing. There were four treatment group T_0 (fertilizer) as control, T_1 (biogas slurry), T_2 (broiler litter) and T_3 (layer litter). The BLRI Napier-4 fodder was propagated by stem cutting method. Line to line and plant to plant distance were 70 and 35 cm, respectively. First cut was made 55 days after the establishment. The statistical analysis was done using 'SPSS' statistical programme to compute analysis of variance (ANOVA) for randomized complete block design (RCBD). Differences among the treatment means were determined by Duncan′s Multiple Range Test (DMRT).

Table 1. Biomass yield and morphological characteristic's of BLRI Napier-4 fodder of different sources of organic manure

Treatment group	Biomass yield (t/ha)	%DM	DM (t/ha)	No. of hill (thousand/ha)	No. of tiller/hill	Survival percentage	Cost of biogas slurry/b.lit/l.lit/ferti. (Tk/ha)
Biogas slurry	26.80[a] ±5.36	14.69±0.98	3.94[a]±0.32	21.69±1.11	13.33±0.61	98.51[a] ±2.21	5705.00[c]±21.22
Broiler litter	22.34[b] ±3.33	14.34±1.10	3.20[b] ±0.42	21.47±1.34	10.32±0.87	92.56[b] ±3.69	7187.00[b] ±19.43
Layer litter	22.20[b] ±2.98	14.11±0.79	3.13[b] ±0.09	20.92±0.98	10.21±0.88	91.55[b] ±4.12	7187.00[b] ±23.93
Fertilizer	26.56[a] ±4.87	14.59±1.13	3.87[a] ±0.45	20.87±2.11	14.44±1.11	97.56[a] ±4.23	15856[a] ±29.77
Level of sig.	*	NS	*	NS	NS	*	**

[abc]Mean values in a column with different superscripts differ significantly; NS= Not significant, *P<0.05, **P<0.01

The biomass yield and morphological characteristics of BLRI Napier-4 fodder are presented in Table 1. It was observed that significant (P<0.05) difference was observed in biomass yield among different treatment group. Biomass yield (t/ha) was in order of biogas slurry (26.80)> fertilizer (26.56)> broiler litter (22.34)>layer litter (22.20). Table 1, also showed that DM yield and survival percentage were also significantly (P≤0.05) differed among the treatments. The DM% in all groups was mostly similar but DM yield (t/ha) was the highest (3.94) in biogas slurry and the lowest (3.13) in layer litter. The cost (Tk/ha) was significant (P<0.01) difference among the treatment group. The highest cost (15856Tk/ha) was observed in fertilizer group and the lowest (5705 Tk/ha) was biogas slurry group. Fertilizer cost near about 3 times higher in case of chemical fertilizer than that of biogas slurry. The results revealed that biogas slurry was reduced the expenditure of cultivation cost of fodder.

Table 2. Chemical composition of BLRI Napier-4 under different types of organic manure

Treatment group	%DM fresh basis	% DM basis			
		Ash	ADF	CP	ME (MJ/kg DM)
Biogas slurry	14.69±0.92	11.34±0.69	47.31±1.54	10.68±0.39	9.91±0.08
Broiler litter	14.34±0.56	12.01±0.78	46.12±2.11	10.22±0.45	9.72±0.09
Layer litter	14.11±0.67	11.92±0.98	45.92±1.66	10.67±0.68	9.41±0.10
Fertilizer	14.59±0.76	11.37±.046	46.22±2.34	11.21±0.76	9.81±0.07
Level of sig.	NS	NS	NS	NS	NS

Table 2 shows that there was no significant (p>0.01) effect of different organic manures on nutritive value of BLRI Napier-4.The results also showed that CP content did not effect by the application of different type of organic manure.

Fig.1 Experimental fodder plots of BLRI Napier-4 of different treatment group

The performance evaluation of different type's organic manure on perform fodder production will be continued. Therefore, so far obtained revealed that biogas slurry may be used as sources of fertilizer for fodder cultivation in Baghabari milk shed area.

Fodder production and marketing system in some selected areas of Bangladesh

Fodder plays an important role in economising the cost of production of livestock products especially of milk. Feed and fodder cost constitute about 60-70% of cost of milk production (Grover, D.K *et.al,* 2012). Fodder comprises a major protein and energy of dairy ration of milch animals and therefore, cultivation of nutritious and high yielding variety fodder is inevitable.Profitable livestock farming depends mainly on adequate availability of fodder with reasonable price. In Bangladesh, fodder production and its conservation/ preservation practice is a very new chapter. Despite various impediments the farmers are very much eager to produce fodder for their livestock as bulk as well as nutrition.Therefore, an investigation was carried on fodder production and marketing system in some selected areas of Bangladesh. The objectives are as:to determine the income coefficient of various fodder farm households, fodder production, processing and marketing system, estimate cost of production and returns and constrains faced by the producers in production, marketing and processing of fodder and remedial measures.In this regard, four study areas were selected from four districts viz:Dinajpur,Jessore,Kurigram andRangpur purposivelyconsidering the concentration of fodder production and marketing. The selected Upazilas were Chirirbandar under Dinajpur district,JessoreSadar under Jessore district,KurigramSadar under Kurigram district andBadargonj under Rangpur district. A purposive sampling technique was followed for collecting of primary data from the field and accordingly 3 categories of sample farmerswere selected namely: i) Fodder Producer cum seller; ii) Fodder Producer cum Dairy owner having 1-2 dairy cows as small, 3-4 dairy cows as medium and 5 and above dairy cows as large farmer; iii) Fodder Middleman.To achieve the above objectives a total of 200 fodder farmers (80 Fodder Producer cum seller, 80 Fodder Producer cum Dairy owner and 40 Fodder Middleman) were interviewed. Field survey method and focus group discussions were followed to collectnecessary primary data and information. Descriptive statistics, mathematical techniques and Cobb Douglas Production function were applied to achieve the objectives and to get the desirable outputs.

The study reveals that the production cost of fodder for producer was estimated the highest (Tk 1,87,598/ha) in Kurigram district and the lowest (Tk 1,71,883/ha) for producer cum seller in Kurigram district. The bio-mass yield estimated was the highest (214.05 t/ha) for producer in Dinajpur district and the lowest was (201.45 t/ha) for producer cum seller in kurigram district.Annual net return from fodder production wasestimated the highest (Tk 2,12,272/ha) for producer cum seller in Jessore district and the lowest (Tk 1,29,806/ha) for producer cum seller in Kurigram district. The BCR wasestimated the highest 2.18 for producer cum seller in Jessore district and the lowest was 1.75 for producer cum seller in Kurigram district.

Table1. Estimated co-efficient and related statistic of annual income for fodder producer cum seller

Explanatory variables	Coefficients	Standard Error	Probability	Significant Level
Constant	9.774***	0.699	15.778	0.000
Crop Sector (X_1)	0.040	0.017	0.405	0.687
Fisheries Sector (X_2)	0.225	0.016	2.325	0.023
Fodder Sale (X_3)	**0.472***	**0.045**	**4.795**	**0.000**
Service Sector (X_4)	0.093	0.020	0.963	0.339
Business Sector (X_5)	0.390	0.015	3.958	0.000
Livestock Sector (X_6)	**0.211****	**0.020**	**2.200**	**0.031**
R^2	0.93	0.043	-	-
F value	7.404***	-	-	0.000

(*** Significant at 1% level,** Significant at 5% level,* Significant at 10% level)

The co-efficient of the variable fodder sale was 0.472 and was significant at 1% level of confidence with positive sign. This implies that keeping other things constant, 1% increase in fodder sale would to an increase in annual income by 0.472% (Table 1).

Table 2. Estimated co-efficient and related statistic of annual income for fodder producer

Explanatory variables	Coefficients	Standard Error	Probability	Significant Level
Constant	10.899***	0.522	20.881	0.000
Crop Sector (X_1)	0.074	0.037	0.863	0.391
Fisheries Sector (X_2)	0.441***	0.018	4.923	0.000
Service Sector (X_3)	0.187***	0.022	2.329	0.023
Business Sector (X_4)	0.284***	0.015	3.363	0.001
Livestock Sector (X_5)	**0.312***	**0.027**	**3.814**	**0.000**
R^2	0.97	0.012	-	
F value	18.662***	-	-	0.000

(*** Significant at 1% level, ** Significant at 5% level,* Significant at 10% level)

The co-efficient of the variable livestock sector was 0.312 and was significant at 1% level of confidence with positive sign. This implies that keeping other things constant, 1% increase in fodder production would to an increase in annual income by 0.312% (Table 2).

Table 3. Estimated co-efficient and related statistic of annual income for fodder Middleman

Explanatory variables	Coefficients	Standard Error	Probability	Significant Level
Constant	0.790**	1.110	0.711	0.482
Crop Sector (X_1)	0.269***	0.006	3.426	0.002
Fisheries Sector (X_2)	0.108	0.009	1.325	0.194
Fodder Business (X_3)	**0.770*****	**0.093**	**10.021**	**0.000**
Labour Sale (X_4)	0.089	0.006	1.057	0.298
Livestock Sector (X_5)	0.283***	0.009	3.390	0.002
R^2	0.830	0.144	-	-
F value	33.17***	-	-	.000

(*** Significant at 1% level, ** Significant at 5% level,* Significant at 10% level)

The co-efficient of the variable fodder business was 0.770 and was significant at 1% level of confidence with positive sign. This implies that keeping other things constant, 1% increase in fodder business would to an increase in annual income by 0.770% (Table 3).

Table 4. Fodder producer cum dairy owner's Annual income from milk sale

Income	Dinajpur		Jessore		Kurigram		Rangpur		All area	
	Cross	Local	Cross	Local	Cross	Local	Cross	Local	Cross	Local
Dairy 1-2	117300	34235	150720	41518	107460	31240	105608	27642	120272	33658
Dairy 3-4	196200	58628	197502	53200	205200	51340	168013	60236	191728	55851
Dairy 5-6	416700	1315000	502000	115235	341550	102500	408900	105000	417287	113558

It is observed that the dairy owner having 1-2 cross-bred dairy cattle earned Tk. 1.50,720 as the highest income in Jessore, 3-4 cross-bred dairy cattle earned Tk. 2,05,200 as the highest income in Kurigram and 5-6 cross-bred dairy cattle earned Tk. 5,02,000 as the highest income in Jessore (Table-4).In the study areas, surplus green fodder was sold in the market. The fodder was sold either in bundles or weight basis.For marketing of fodders, various marketing channel are operating. The main channels are: (i) Producer-Dairy owner and (ii) Producer-Fodder Middleman-Dairy owner.There were problems related to fodder production in the study areas was lack of HYV fodder species, lack of knowledge for fodder cultivation, lack of suitable land availability, lack of technical knowhow, lack of adequate fodder scientist, lack of input facilities (i.e. fodder cuttings, irrigation, fertilizer, hire labour), scarcity of marketing facilities and fodder markets are unorganized and unregulated.Based on those problems the following needs to be taken into consideration: Supply of HYV fodder, Provide training on fodder cultivation and preservation technology through visual and audio visual methods, availability of more milk producing cattle breed, disseminate scientific cultivation practices of fodder and post-harvest technologies (i. e. Silage, hay etc) and create organized marketing structure in surplus fodder production areas.

Activities of Foot and Mouth Diesease (FMD) and Peste des Petites Ruminant (PPR) Project

Foot-and-mouth disease (FMD) is one of the highly contagious economically important diseases of domestic animals in Bangladesh. FMD is an endemic disease in Bangladesh. The research was undertaken to isolation and identification of circulating FMD virus serotypes in Bangladesh. From January, 2011 to December, 2014, total ninety four clinical samples (saliva, tongue, inter digital space tissue, milk sample) were collected from suspected outbreaks of different area in Bangladesh. All samples were subjected to RNA extraction and RT-PCR for detection and serotyping FMDV in clinical samples. Out of 125 samples, 89 (71%) samples were positive for FMD virus. There are three different serotypes of FMD virus currently prevalent in Bangladesh. Among the positive FMD virus isolates, serotype O accounts for about 38% followed by Asia 1 (31%) and A (8%) have been detected. FMDV infection was higher (49%) in monsoon than in summer (28%), winter (22%) season. Five for O serotypes and four for Asia 1 and One for A, were selected for VP1 nucleotide sequence of FMDV. All sequence data were analyzed with Bioedit, Chromas software and Similarity searching by BLAST with GenBank database. The partial VP1 gene sequences obtained in this study and have been deposited in the GenBank database and got the accession numbers: KP119754, KP119755, KP119756, KP119757, KP119758, KP119759, KP119760, KP119761, KP119762, KP119763.

Table 1. Outbreaks of FMDV serotypes in different Districts of Bangladesh

Area	Total sample	Positive isolates	Serotyping			FMD %
			O type	A type	Asia1	
Savar	52	39	5	5	16	52
Joydevpur	3	2	1	-	1	3
Kaligonj	5	5	5	-	-	5
Kapasia	17	14	8	1	3	17
Sirazgonj	7	5	1	-	4	7
Kurigram	5	3	2	-	-	5
Dinajpur	6	6	6	-	-	6
Gaibandha	15	13	6	1	2	15
Chittagong	5	2	-	-	2	5
Total	125	89	34 (38%)	7 (8%)	28 (31%)	125

Procurement during 2013- 2014 financial year:

Sl. No.	Item	Procure (Lac Taka)
1	Chemical and Reagent	20.43
2	Laboratory equipment (ELISA microplate reader, Gel documentation, Electrophoresis system, Centrifuge, Oven, Water bath, CO2 incubator, Refrigerator)	57.82
3	Office and Laboratory furniture (Sofa set, Steel almira, Conference Chair and table, Offocer's chair and table)	7.50
4	Mobile clinic	40.00
5	FMD Laboratory construction	18.68
	Total	144.43 (Lac Taka)

Training program under FMD and PPR Research project:

Sl. No.	Title	Venue	Target people	Duration
1	FMD and PPR Disease: control, prevention and Diagnosis	National Reference Laboratory of Avian Influenza conference room, BLRI, Savar.	BLRI scientist and Laboratory technician (Eight participants) BLRI, Savar	Five days
2	FMD and PPR Disease: Control and Management	Bagabari substation office of BLRI, Serajgonj.	Fifteen Farmer's from Bagabari area, Serajgonj.	Two days
3	FMD and PPR Disease: Control and Management	Social Upliftment Society conference room, Musurikhola Branch Vakurta, Savar.	Fifteen Farmer's from Vakurta area, Savar, Dhaka	Two days
4	Biosafety Management training	National Reference Laboratory of Avian Influenza conference room, BLRI, Savar.	BLRI scientist and Laboratory technician (Eight participants) BLRI, Savar	Three days

Strengthening Research and On-farm Trial Programs of BLRI Regional Stations Project

Conservation of farm animal genetic resources (FAnGR) at Naikhoncari.

Performances of hilly goat development at farm level.

The hilly goats are browsing in nature and allowed to grasses in field. They are able to adapt any adverse condition. They are small in size but prolificacy are high. The tribal people in our hilly areas are also habitual to rearing this species. The adult body weight of hilly goat was 20 95 kg. The face, horn, ear and udder length were 15.56, 7.18, 12.19 and 12.67cm respectively. The HG, FL,HL and BL were 61.51, 46.8, 49.48 and 55.24 cm respectively.The reproductive parameters were Gestation length (GL), Kidding to first heat (KFH), Kidding interval (KI), litter size (LS) and birth weight of kids (BW). The reproductive traits of hilly goat with generation significantly affect on litter size and kidding interval. The kidding interval was lowest in generation 1 (190.5±2.94 days) and highest kidding interval were generation 2 (222.13±5.64 days) and generation 3 (221.77±6.6 days) respectively. The average litter size was 1.73±0.04. The highest and lowest litter size were generation 1 (1.79±0.06).and generation 3 (1.53±0.08) respectively. The kid birth weight, gestation length and kidding to first heat, were non significantly
($P<.05$) affected on generation. The average means values of kid birth weight, gestation length and kidding to first heat were 1.2±.01 kg, 148.5±0.77days and 33.49±1.5 days respectively According to parity the reproductive traits only significantly ($P<.05$) affect on litter size. The litter size was highest in fifth parity (2.04±0.15). The first parity litter size was significantly ($P>05$) lowest (1.48±0.06). The litter sizes were showed increasing trends up to fifth parity. The kid birth weight was increasing trends with increasing parity up to fifth. Birth weight of single kid (1.24±0.02 kg) stood first followed by twin (1.2±0.01 kg), triplet (1.1±0.03kg) and quadruplet kids (0.93±0.08 (kg).

Figure : Hily Buck, Doe and Hilly Herd

Conservation of Farm Animal Genetic Resources (FAnGR) at Naikhongchari

Conservation and improvement of Hilly chicken at Naikhongchari regional station

A total of 111 adult native Hilly chicken (92 females 19 males) were studied of which 60 feathered birds (46 females and 14 males) compared as body size (large, medium and small) and 5 Naked Neck birds (3 females and 2 males) reared to understand their productive and reproductive performances under intensive management. The average hen-day egg production of large, medium and small sizes Hilly chicken during 10 months production period were 38.93 ,42.46 and 45.54 % (p>0.05), respectively. The adult body weight of females and males of large, medium and small sizes were 2205, 1892 and 1622 g; and 3060, 2716 and 2622 g (p<0.01), respectively. The age of first egg and egg weight were 153,148 and 149 d (p>0.05); and 44.9, 40.6 and 39 g (p<0.01), respectively. The average daily feed consumption per bird were 104,107 and 106 g (p<0.01), respectively. Mortality of adult birds during laying period were 20, 26.66 and 7.4 % (p>0.05), respectively. The hen-day egg production of Naked Neck Hilly Chicken during 6 months production period was 49.68%. The average body weight of adult female and male birds was 1975 and 2935 g. The age of first egg and egg weight was 169 d and 37 g. Average daily feed consumption per bird was 105 g. Natural hatching and chick brooding were done by mother hens (43 females and 3 males). Hatchability of Hilly chicken and Naked Neck Hilly chicken was found 76.6 and 56.9 %, respectively. The average body weight of Hilly and Naked Neck Hilly chicks at day-old, 9 and 11 weeks of age were 30.4 and 26.5; 473.5 and 450.6; and 727.3 and 645 g, respectively. The average feed consumption per bird up to 11 weeks of age was 2470 and 2160 g; and feed conversion rate was 3.39 and 3.34, respectively. Mortality of chicks up to 11 weeks of age was 6.11 and 7.14 %. It was concluded that Hilly chickens were improved by body weight than previous year and both feathered and Naked Neck Hilly chicken require reproduce to have large number stock for undertaking conservation and further improvement programme.

Figure: Hilly Naked Neck Chicken,Hilly Chicken and Hilly Broody hen with Chicks

Training:

BRSP (BLRI Regional Station Strengthening Project) arranged a 03 days training program of "Hands on Training on Laboratory Techniques of Animal Nutrition" on 18th – 20th June, 2014. In this training program 10 participants of which 08 officers and 02 laboratory technicians were present. The main objective of this training program was to train up the respective personnel of animal nutrition laboratory of both regional station of BLRI.

Research Farm Section

Breeding stock for BCB-1 and RCC

Breeding stock for BCB-1

Category	Present stock (Number)
Milking cows	29
Dry cows	32
Total cows	**61**
Adult bulls (Teaser, Brahman & breeding)	13
Heifers (Weaning to before puberty)	60
Growing bulls (Weaning to before adult)	50
Male calves	14
Female calves	15
Total	213

Breeding stock for RCC

Category	Present stock (Number)
Milking cows	33
Dry cows	29
Total cows	**62**
Adult bulls (Adults, & breeding)	7
Heifers (Weaning to before puberty)	46
Growing bulls (Weaning to before adult)	61
Male calves	18
Female calves	15
Total	209

Grand Total (Number): (BCB 1 + RCC) = 213 + 209 = 422

Annual Fodder cultivation and distribution (2013-2014)

SL. No.	Plot No	Land (Hector)	Fodder	Work schedule	Fodder production (Ton)	Comments
1.	F_1	1	Napier	Cutting tramplant, cowdung supply, urea supply	100	Fresh grass supply-100 (Ton)
2.	F_2	3	Napier BLRI-3	Cutting tramplant, cowdung supply, urea supply & Silage	200	Fresh grass supply-200 (Ton)
3.	F_4	3	Splendida & Endropogon	Cutting tramplant, cowdung supply, urea supply & Silage	100	Silage-100 (Ton)
4.	F_6	3	Napier	Cutting tramplant, cowdung supply, urea supply & Silage	100	Silage-100 (Ton)
5.	F_7	3	Triticaly & Maize	Cutting tramplant, cowdung supply, urea supply & Silage	20	Fresh grass supply-20 (Ton)
6.	D_W	1	German & Dal Para	Cutting tramplant	100	Fresh grass supply-100 (Ton)
7.	P_1	7	Splendida	Cutting tramplant, cowdung supply, urea supply & Silage	200	Silage-200 (Ton)
8.	L_1	4	Splendida	Cutting tramplant, cowdung supply, urea supply & Silage	150	Silage-150 (Ton)
9.	L_2	3	German	Cutting tramplant, urea supply	100	Fresh grass supply-100 (Ton)
10.	L_3	3	German	Cutting tramplant, urea supply	100	Fresh grass supply-100 (Ton)
11.	L_4	3	German	Cutting tramplant, urea supply	100	Fresh grass supply-100 (Ton)
12.	L_5	2	German	Cutting tramplant, urea supply	60	Fresh grass supply-60 (Ton)
13.	L_6	1	German	Cutting tramplant, urea supply	40	Fresh grass supply-40 (Ton)
14.	F_3	3	Napier BLRI-4	Cutting tramplant, cowdung supply, urea supply & Silage	150	Fresh grass supply-150 (Ton)
15.	M_1–R_1	1	Splendida	Cutting tramplant, cowdung supply, urea supply & Silage	50	Silage-50 (Ton)
16.	F_8–F_{10}	8	Napier	Cutting tramplant, cowdung supply, urea supply & Silage	400	Cutting-200 (Ton) Silage-200 (Ton)
17.	J_1	2	Splendida	Cutting tramplant, cowdung supply, urea supply & Silage	50	Silage-50 (Ton)

18.	H1	2	Napier BLRI-4	Cutting tramplant, urea supply	80	Fresh grass supply -80 (Ton)
19.	H2	2	Napier BLRI-4	Cutting tramplant, urea supply	80	Fresh grass supply -80 (Ton)
20.	H3	.5	Napier BLRI-4	Cutting tramplant, urea supply	20	Fresh grass supply -20 (Ton)
21.	H4	.5	Napier BLRI-4	Cutting tramplant, urea supply	20	Fresh grass supply -20 (Ton)
22.	H5	.5	Napier	Cutting tramplant, urea supply	20	Fresh grass supply -20 (Ton)
23.	H6	.5	Napier	Cutting tramplant, urea supply	20	Fresh grass supply -20 (Ton)
24.	H7	.5	Napier	Cutting tramplant, urea supply	20	Fresh grass supply -20 (Ton)
25.	H1	.5	Napier	Cutting tramplant, urea supply	20	Fresh grass supply -20 (Ton)
26.	H1	2	Napier BLRI-4	Cutting tramplant, urea supply	80	Fresh grass supply -80 (Ton)
Total		60 Hector	-	-	2380 Ton	

Fresh grass supply-1330 Ton, Silage-850 Ton, Cutting-200 Ton Grand Total: 2380 Ton

Regional station, Baghabari, Shahjadpur, Sirajganj

Baghabari area is one of the important milk pocket area of Bangladesh. It is situated under Shahjadpur upazila of Sirajgonj district belong to Korotoya flood plain agro-ecological zone (AEZ-4). The south western parts of Shahjadpurupazila is almost level basins forming milk pocket area or bathan area. Bathan is a common pasture land grazing cattle from January to June and remains under the flood water during the rest period of months each year. However, feed scarcity especially green fodder is one of the most important problems for rearing dairy cows in the Bathan area. In this context, BLRI Regional Station has taken various effective initiatives to mitigate the feeds and fodder problems in the milk vita areas. It was established a fodder germplasm bank consisting of fifteen different fodder germplasm for propagation and dissemination among farmers. A Nutrition Laboratory was set up with all modern facilities for analyzing the nutrient composition of feeds and fodder. A disease diagnostic laboratory was also installed by embedding with sophisticated equipments for testing different kinds of sample like feces, blood, milk, serum etc. Hence, this Regional station was commenced with the objectives to identify the regional farm problems, to strengthen farming system research, to validate on farm developed technologies, to establish strong linkage between research and extension, to identify problems and their subsequent solution for livestock and poultry development. Study epidemiology on existing situation of various bacterial, viral, fungal, parasitic disease and their pathogenic effects on the products of animals.

1. **Completed research work:**
   The following research works were completed during the year of 2013-14:
   a. Effect of modified feeding practices of milk production of cross bred dairy cows in Baghabari milk shed area.
      In conclusion, the introduction of legume hay as modified feeding practice may be an alternative feeding system to sustain milk production during lean period of July to October in each year.

b. Effect of different types of organic manure of biogas yield, morphological characteristics and nutritive value of BLRI: Napier-4 under Baghabari milk shed area.

In conclusion, biogas slurry may be used as a source of fertilizer in the Baghbari milk shed area for commercial fodder cultivation.

2. **Completed other activities in 2014:**

The following works were successfully completed in 2014 at Baghabari Regional Station:

   a. **Tree plantation:**

A total number of eighty eight (88) plants of twenty four (24) different plant species were planted in the campus area of this station. The following tree plants were planted

Sl. no	Name of the tree	Amount	Sl. no	Name of the tree	Amount
1.	Mango (Ampropali)	5	13.	Kodbel	1
2.	Mango (Asshina)	4	14.	Lotkon	1
3.	Mango (Nengra)	4	15.	Pomegranate	2
4.	Mango (Gopalvog)	2	16.	Olive	3
5.	Mango (khirshapata)	2	17.	Amra	3
6.	Mango (Harivanga)	2	18.	Papaya	20
7.	Jackfruit	12	19.	Tejpata	1
8.	Litchi (China)	3	20.	Krishnachura	4
9.	Litchi (Madrazi)	1	21.	Thuja	5
10.	Baukul	3	22.	Belli	2
11.	Narikelkul	3	23.	Joba	2
12.	Jamrul	3	24.	Bael	1

Fig: Tree plantation in Baghabari Regional Station

   b. **Gas line connection:**

A gas line was connected from the Pashchimanchal Gas Company Limited, Baghabari Regional Sell Center, Sirjagonj. Five stoves (Pzjv) with two burners wereset up through one Riger (ivBRvi) from the main gas line.

Fig 2: Gas line connection in Regional station

c. In Charge- Quarter Servicing:

Quarter services including repairing of door, windows netting, toilet etc repairing and white wash of whole building were completed by the Engineering section of BLRI.

d. Disease Diagnostic Laboratory Works:

A total number of 476 samples were analyzed in the laboratory from 1 Jan - 31 Dec, 2014.There were 440, 44 and 02 for feces, bloodand milk sample, respectively.

e. Nutrition Laboratory Work:

Four concentrate feed samples were analyzed for proximate components between January to December, 2014.

f. Fodder Demonstration Plot:

A fodder demonstration plotof Napier-4 fodder genotype was established at the Head Quarter of SahjadpurUpazilaby helping of Fodder Research and Development Project

Fig. 3 Fodder demonstration plot

g. Fodder cutting supply to dairy farmers:

A total number of seven lac seventy eight thousand fodder cuttings were sold to dairy farmers from this station in 2014. Fodder cuttings were purchased by One hundred eighty seven (187) dairy farmers in the Baghabari milk shed areas during October to December, 2014.

Fig 4: Cutting distribution to the farmers

h. **Training implemented:**

Following training programs were successfully implemented by the regional station:

Date	Topics	Duration	No. of participants
16-17th May	FMD and PPR control management	2 days	50
22-23 Sept	Fodder production, preservation and management	2 days	50

Fig.5 Photos on training activities

Regional Station, Naikhongchari, Bandarban
Activities of Naikhongchari Regional Station, Bandarban-2014

Bangladesh Livestock Research Institute, Regional Station is situated at Naikhongchari Upazilla under Bandarban district of the Chittagong Hill Tracts region. It was established in 1989-1990. From the time being, it works to identify the problems and their subsequent solutions for livestock and poultry development (breed, health, housing system, feeding system and nutrition) through research based knowledge and sustainable technology intervention in hilly areas. It also works for conservation and improvement of hilly livestock and poultry & establishment of HY fodder germplasm for distribution of its cuttings/seeds to the concerned farmer's in hilly regions.

Research works

Title	Present Status
A) Strengthening Research and on-farm trial programs of BLRI Regional Stations Project	Completed

Construction:
➤ A boundary wall and 1st floor of the Office cum Laboratory (Animal Nutrition and Disease Diagnosis) building was constructed.
➤ Three phase electricity line was connected to the laboratory building.
➤ A Ring well was also set-up beside the office cum Laboratory building.

Fig 1 Construction of 1st floor lab building and boundary wall

| B) Conservation of Farm Animal Genetic Resources (FAnGR) of hilly region at Naikhongchari' | On-going |

Activities:

a) Conservation and Development of Hilly Chicken and Jungle Fowl
➢ Data on Hilly Chicken and Jungle Fowl of body weight, egg weight, hatchability, fertility and daily feed intake are collected and analysis for their improvement.
➢ Regular activity of vaccination, de-worming, de-beaking and artificial insemination is also done.
➢ Conserve Jungle Fowl in hilly areas from extinction.

Fig 2 Hilly Chicken and Jungle Fowl in research farm

b) Conservation and Improvement of Goat, Sheep, Gayal and Deer
➢ The productive and reproductive data of Brown Bengal goat is recorded and analysis for characterization. The regular activities of vaccination, de-worming, dipping, castration, culling and mating is done for betterment of farm animals.
➢ Conserve the farm animals namely Gayal and Deer in hilly areas from extinction.
➢ For adopting of native sheep at hilly regions, their productive and reproductive data is recorded for analysis.

Fig 3 Brown Bengal goat, Sheep and Gayal in research farm

c) Conservation of different types of animals in research farm

Sl. No.	Animal	Number	Class based on Age & sex
01	Goat	161	Buck = 30, Doe = 66, Male grower & Kids = 27 & Female grower & Kids = 38.
02	Sheep	52	Ram =15, Ewe = 26, Male grower & Lamb = 5 & Female grower & Lamb = 4.
03	Gayal	05	Adult male Gayal = 2 and Adult female Gayal = 3.
04	Deer	7	Stag = 4 and Hind = 2.
05	Hilly Chicken	197	Hen= 43, Cock = 94 and Chick =60
06	Jungle Fowl	35	Hen= 6, Cock = 7 and Chick =22.

C) Conservation and Improvement of native sheep through community and commercial farming (Component-A Research, 2nd phase) project	On-going

Activities:

➢ Distribution of sheep to the selected local communities and gave them technical assistance (vaccination, de-worming, dipping, castration etc.)

➢ For adopting of native sheep at hilly regions, their productive and reproductive data is recorded and analyzed.

▪ Present number of sheep in Community Farmers

Farmer No.	Number of Sheep						Total
	Ram	Ewe	Wether	Pregnant	Grower	Lamb	
10	**11**	**27**	**10**	**05**	**04**	**21**	**78**

Fig 4 Native sheep in community

D) Fodder Conservation Research Project	On-going

Activities:

➢ Establishment of fodder germplasm and production of different types of perennial HY fodders at Research Farm.

➢ Production, cultivation and processing of seasonal fodders.

Name of different types of Fodder

Sl. No.	Common Name	Scientific Name
	Perennial	
01	Napier Hybred (Napier-1, Napier-2 Napier-3 Napier-4)	*Pennisetum purpureum*
02	Para	*Brachiaria mutica*
03	German	*Echinoclora crousgali*
04	Signal	*Brachiaria decumbens*
05	Endropogon	*Andropogon gyanus*
06	Rozi	*Bracharia ruziziensis*
07	Splendida	*Setaria splendida*
	Seasonal	
01	Maize	*Zea mays*
02	Cowpea	*Vigna unguiculata*
03	Matikalai	*Vigna mungo*

Fig 5 Fodder germplasm at Research farm

Other activities:

1) Office lab
- ➢ Collection of Samples (animal faeces) from research farm and community.
- ➢ Analysis and recorded of samples and give prescribed suggestions.
- ➢ Regular post-mortem of animal is done and keeps record.

2) Training Program

Training program was organized at Naikhaongchari regional station conference room following the title of 'Development of Livestock and poultry under farming system approach' for sheep and poultry beneficiaries to gather knowledge about farming and rearing system. In this training program about 40 beneficiaries were participated.

Fig 6 Training program at Naikhaongchari regional station conference room.

3) Vaccination Program at community

Vaccination program was done in t wo villages of Naikhongchari sadar and administrate FMD vaccine about 264 no's of cattle (80 farmers)

Fig 6 vaccination program in community at Naikhongcahri.

Library

Library Section

BLRI library which functions as a resource center, is constantly being enriched. BLRI maintains the library to support the research, training and disseminate the research findings and activities of the institute's researcher. This support is provided through a variety of activities as stated below. BLRI library has been continued to extend its various facilities to the researcher, including those in the regional stations at various places in the country. Some services were also enjoyed by persons other than the BLRI officer-staff.

Library use: More than 500 users including researcher, research support personnel, administrator and trainees from both within and outside the institute take advantage of the library's major facilities and services. Among the outside reader-visitors, the university students, Mphill and Ph.D Student, scientists and researchers from various NGO's, Savar Dairy Farm, RV & F Depot and Military Dairy Farm use this library frequently. The library's infrastructure facilities and physical environment is constantly being improved. The reference service, document delivery, dissemination channels, automated library service and on-line facilities are under-way to further improve with a view to making it a specialized library for livestock research in the country and more useful to the users.

Collection development: The authority is always careful to increase the library collection, upgrade its services and improve the information support for the scientists and researchers of the institute. The authority also allocates a regular revenue and Project budget in every financial year to purchase reading materials for the library. Fodder Research and development project Purchased 68 New books for the year of 2013-2014, Revenue budget purchased 108 New books for the year of 2013-2014, Besides, the library received a remarkable number of journal & workshop proceedings, conventional and non-conventional research reports, annual reports, newsletters and magazines etc. on complimentary or exchange basis. The library always monitored the needs of the scientists of the institute for scientific literature and took special care to procure those in the fastest possible way. Total number of books 5703, Journals title 200 and reports 250 in the BLRI library respectively. Number of old journals binding 267 for the year of 2013-2014.

Photocopying service: There are photocopy machines in the library to improve the document delivery services and information support such as CAS, SDI etc. to facilitate the researchers. The library's photocopying service is made available to them as needed. number of 86078 Photocopy materials have been delivered for official and research purposes for the year 2013-2014.

Computer: One personal computer was acquired for the library to facilitate word processing and database related work. Another one personal computer were added from NATP Project BARC to develop

library database. Now database process is under-way to computerize the library collections in near future to strengthen information retrieval facilities.

Borrowing facilities: The library's borrowing facilities were made available as usual to the researchers, administrators, Mphill, Ph.D Student, scientists, officer and staff of the institute and those of the RV & F Depot, Savar Dairy Farm (on a limited basis). The library maintained formal relationships with the SAIC, AIC, BAU library, BANSDOC library, BARI library, Jahangirnagar University library, and BPATC library.

Reference service: The library staffs are often required to find answers to formal/informal reference queries. They are committed to response the queries and to check various reference citations.

BLRI Publications

BLRI's Publishes Publications includes Journal, Annual Report, Proceeding, Newsletter, Scientific monographs, Bulletins, Leaflets, Technical papers, Research reports, Brochure. The Institute also publishes others Publication.

No.

BLRI Journal

1. Bangladesh Journal of Livestock Research, Vol.1, No.1, July-1993
2. Bangladesh Journal of Livestock Research, Vol.2, January-1994 To Vol.5 No.2, January-1998
3. Bangladesh Journal of Livestock Research, Vol.6, No.1&2, January-1999, June-2002
4. Bangladesh Journal of Livestock Research, Vol.7, No.1&2, January-2000, and Vol.8, No.1&2, January-2001, June-2002
5. Bangladesh Journal of Livestock Research, Vol.9, No.1,(Jan.-June)-2002 and Vol.9, No.2, (July-Dec.)-2002, June-2004
6. Bangladesh Journal of Livestock Research, Vol.10, No.1,(Jan.-June)-2003 and Vol.10, No.2, (July-Dec.)-2003, June-2004
7. Bangladesh Journal of Livestock Research, Vol.11, No.1,(Jan.-June) & No.2, (July-Dec.)-2004, November-2005
8. Bangladesh Journal of Livestock Research, Vol.12, No.1&2, (Jan.-June and July-Dec.)-2005, March-2007
9. Bangladesh Journal of Livestock Research, Vol.13, No.1&2, (Jan.-June and July-Dec.)-2006, June-2007
10. Bangladesh Journal of Livestock Research, Vol.14, No.1&2, (Jan.-June and July-Dec.)-2007, June-2008
11. Bangladesh Journal of Livestock Research, Vol.15, No.1&2, (Jan.-June and July-Dec.)-2008, June-2009
12. Bangladesh Journal of Livestock Research, Vol.16, No.1&2, (Jan.-June and July-Dec.)-2009,June-2010
13. Bangladesh Journal of Livestock Research, Vol.17, No.1&2, (Jan.-June and July-Dec.)-2010, June-2011
14. Bangladesh Journal of Livestock Research, Vol.18, No.1&2, (Jan.-June and July-Dec.)-2011, June-2012
15. Bangladesh Journal of Livestock Research, Vol.19, No.1 (Jan-June) and No. 2, (July-Dec.)-2012, June-2013

BLRI Annual Report

16. Annual Report (Progress Report)-1985-91, July-1991
17. Annual Report-1992-93 to 1997-98, June-2002
18. Annual Report-1999, December-2002
19. Annual Report-2000, June-2004
20. Annual Report-2001, February-2005
21. Annual Report-2002, december-2005
22. Annual Report-2003, June-2006
23. Annual Report-2004, December-2006
24. Annual Report-2005-2006, June-2007
25. Annual Report-2007, June-2008
26. Annual Report-2008, June-2009
27. Annual Report-2009, June-2010
28. Annual Report-2010, June-2011
29. Annual Report-2011, June-2012
30. Annual Report-2012, June-2013

31. Annual Report-2013, June-2014

BLRI Proceeding

32. First Annual Livestock Research Workshop Proceedings, Livestock Research Institute, Nov. 20,1986
33. Bangladesh Livestock Research Institute (BLRI), Progress of Research, October-1988
34. Proceedings of the Workshop on Livestock Development in Bangladesh, 16-18 July-1991
35. Proceedings of the Workshop on Livestock Research in Bangladesh, February-2,1992
36. বার্ষিক গবেষণা ও সম্প্রসারণ কর্মশালা, ১১-12 Rb-2003, Rb-2003
37. Proceedings of Annual Research Review Workshop-2004, June-28-29, 2004
38. Annual Research Review Workshop-2005, April-25-26, 2005
39. Annual Research Review Workshop-2006, June-15-16, 2006
40. Annual Research Review Workshop-2007, June-13-14 June, 2007
41. Annual Research Review Workshop-2008, June-17-18, 2008
42. Annual Research Review Workshop-2009, June-15-16, 2009
43. Annual Research Review Workshop-2010, June-22-23, 2010
44. Proceedings of the Annual Research Review Workshop-2009-2010, June-11
45. Annual Research Review Workshop-2011, June-28-29, 2011
46. Proceedings of the Annual Research Review Workshop-2010-2011, May-2012
47. Annual Research Review Workshop-2012, June-24-25,2012
48. Proceedings of the Annual Research Review Workshop 2012-2013, December-2014

BLRI Newsletter

49. BLRI Newsletter, Vol.1 No.1, December-1989
50. BLRI Newsletter, Vol.2 No.1, March-1991
51. বিএলআরআই নিউজলেটার Vol.1 issue No.1&2, 2010
52. বিএলআরআই নিউজলেটার Vol.2 issue No.1&2, 2011
53. বিএলআরআই নিউজলেটার Vol.2 issue No.3&4, 2011
54. বিএলআরআই নিউজলেটার Vol.3 issue No.1&2, 2012
55. বিএলআরআই নিউজলেটার Vol.5 issue No.1&2, 2014

BLRI others Publication

56. eb¨vi ci Mew`ci I n¤w-মুরগির জন্য চাষী ভাইদের করণীয়
57. ইপিল ইপিল, পশু উৎপাদন গবেষণা বিভাগ
58. Black Bengal goat Under Stall-Fed Condition, APRD
59. Completed, on-going and Future Studies and project programme of Animal Production Research Division, BLRI
60. Effect of molasses supplementation of roughage based diet on growth performance of cattle.
61. গবাদিপশুর ক্ষুরারোগ ও তার দমন ব্যবস্থা
62. " বাংলাদেশী ভেড়ার জাতসমূহ ও এর বৈশিষ্ট্য" শীর্ষক পোস্টার
63. "পোল্ট্রি খামারের জীব নিরাপত্তা" শীর্ষক পোস্টার
64. Laboratory Manual for Homologous Goatpox Vaccine Production, June-2007
65. আবদ্ধ অবস্থায় কাল ছাগল পালন,
66. ছাগল উৎপাদন বৃদ্ধির মাধ্যমে দারিদ বিমোচন ব্রশিওর
67. Sugarcane utilization as a dual purpose crop for sustainable livestock farming

68.		Development of beef cattle breed using Gayal (Bos frontalis)
69.		কর্ণস্ট্র প্যালেট ফিডঃ বিএলআরআই কর্তৃক উদ্ভাবিত একটি পূনাংগ গো-Lv`¨ ‖kí Cˈ‖ɜ
70.		মুরগির রোগ নিয়ন্ত্রণ ব্যবস্থাপনা প্রশিক্ষণ সহায়িকা
71.		লাভজনক দুগ্ধ খামারের জন্য নেপিয়ার (নেপিয়ার বাজরা) ঘাস চাষ
72.		আরসিসি চিটাগাং অঞ্চলের একটি অষ্টমুখী লাল গরম্ন
73.		লেয়ার মুরগি পালন নির্দেশিকা
74.		Foot and Mouth Disease
75.		Ke̸Zi cvj b
76.		Reproductive Performances of Cows in Savar Dariy Farm
77.		Memorandum of Agreement Between BL:RI and DLS on Hand-Over of Savar Farm to BLRI.
78.		Livestock Sub –Sector in Bangladesh: Status and Development Potentials.
79.	1963-85	Abstracts of Research in Parasitology in Bangladesh. 1963-1985
80.	1986-90	Poultry Production Research Division. Research Report-1986-90
81.	1988-89	Epidemiology of Foot and Mouth Disease in Bangladesh and Selection of Vaccines Virus Strains, Annual Report, 1988-89
82.	1988-89	Proceedings of the Workshop on the Achievement of Research Under PL 480 Title-III, 1988-89, February-1990
83.	1989-90	Report on Farming System Research. FSR Report No.1, 1989-1990
84.	1989-90	Performance of Black Bengal Goat under Stall-fed condition, 1989-90
85.	1989-90	Development of fodder production programme for BLRI fields, 1989-1990
86.	1989-90	Epidemiology of Foot and Mouth Disease in Bangladesh and Selection of Vaccines Virus Strains, Annual Report, 1989-90
87.	1989-99	Development of Straw Based Ration for Feeding Ruminants (1989-1999)
88.	1991-93	Achievement of Research Under PL 480, Title- III, 1991-93, December-1993
89.	1991-96	Farming Systems Research and Development Project (1991-96)
90.	1990-91	Report on Farming System Research. FSR Report No. 2, 1990-91
91.	1990-91	Performance of Black Bengal Goat under Stall-fed Condition. Progress Report-1990-91
92.	1990-91	Development of Feeding Regimes for Calves. 3rd Annual Report, 1990-91
93.	1990-91	Evaluation of Artificial Insemination Programme in Bangladesh. Progress Report, 1990-91
94.	1990-91	Fodder Research and Production Programme, 2nd Annual Progress Report, 1990-91
95.	1993-94	Poultry Breeding and Rearing in BLRI, Progress Report, April- 1993 to June-1994
96.	1986	Check lists of Helminthes of Animals and Birds in Bangladesh. December-1986
97.	1987	Characteristics of two villages for farming system research, February-1987
98.	1987	Fattening of Beef Cattle, May-1987
99.	1988	বাংলাদেশ গবাদিপশু গবেষণা ইনস্টিটিউট, ডিসেম্বর, ১৯৮৮
100.	1988	About BLRI (in English), December 1988
101.	1988	An Epidemiological Study of Calf Diseases in Bangladesh, Annual Report for 1988
102.	1989	Proceedings of the Meeting of Counterpart Scientists of SAARC Member of Countries on Livestock Improvement, December- 18-19,1989
103.	1989	Survey report on existing farming system at rawtara village, Baghabari, June-1989.
104.	1989	Research abstracts of livestock Activities at Baghabari Farming System Research Site, June-1989
105.	1989	Identification of Problems Affecting the Livestock and Poultry Production and Transfer of Technology to Improve Their Production at Farming System, June-1989
106.	1990	Feeding Pattern of Birds (chicken and ducks) Under Scavenging Condition and Formulation of Supplementary Ration Using the Local Ingredients. Second Annual Progress Report, September-1990
107.	1990	Development of feeding Regimes for Calves, Second Annual Progress Report, 9th Oct.-1990

108.	1990	Study on Livestock Feeds Fodder and Feeding Practices in Bangladesh and Their Nutritive Evaluation, 9th October, 1990
109.	1991	দল ঘাস, পশু উৎপাদন গবেষণা বিভাগ, মে- 1991
110.	1991	About BLRI, June-1991
111.	1991	Proceeding of the Meeting of Counterpart Scientists of SAARC Member Countries on Animal Genetic Resource Conservation, 11-12 November, 1991
112.	1991	বাংলাদেশ ক্ষুরারোগ ভাইরাসের টাইপ ও সাব-UvBc, g›P©1991
113.	1992	A socio-Economic Evaluation of the Artificial Insemination Programme in Bangladesh, June-1992
114.	1994	Development of straw based ration for feeding ruminants, June-1994
115.	1994	Collaborative Livestock Research and Extension Programme Between BLRI and Proshika, June-1994.
116.	1995	Status of beef cattle production in Bangladesh, May-1995
117.	1995	Evaluation of Productive and Reproductive Performances of F1, F2 and F3 Progenies of Local x Friesian and Sahiwal x Friesian Cross-bred Cattle in the Savar Dairy farm. Research Report, July-1995.
118.	1995	A report on the straw preservation under wet condition and its utilization for the ruminant,August-1995
119.	1995	A Report on the Study on Supplementing Effects or Feeding System of Molasses and Urea on Methane and Microbial Nitrogen Production in the Rumen and Growth Performances of Bulls Fed a Straw Diet, September-1995.
120.	1997	Socio-economic Impact of Smallholder Livestock Development Project in Bangladesh, October-1997
121.	1998	c¨ï m¤c` । n¨m-মুরগি উন্নয়ন প্রযুক্তি পরিচিতি, জানুয়ারী- 1998
122.	1998	স্বল্প খরচে উৎকৃষ্ট গো-খাদ্য ইউরিয়া মোলাসেস স্ট্র (ইD,Gg,Gm) (Urea Molasses Straw (UMS) for Beef Fattening), Rj vB-1998
123.	1998	গরম্নর জন্য সবুজ ঘাসের বিকল্প হিসাবে এ্যালজির (শেওলা) ব্যবহার, প্রথম সংস্করণ, জুলাই-1998
124.	1998	দেশী পদ্ধতিতে স্বল্প ব্যয়ে সবুজ ঘাস সংরক্ষণ, প্রথম সংস্করণ, জুলাই-1998
125.	1998	মুরগির বাচ্চা পালন নির্দেশিকা, প্রথম সংস্করণ, জুলাই-1998
126.	1998	হাঁস পালন ব্যবস্থাপনা নির্দেশিকা, প্রথম সংস্করণ, জুলাই-1998
127.	1998	গিনিফাউল প্রতিপালন, প্রথম সংস্করণ, জুলাই-1998
128.	1998	কোয়েল পালন ব্যবস্থাপনা নির্দেশিকা, প্রথম সংস্করণ, জুলাই-1998
129.	1998	বাড়ন্ত মুরগির বাচ্চা পালন, প্রথম সংস্করণ, জুলাB-1998
130.	1998	ছেড়ে পালনের উপযোগী মুরগি ফাওমী, প্রথম সংস্করণ, জুলাই-1998
131.	1998	পশু পাখীর খাদ্য হিসেবে সমন্বিত খামারের বর্জ্য হতে ডাকউইড উৎপাদন এবং এর ব্যবহার, ১৯৯৮
132.	1998	লাভজনক দুগ্ধ উৎপাদন ও গরম্ন মোটা তাজাকরণে কয়েকটি খাদ্য প্রযুক্তি, জুন-1998
133.	1999	Research Achievements and Activities, April-1999
134.	1999	বাছুর ব্যবস্থাপনা, জুন-1999
135.	1999	লাভজনক দুগ্ধ খামার স্থাপন, জুন-1999
136.	1999	ট্রেনিং ম্যানুয়েল-j vfRbK Mew`c¨ï । n¨m-gyï wM, Rþ-1999
137.	1999	মিশ্র ফসল হিসাবে গো-খাদ্য ভূট্টার চাষ, প্রথম সংস্করণ, সেপ্টেম্বর-1999
138.	1999	ELISA Technique ব্যবহার করে ক্ষুরা রোগ নির্ণয়, প্রথম সংস্করণ, সেপ্টেম্বর-1999
139.	1999	ছাগল বসন্সেত্বর টিকা, প্রথম সংস্করণ, সেপ্টেম্বর-1999
140.	1999	পি পি আর রোগের এ্যান্টিসিরাম-এ্যান্টিবায়োটিক সমন্বিত চিকিৎসা পদ্ধতি, প্রথম সংস্করণ, সেপ্টেম্বর-1999
141.	1999	পি পি আর রোগের ভ্যাকসিন, প্রথম সংস্করণ, সেপ্টেম্বর-1999
142.	1999	দেশীয় মুরগির জাত পরিচিতি, প্রথম সংস্করণ, সেপ্টেম্বর-1999
143.	1999	দারিদ্র বিমোচনে গ্রামীণ পরিবেশে সংকর প্রজাতির মুরগি পালন পদ্ধতি, প্রথম সংস্করণ, সেপ্টেম্বর-1999
144.	1999	Economics and Marketing Research Division, Progress Report, June-1999

145.	2009-10	A Compendium on Red Chittagong Cattle of Bangladesh, 2009-2010
146.	2010-11	দুধপন্য উৎপাদনে দেশী প্রযুক্তি, ২০১০-11
147.	2000	ট্রেনিং ম্যানুয়েল, প্রথম সংস্করণ, ফেব্রুয়ারী-2000
148.	2000	Economics and Marketing Research Division, Progress Report, June-2000
149.	2000	BLRI: A Brief Acquaintance, January-2000
150.	2000	Peste des petits ruminants (PPR), A brief introduction, its diagnosis and control, February-2000
151.	2001	BLRI An Overview, June-2001
152.	2001	Improvement of black Bengal Goat through selective breeding, May-2001
153.	2002	বর্ষাকালে ভিজা খড়ের পচন রোধকল্পে স্বল্প খরচে সংরক্ষণ, দ্বিতীয় সংস্করণ, জুন-2002
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155.	2002	ছাগল পালন ম্যানুয়েল, এপ্রিল-2002
156.	2002	পশুখাদ্য ও জ্বালানী হিসেবে ইপিল ইপিলের চাষ ও ব্যবহার, প্রথম সংস্করণ, জুন-2002
157.	2002	খামারের বর্জ্য হতে সারা বছর ডাকউইড উৎপাদন এবং পশুখাদ্য হিসেবে এর ব্যবহার, প্রথম সংস্করণ, জুন-2002
158.	2002	ſÆv-কাউপি মিশ্র গো-খাদ্য চাষ ও ব্যবহার, প্রথম সংস্করণ, জুন-2002
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160.	2002	দারিদ্র বিমোচনে ছাগল পালন মডেল, প্রথম সংস্করণ, জুন-2002
161.	2002	গো-খাদ্য হিসেবে কলাগাছের সংরক্ষণ ও ব্যবহার, প্রথম সংস্করণ, জুন-2002
162.	2002	আখের উপজাত সংরক্ষণ ও গো-খাদ্য হিসেবে ব্যবহার, প্রথম সংস্করণ, জুন-2002
163.	2002	লবনাক্ত, বন্যাকবলিত ও মধুপুর গড় এলাকার জন্য ঘাস উৎপাদন, প্রথম সংস্করণ, জুন-2002
164.	2002	এনজাইম ইমিউনো শ্লাইড এসে পদ্ধতিতে দ্রুত্ত রোগ সনাক্তকরণ, প্রথম সংস্করণ, জুন-2002
165.	2002	গবাদিপশুর পরজীবী মুক্তকরণের আদর্শ প্রযুক্তি, প্রথম সংস্করণ, জুন-2002
166.	2002	মুরগির মাইকোপাজমা রোগ নির্ণায়ক (ডায়াগনস্টিক এন্টিজেন), জুন-2002
167.	2002	পাহাড়ী জমিতে সবুজ ঘাস উৎপাদন ও ব্যবহার, প্রথম সংস্করণ, জুন-2002
168.	2002	মুরগির সালমোনেলোসিস রোগ দমনে ফাউল টাইফয়েড ভ্যাকসিন, প্রথম সংস্করণ, জুন-2002
169.	2002	মুরগির সালমোনেলোসিস রোগ নির্ণয় ও দমনে পুরোরাম এন্টিজেন, প্রথম সংস্করণ, জুন-2002
170.	2002	ছাগলের পিপিআর রোগের স্বাস্থ্য ব্যবস্থাপনা, প্রথম সংস্করণ, জুন-2002
171.	2002	ভূমিহীনদের জন্য লেয়ার মুরগী উৎপাদন মডেল, প্রথম সংস্করণ, জুন-2002
172.	2002	মাঠ পর্যায়ে মুরগির রাণীক্ষেত রোগ দমনে স্থানীয়ভাবে তৈরী টিকা ও অষ্ট্রেলিয়ান NDV_4 HR , প্রথম সংস্করণ, জুন-2002
173.	2002	Proceedings of the Workshop on Poverty Alleviation Through Goat Production: National Programme (27 April-3 May 2002), December-2002
174.	2003	ট্রেনিং ম্যানুয়েল(পরিমার্জিত দ্বিতীয় সংস্করণ, ২০০৩
175.	2003	স্টল ফিডিং পদ্ধতিতে ছাগল পালন, প্রথম সংস্করণ, মার্চ-2003
176.	2004	Research and Development Strategic Plan (2003-2006), February-2004
177.	2004	হিমোলাইসিন প্রস্তুত প্রণালী, প্রথম সংস্করণ, মার্চ-2004
178.	2004	মাঠ পর্যায়ে পোল্ট্রি ও পশু খাদ্যের গুণগতমান নির্ণয়, প্রথম সংস্করণ, জুলাই-2004
179.	2004	মানসম্পন্ন ব্রয়লার ও লেয়ার বাচ্চার বৈশিষ্ট্য, প্রথম সংস্করণ, জুলাই-2004
180.	2004	হাওড়ে লাভজনকভাবে হাঁস পালনের কৌশল, প্রথম সংস্করণ, জুলাই-2004
181.	2004	eb¨Kvj¨ xb I eb¨vi ci Mew`¨ ci I Ñ nvm-মুরগির জন্য চাষীভাইদেও করণীয়, জুলাই-2004
182.	2004	Kgwcেমন্ট ফিক্সেশন পরীক্ষা (একটি গবেষণাগার ম্যানুয়াল), প্রথম সংস্করণ, আগষ্ট-2004
183.	2004	ভেড়া পালন ম্যানুয়েল, ডিসেম্বর-2004
184.	2005	Mew`¨ ci , nvm-মুরগি এবং মৎস্য খাদ্য ও রোগ চিকিৎসায় উদ্ভিদ ম্যানুয়েল, প্রথম সংস্করণ, ফেব্রুয়ারী-2005
185.	2005	এভিয়ান ইনফ্লুয়েঞ্জা ক্লিনিক্যাল ও পোষ্টমর্টেম লক্ষণ এবং দমন ও প্রতিরোধ পদ্ধতি, প্রথম সংস্করণ, ফেব্রুয়ারী-2005
186.	2005	পশুসম্পদ ও পোল্ট্রি উৎপাদন প্রযুক্তি নির্দেশিকা, জুন-2005
187.	2006	ছাগলের বাচ্চার মৃত্যুর কারণ ও প্রতিকার, প্রথম সংস্করণ, জুন-2006
188.	2006	A Compendium of Livestock Technologies Developed by Bangladesh Livestock Research Institute, First edition, June-2006

189.	2006	‧Ui‧UK¨wj Drcv`b I e¨envi , 2q c‧KvkKvj , AwMó-2006
190.	2007	মোটাতাজাকরণের জন্য গরম্ন নির্বাচন, ফেব্রম্নয়ারী - 2007
191.	2007	গরম্নর তড়কা রোগ দমন ব্যবস্থাপনা, ফেব্রম্নয়ারী - 2007
192.	2007	গরম্নর বাদলা রোগ দমন ব্যবস্থাপনা, ফেব্রম্নয়ারী - 2007
193.	2007	গরম্নর গলাফোলা রোগ দমন ব্যবস্থাপনা, ফেব্রম্নয়ারী - 2007
194.	2007	ছাগলের বসন্ত রোগ দমন ব্যবস্থাপbv, gvP© 2007
195.	2007	পোল্ট্রি খামারের জীব নিরাপত্তা নিশ্চিতকরণের লক্ষে নিম্নের নিষয়গুলির প্রতি সতর্ক থাকা উচিত, মার্চ-2007
196.	2007	ভেড়ার খাদ্য ব্যবস্থাপনা, ডিসেম্বর-2007
197.	2007	পিপিআর ভাইসাসের বিরম্নদ্ধে এন্টিবডি নির্ণয়ে C-EISA c×‧Z, Rþ-2007
198.	2007	BLRI- A Brief Acquaintance, June-2007
199.	2007	‘‘বিশ্ব ভেড়ার জাত ও বাংলাদেশে প্রাপ্ত ভেড়াসমূহ’’ শীর্ষক পোষ্টার, জুন-2007
200.	2007	পশুসম্পদ ও পোল্ট্রি উৎপাদন প্রযুক্তি নির্দেশিকা ঃ পরিমার্জিত সংস্করণ, জুন ২০০৭ খ্রিঃ
201.	2008	উচ্চ ফলনশীল ঘাসর চাষ, দ্বিতীয় সংস্করণ, নভেম্বর-2008
202.	2008	স্টল ফিডিং পদ্ধতিতে ভেড়া পালন, প্রথম সংস্করণ, এপ্রিল-2008
203.	2008	দেশী ভেড়ার প্রজনন পরিকল্পনা ও ব্যবস্থাপনা, প্রথম সংস্করণ, মে-2008
204.	2008	ভেড়ার ফুট রট রোগের চিকিৎসা, প্রথম সংস্করণ, মে-2008
205.	2008	ভেড়ার বহিঃ পরজীবীর প্রতিরোধ ও চিকিৎসা, প্রথম সংস্করণ, মে-2008
206.	2008	ভেড়ার প্রজনন ব্যবস্থাপনা, মে-2008
207.	2008	ক্ষুদ্র খামারীদের জন্য ছাগল পালন পদ্ধতি, প্রথম সংস্করণ, জুন-2008
208.	2008	মহিষ পালন ব্যবস্থাপনা, প্রথম সংস্করণ, জুন-2008
209.	2008	ভেড়া পালন নির্দেশিকা, প্রথম সংস্করণ, জুন-2008
210.	2008	ছাগলের বাচ্চার প্রতিপালন, ২য় সংস্করণ, নভেম্বর-2008
211.	2008	এভিয়ান ইনফ্লুয়েঞ্জা প্রতিরোধে জীব নিরাপত্তা নির্দেশিকা, সেপ্টেম্বর-2008
212.	2008	ব্রয়লার পালন নির্দেশিকা, প্রথম সংস্করণ, সেপ্টেম্বর-2008
213.	2009	মুরগির গামবোরো রোগ নিয়ন্ত্রণের কার্যকর পদ্ধতি, দ্বিতীয় সংস্করণ, নভেম্বর-2009
214.	2009	মুরগির রানীক্ষেত রোগ নিয়ন্ত্রণের কার্যকর পদ্ধতি, দ্বিতীয় সংস্করণ, নভেম্বর-2009
215.	2009	GBPAvB (HI) পরীক্ষার জন্য ফিল্টার পেপারের সাহায্যে রক্ত নমুনা সংগ্রহ পদ্ধতি, দ্বিতীয় সংস্করণ, নভেম্বর-2009
216.	2009	বাণিজ্যিক মুরগির খামারে জীব নিরাপত্তা ব্যবস্থাপনা,প্রকাশকালঃ নভেম্বর-2009
217.	2009	মুরগির সালামোনেলা রোগঃ প্রতিরোধ ও নিয়ন্ত্রণ পদ্ধতি, দ্বিতীয় সংস্করণ, নভেম্বর-2009
218.	2009	gyi‧গির খামারের বর্জ্য ব্যবস্থাপনা ও কম্পোস্টিং, দ্বিতীয় সংস্করণ, নভেম্বর-2009
219.	2009	পশুসম্পদ ও পোল্ট্রি উৎপাদন প্রযুক্তি নির্দেশিকা, তৃতীয় সংস্করণ, জুন-2009
220.	2009	দেশী ভেড়ার পশম হতে ঘরে বসে চাদর, শাল ও মাদুর তৈরির সহজ পদ্ধতি, প্রথম সংস্করণ, মার্চ-2009
221.	2009	ভেড়ার বাচ্চার প্রতিপালন, gvP©2009
222.	2009	A Study on Highly Pathogenic Avan Influenza in Bangladesh, June-2009
223.	2009	মুরগির কৃত্রিম প্রজননের সহজ পদ্ধতি, প্রথম সংস্করণ, জুন-2009
224.	2009	ফডার থেকে ডিএনএ (DNA) পৃতকীকরণের সহজ পদ্ধতি, প্রথম সংস্করণ, জুন-2009
225.	2009	মাইকোটক্সিন নিয়ন্ত্রণের উপায়, প্রথম সংস্করণ, জুন-2009
226.	2009	রক্তের নমুনা থেকে ডিএনএ নিস্কাশন, প্রথম সংস্করণ, জুন-2009
227.	2009	ক্ষুদ্র পোল্ট্রি খামারীদের ‘‘খামার ব্যবস্থাপনা’’ বিষয়ে প্রযুক্তি হস্তান্তর কর্মকর্তার নিকট প্রতিনিয়ত প্রশ্ন ও জবাব, প্রথম সংস্করণ, নভেম্বর-2009
228.	2009	কৃত্রিম গো-প্রজনন ম্যানুয়েল, প্রথম সংস্করণ, জুন-2009
229.	2009	ভেড়ার খামার জীব নিরাপত্তা, প্রথম সংস্করণ, নভেম্বর-2009
230.	2010	ভেড়া পালন নির্দেশিকা, ২য় সংস্করণ, অক্টোবর-2010
231.	2010	অ্যান্থ্রাক্স বা তড়কা রোগ আতঙ্ক নয়, প্রয়োজন সচেতনতা, আগষ্ট-2010
232.	2010	পশুসম্পদ ও পোল্ট্রি উৎপাদন প্রযুক্তি নির্দেশিকা, ২য় সংস্করণ, জুন-2010
233.	2010	ভেড়ার খাদ্য ও পুষ্টি ব্যবস্থাপনা, প্রথম সংস্করণ, জুন-2010
234.	2011	ভেড়ার ব্যাপক অ্যালোপেসিয়া (লোম উঠা) রোগের কারণ, লক্ষণ ও প্রতিকার, মার্চ-2011

Engineering Section

Engineering Section under Support Service Division has been working from the beginning of the Institute. The Section is headed by an Executive Engineer (Civil) with 2 (two) Sub-Assistant Engineer (Civil), 1 (one) Sub-Assistant Engineer (Electronics), 1(one) Electrician and 1 (one) Mason.

Following development and repair/ renovation/Maintenance works has been implemented by the Engineering Section under revenue budget & development project during the year 2013-2014.

A.   Under revenue budget (Repair and renovation works)

Sl. No.	Name or works	Qty.	Value of works In Lakh Tk.
1.	Repair of Residential Building	19 unit	24.95
2.	Repair of other building and infrastructures	L.S	18.00
3.	Fixing of service chute & G.I pipe fencing including construction of RCC floor at A.I Lab yard.	L.S	1.99
4.	Construction of plastic slated floor at Goat shed	L.S	3.98
5.	Repair of Machineries & Equipments : (Repair of Air cooler, Milk processing plant, sub-station, Pump, Freeze etc.)	L.S	6.03
6.	Others repair and maintenance (Gas water & Electricity) (Repair of water line, Bio-Gas plant, Transformer, Incubator, Electric pole, water tank, Gas line, observation tower etc.	L.S	15.03
7.	Repair & Maintenance of PABX		0.650

B.   Under Development Project

Sl. No.	Name or works	Qty.	Value of works In Lakh Tk.
1.	**Conservation and improvement of native sheep through community farming and commercial farming project**		
	a. Installation of deep tube well	L.S	49.94
	b. Construction of pipe line & pump operator house	L.S	18.88
	c. Land Development at BLRI, HQ.	L.S	3.50
2.	**Buffalo Development Project (Component-B)**		
	a. Construction of Bio-Gas plant	L.S	11.46
	b. Construction of Bio. Tech. Lab. bldg.. (On going)	550 m^2	400.04
3.	**Strengthing Research and on-Farm Trial Programs of BLRI Regional Stations Project**		
	a. Internal carpeting road & fodder link road at Baghabari Regional Station	L.S	9.15
	b. Vertical extension of disease Diagnosis Lab, Boundary wall, Ring well etc. at Naikhongchari	150 m^2	37.89
4.	**Study on Bangladesh Lamb Production Project**		
	a. Construction of plastic slated floor at Goat shed	L.S	5.00

ICT activities at BLRI

Bangladesh Livestock Research Institute (BLRI) has improved it's Information Communication Technology (ICT) infrastructure for R&D and other official activities.BLRI Server room has been enriched after installing HP Servers with server rack,CISCO network equipment, Online UPS and other related accessories at server room.

BLRI is connected with Nation Agricultural Research System (NARS) using ICT. Bangladesh Agriculture Research Council (BARC) is apex body of agricultural research in Bangladesh. BLRI is connected to BARC's Data-Center through Virtual Private Network (VPN). Scientists are using The Essential Electronic Agricultural Library (TEEAL), a digital collection of world renowned research journals for agriculture and related sciences. Researchers can discover and access about 250 (1990-2011) international Journalsfull-text PDF articles using BARC data center.All office building are connected through underground optical fiber backbone including some farm area for online surveillance.All office rooms, laboratories, library, conference room, guest house and DG's Banglo areconnected to the LAN. Scientists and officials are getting the facilities such as file or data sharing, print sharing, communicating among themselves through the LAN for better R&D activities. Management Information System (MIS) has been developed which contains the following modules. It is fully dynamic and web based software.

1. Research Management Information System (RMIS)
2. Human Resource Management Information system (HRMS)
3. Financial Management Information system (FMIS)
4. Procurement Management Information system (PMIS)
5. Inventory Management Information System (IMIS)
6. Training Management Information system (TMIS)
7. Library Management Information System (LMIS)
8. Vehicle Management Information System (VMIS)
9. Data Bank (Gene Bank, Policy Document, Knowledge Bank etc.)

Dedicated 5 Mbps full duplex Internet connectivity is attached to the LAN. Scientists and officials are using 24 hours uninterruptible Internet from every computer under the LAN. Some areas of office are under wireless internet connection (Wi-FI). Internet is accessible through mobile device like Smart phone, Tablet PCs, Laptop etc. Scientists are communicating with different internationalResearch Institute, Universities and related organization for better R&Dactivitiesby using internet. Updated R&D information, news, reports, and other activities are available in BLRI official website http://www.blri.gov.bd.

Accounts section

Financial Statement for the Year 2013-2014 (Revenue Budget)

Taka in lakh)

Economic Code	Particular	Total budget	Total expenditure	Balance
4500	Officers Salary	157.43	157.43	-
4600	Staff Salary	105.51	105.51	-
4700	Allowances	184.12	184.12	-
4800	Supply & Service	782.00	765.19	16.81
4900	Repair & Maintenance	83.50	83.50	-
5300	Contributory provident fund	34.18	34.18	-
6300	Retirement allowance Gratuity	68.74	9.72	59.02
	Grand Total:	**1415.48**	**1339.65**	**75.83**

Store cum Procurement Section

Sl. No.	Subject Name	Quantity	Total Amount (Tk.)
1.	**Animal & Poultry Feed:-**		
	a) Wheat bran, Fish meal, Coconut cake (Lot-1	L.S.	Tk.52,91,800.00
	b) Keshari bran, Til oil cake , DCP etc (Lot-2	L.S.	Tk.34,52,200.00
	c) Soya bean meal, Wheat crashed, Maize crashed etc. (Lot-3)	L.S.	Tk.40,93,100.00
	d) Poultry Feed (Lot-4)	L.S.	Tk.78,80,800.00
2.	**Stationeries**	L.S.	Tk.4,49,781.00
3.	**Electric Goods**	L.S.	Tk.4,22,365.00
4.	**Sanitary Goods**	L.S.	T.4,08,940.00

List of Personnel

Permanent set up:

No.	Name	Designation
1.	Md. Nazrul Islam, Ph.D. (Poultry Management)	Director General (C.C.)
2.	Lokman Ahmed, BCS (Admin)	Additional Director
3.	Khan Shahidul Huque, Ph.D. (Animal Nutrition)	Chief Scientific Officer
4.	M.J.F.A. Taimur, Ph.D. (Parasitology)	Chief Scientific Officer
5.	Mrs. T. N. Nahar, Ph.D. (Animal Breeding)	Chief Scientific Officer
6.	Azharul Islam Talukder, Ph.D (Animal Breeding)	Principal Scientific Officer
7.	Md. Mahfuzar Rahman, Ph.D. (Poultry Science)	Principal Scientific Officer
8.	Md. Ebadul Haque, Ph.D. (Poultry Science)	Senior Training Officer
9.	Mrs. Jerina Begum, M.A. (Social Work)	Senior Scientific Officer
10.	Nathu Ram Sarkar, Ph.D. (Animal Nutrition)	Senior Scientific Officer
11.	Md. Gias Uddin, Ph.D. (Vet.Epidemiology)	Senior Scientific Officer
12.	Md. Ershaduzzaman, Ph.D. (Bacteriology)	Senior Scientific Officer
13.	Md. Abdul Jalil, M.Sc. (A.H.), (Animal Breeding)	Senior Scientific Officer
14.	S.M. Ekthair Uddin, M.A. (Library Science)	Libraian
15.	S.M. Aminul Islam, B.A. (Hons.) M.A. (Social Work)	Publication officer
16.	Md. Shah Alam, B.A. (Hons.) M.A. (Islamic History)	Information Officer
17.	Mohammad Lutful Haque, M.Sc. (Computer Eng.)	System Analyst
18.	S.M. Jahangir Hossain, M.Sc. (A.H.), Ph.D. Fellow, BAU	Senior Scientific Officer
19.	Nasrin Sultana, M.Sc. (A.H.), Ph.D. Fellow, Malaysia	Senior Scientific Officer
20.	Dr. Md. Rafiqul Islam, M.Sc.(Vet. Science), Ph.D.	Senior Scientific Officer
21.	Md. Asaduzzaman, M.S. (A.H.), Ph.D. Fellow, BAU	Senior Scientific Officer
22.	Shakila Faruque, M.S. (A.H.), Ph.D. Fellow, BAU	Senior Scientific Officer
23.	Md. Sazedul Karim Sarker, Ph.D. (Animal Nutrition)	Senior Scientific Officer
24.	Parvin Mostari, M.S. (A.H.), Ph.D.	Senior Scientific Officer
25.	Razia Khatun, M.S. (A.H.), Ph.D Fellow, JU.	Senior Scientific Officer

26.	Kamurn Nahar Monira, M.S. (A.H.), Poultry Science	Senior Traning Officer
27.	Biplob Kumar Roy, Ph.D. (Livestock Production Management)	Senior Scientific Officer
28.	Dr. Md. Hasan-Al-Faruque, M.S., Ph.D. Fellow, Koria	Senior Scientific Officer
29.	Gautam Kumar Deb, Ph.D. (Reproductive Biotechnology)	Senior Scientific Officer
30.	Md Jillur Rahman, M.S. (A.H.), Ph.D.	Senior Scientific Officer
31.	Sardar Muhammad Amanullah, M.S. (A.H.), Ph.D. Fellow, Koria	Senior Scientific Officer
32.	Md. Asraful Islam, B.Sc. Eng. MBA	Executive Engineer
33.	Dr.Md. Nuruzzaman Munsi, M.S. (Surgery & Obstratics)	Scientific Officer
34.	Md. Rakibul Hassan, M.S. (A.H.), Ph.D.	Scientific Officer
35.	Sadek Ahmed, M.A. (A.H.), Ph.D. Fellow, Itali	Scientific Officer
36.	Md. Saiful Islam, Age. Economics	Scientific Officer
37.	Mohammed Abdus Samad, (Microbiology) Ph.D. Fellow, Koria	Scientific Officer
38.	Shahin Alam, M.S. (Microbiology)	Scientific Officer
39.	Mohammad Abdur Rashid, M.S. (A.H.), Poultry Science	Scientific Officer
40.	Shamim Ahmed, M.S. (A.H.), Nutrition	Scientific Officer
41.	Ali Akbar Bhuiya, M.S. (A.H.), Nutrition	Scientific Officer
42.	Halima Khatun, M.S. (A.H.), Poultry Science	Scientific Officer
43.	Mohammad Sirajul Islam, M.S. (A.H.), Animal Breeding & Geneties	Scientific Officer
44.	Sheik Md. Mahbubur Rahman, B.Com.	Accounts Officer
45.	Mrs Mahafuza Khatun, M.S.S	Scientific Officer
46.	Md. Abu Yousuf, DVM, MS in Pathology	Scientific Officer
47.	Md. Nazmul Huda, B. Sc (A.H)	Scientific Officer
48.	Md. Hafizur Rahman, DVM, MS(Microbiology)	Scientific Officer
49.	Md. Mukhlasur Rahman, M.Sc.	Scientific Officer
50.	Ponir Chowdhury, M.Sc.	Scientific Officer
51.	Md. Abu Hemayet, MS in Poultry Science	Scientific Officer
52.	Md. Rezaul Hi Rakib, B. Sc. (A.H)	Scientific Officer
53.	Md. Masud Rana, M.Sc.	Scientific Officer
54.	Md. Obayed Al Rahman, M.Sc.	Scientific Officer
55.	Md. Ahasanul Kabir, B. Sc. (A.H.)	Scientific Officer
56.	Md. Nazzmus Sakib, B.Sc.	Scientific Officer
57.	Md. Rezaul Karim, DVM.	Scientific Officer
58.	Md. Asadul Alam, Poultry Science	Scientific Officer
59.	Md. Khairul Basar (A.H.)	Scientific Officer
60.	Md. Sohel Rana, (Poultry Science)	Scientific Officer
61.	Farhana Afroz, (A.H.)	Scientific Officer
62.	Md. Yousuf Ali,(Poultry Science)	Scientific Officer
63.	Noni Gopal Das, (A.H.)	Scientific Officer
64.	Yousuf Ali Khan, (A.H.)	Scientific Officer
65.	Md. Khurshed Hossain, B.A	Procurement Officer
66.	Md. Keramot Ali, Dip-in-Engg. (Civil)	Sub-Assistant Engineer
67.	Md. Abdus Samad, Dip-in-Engg. (Civil)	Sub-Assistant Engineer
68.	Md. Alamgir, B.Sc.	Store-cum- Procurement Officer
69.	Md. Shafiqul Alam Mondol, Dip-in-Engg. (Civil) (Electric)	Sub-Assistant Engineer
70.	Md. Ahsan Habib, M Com	Security Officer

Packages and Technologies Developed by BLRI

A. Packages

Sl.No	Name of Package	Year developed
1.	Cattle Fattening	1998
2.	Health management package to control PPR	1999
3.	Quail rearing,	2000
4.	Calf rearing	2002
5.	Dairy Farming	2002
6.	Forage production and preservation	2002
7.	Goat rearing model for poverty alleviation	2002
8.	Rearing of Black Bengal goats under semi-intensive management	2002
9.	Commercial layer model for small farmers	2002
10.	FMD control measures	2002
11.	Goat rearing under stall-fed condition	2003
12.	Broiler rearing model for small farmers	2003
13.	Duck rearing in rural area	2003
14.	Rabbit rearing model for small farmers	2004
15.	Gumboro disease control package	2004
16.	Newcastle disease control package	2004
17.	Cockerel rearing	2005
18.	Management of Sheep Breeding and Genetics	2007
19.	Pigeon Rearing	2009

B. Technologies

Sl.No	Name of Technologies	Year developed
1.	Salmonella vaccine	1995
2.	ELISA– based techniques for the diagnosis of FMD	1995
3.	Salmonella antigen for the diagnosis pullorum disease	1995
4.	Use of coconut, mustard oil cake and ipil-ipil leaf meal in the poultry diet	1997
5.	Urea-Molasses-Straw (UMS) -a basal feed for cattle	1998
6.	Appropriate exotic blood level for crossbreeding program of dairy cattle	1998
7.	Straw preservation under wet condition	1998
8.	Urea –Molasses Block preservation technique	1998
9.	Algae production and its use as an alternative feed for ruminants	1998
10.	Low cost preservation of green grass	1998
11.	Molasses utilization as a feed for cattle	1998
12.	Livestock feed and fuel production from cultivation of ipil ipil	1998
13.	Maize and cowpea mixed forage production and utilization	1998
14.	Combined antibiotic hyper immune serum therapy for PPR	1999
15.	Hygienic and improved chick brooder	2001
16.	PPR vaccine	2001
17.	C-EISA method for antibody determination against PPR virus	2001
18.	Enzyme Immuno Slide Assay (ELISA) for diagnosis of PPR and Rinderpest disease	2001

19.	Banana foliage processing and preservation for feeding cattle	2002
20.	Sugarcane by-products processing and preservation for feeding cattle	2002
21.	Manure-based year-round duckweed production and its utilization for feeding livestock and poultry	2002
22.	Dairy cattle development through artificial insemination and selection techniques	2002
23.	Control model for gastro-intestinal helminth parasites	2002
24.	Mycoplasma antigen	2002
25.	Improved technique for the production of organic chicken	2002
26.	Techniques for selection of best genotypes of Black Bengal goat for farm establishment	2002
27.	Manufacturing process of Astagram Ponir (cheese) and its marketing	2003
28.	Embryo transfer technique use in native cows	2003
29.	Baksa-a native grass production and its use in dairy cattle	2003
30.	Maize stover preservation and its use for feeding cattle	2003
31.	Pruning level of jackfruit leaves and system of feeding to goat	2003
32.	ND antigen for HI test	2003
33.	Bio-security in commercial poultry farms	2003
34.	Filter Paper-Strip blood collection method for HI test	2003
35.	Fodder crop production for saline belt, flood prone and Madhupur tract areas	2004
36.	Fodder production on the hill slopes for livestock production and to alleviate soil erosion	2004
37.	Hemolysin for complement fixation test	2004
38.	Goat kid management	2006
39.	EISA method for determination of Goatpox disease	2006
40.	Goat pox Vaccine	2007
41.	`Mina Mix' as source of mineral for livestock	2009
42.	Cornstrow Pellet Feed	2010
43.	Shuvra-BLRI Layer Strain-1	2011
44.	Thermostable PPR Vaccine	2012
45.	Napiar-4 High yielding grass	2012
46.	BLRM DNA Extraction Kit	2012
47.	Milk replacer for calves	2012
48.	Biosecurity model for commercial small scale poultry farmer	2012