

**Bangladesh Livestock Research Institute
Savar, Dhaka-1341**

Research Highlights-2014-15

A) Animal Production Research division

1. Study on improving feed efficiency of Pabna and RCC bulls

1. a) Activity-1: Comparative study on feeding values of sole Moringa and other available roughages

Roughage feed plays an important role in the development of diets for beef cattle, as it directly or indirectly determines the diet cost and influence animal performance. Seeds of Australian Sweet Jumbo and Maize fodder (BADC, hybrid) were procured from local authorized sources and sown in the fields at Pachutia Fodder Research Plot, BLRI, Savar, Dhaka, Bangladesh following all the recommended and standard agronomic practices. Australian Sweet Jumbo was harvested manually at the flowering stage of maturity (at 75 days after sowing) and Maize harvested at dough stage (at 90 days after sowing). After harvesting, Australian Sweet Jumbo and Maize fodder were chopped into 6-8 cm using a chopper machine and ensiled in earthen pit for 30 days. Moringa plant fodder was collected from BLRI fodder research plot. Fresh Moringa plant fodder was chopped using a chopper machine; sun dried for 3-4 days and grounded using a roughage grinder machine. Three different types of roughage i.e., Moringa plants fodder, Australian Sweet Jumbo and Maize were randomly fed to 18 local growing bulls of 103.8 ± 25.5 Kg live weight dividing into three equal groups. The animals were housed individually and fed only the roughage diets *ad libitum* for a period of 75 days; first 15 days was given for the adjustment of feed and experimental conditions. The animals were weighed at an interval of 10 days, and their feed intake, digestibility of nutrients and growth performances were used for comparing the nutritional qualities of different roughages. Moringa plants fodder had a highest average daily gain of 376.0 g compared to 289 g of Maize silage and 218 g Jumbo silage diet. The average feed conversion efficiency (FCR) of the animals was 8.85, 11.52 and 13.08, respectively. The cost involvement of Kg live weight gain of bulls fed Moringa plants fodder, Maize and Australian Sweet Jumbo were Tk. 104.0, 122.0 and 132.0, respectively indicating Moringa foliage fed animals had a lower feed cost compared to Maize or Australian Sweet Jumbo. Considering the nutrition quality of roughages and the cost of beef production, the three different roughages were ranked as Moringa plant fodder > Maize silage > AS Jumbo silage showing a nutritional coefficient of 1.30, 1.0 and 0.88, respectively.



Maize (BADC Hybrid)



Australian Sweet Jumbo



Moringa plants fodder



1.b. Activity-2: Biometrical ranking of available fodder crops

Fodder production practices have been increasing recently even having limitations in land availability. Many of the fodder crops have been becoming profitable to farmers keep farm animals or even to farmers cultivate fodders and harvest fresh biomass for marketing locally. Different seed marketing organizations import seeds of different fodder crops and market them locally taking certification of the Seed Certification Agency (SCA) of the country. The authorization system of introduction of new fodder species in the country, in addition to seed quality, must consider the production and productivity of fodder biomass and its response to animals. This requires enforcing of legal authoritative power of the Department of Livestock services (DLS) in certification system. To make the whole system effective, a database on the quality of different fodders in terms of efficiency of biomass or animal production or benefit & cost ratio or reduction of energy loss as enteric methane in the rumen is required to be developed through careful screening of the available fodder crops in the country. Thus, a research work was undertaken on the development of biometrical ranking systems of available fodder crops in the country. The fodder crops available in the fodder germplasm bank of the Bangladesh Livestock Research Institute (BLRI), Savar, Dhaka were cultivated, conserved and used here. Maize was

considered to be a control roughage feed while a series feeding trials were conducted on native bulls. The Maize Indices (M_f) of available fodder crops, thus developed, are shown in Fig1. Local grass, Urea and Molasses mixed Straws and Maize Stover, Plicatulum, Andropogan, and Splendida had 0.25 to 0.41 M_f ; and among the different varieties of Napier Aurosha had 0.57 and others M_f varied from 0.70 to 0.94. They, including Sugargraze (0.45),

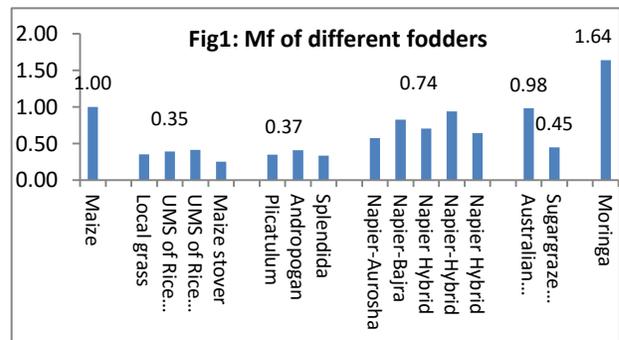


Fig1: Mf of different fodders

were poorer in quality roughages than fodder Maize. Moringa showing 1.64 M_f was the most quality fodder considering the efficiencies of production of biomass, benefit to cost & animal; and reduction of enteric methane in the rumen compared to fodder Maize. Farmers may use this Maize index (M_f) or roughage ranking tool in formulating cost effective diets for making more profit of cattle production. Moreover, it may be used for a certification system to be developed by the concerned authority for releasing fodder crops or seeds for cultivation in the country.

1.3. Activity-3: Feeding effects of increasing concentrate levels with different quality silages on beef production performance of native growing bulls

Farmers aim at achieving of higher productivity along with lower feed consumptions. In intensive beef production, grass silage is typically supplemented with concentrate as the main source of fermentable carbohydrates in order to improve production efficiency and to increase energy and nutrient intake of growing bulls. To produce low price meat and obtain optimum growth, roughage to concentrate ratios in diets should be optimized. Thus, the present study was

undertaken with the objectives to quantify optimum concentrate level with different quality silages and harvest maximum growth performances of local growing bulls. A feeding trial comprised 48 local bulls with initial live weight of 205.08 ± 43.24 Kg were randomly allotted to receive 8 dietary treatments. The concentrates mixture used in the trial composed of crushed maize (12%), wheat bran (35%), Khesari bran (15%), til oil cake (15%), soybean meal (18%), common salt (2%), and dicalcium phosphate (3%). A vitamin mineral premix was added at a level of 0.1% in the concentrate mixture. Animals were housed individually and offered daily rations as two equal portions at 9:00 and 16:00 h. Fresh water was made available in the sheds for experimental animals. The experiment lasted for 75 days included the first 15 days adaptation period was given in which the animals got adjusted to various diets and the rest 60 days was considered for feeding trial. Irrespective of silage type, the average daily gain (ADG) and feed conversion efficiency (FCR) improved with increasing concentrate levels in the diets. The average daily gain in bulls fed Maize silage & concentrate of 100:0.00, 75:25, 50:50 and 25:75 were 406, 697, 849 and 821 g, respectively. Similarly, the average daily gain of animals fed Australian Sweet Jumbo silage to concentrate ratios of 100:0.00, 75:25, 50:50 and 25:75 were 284, 343, 504 and 677 g, respectively. Similarly, concentrate level increased ADG and FCR in AS Jumbo silage diets showing a varying level of growth response from that of feeding Maize silage. Bulls fed Maize silage with graded levels of concentrate tended to have higher ADG (693 g) and better FCR (8.6) compared to ADG (452 g) and FCR (12.5) of Australian Sweet Jumbo with graded levels of concentrate. As concentrate levels increased, feed cost Kg live weight gain estimates also increased. In case of maize silage, the feed cost analysis indicated that, silage to concentrate proportion up to 50:50 was more profitable for Kg live weight gain. For feeding Australian Sweet Jumbo, silage to concentrate proportion of 75:25 was profitable in terms of Kg live weight gain. Therefore, it may be concluded that, feeding maize was more cost effective and better than Australian Sweet Jumbo. The supplementation of concentrates up to 50% for maize and 25% for Australian Sweet Jumbo was profitable for fattening program.

2. System modeling for food waste to feed production (F₂F)

Bangladesh feeds its farm animals in a very poor plane of nutrition having average deficiencies of roughage and concentrate feeds of 56.2% and 80.0%, respectively, of their total requirement. Food and vegetable waste (FVW), estimated annual production of which is 3292×10^3 tons that incurs disposal costs, and causes environment pollution through emitting greenhouse gases and putrid smell, may be a potential source of feed for ruminant animals, when the country confronts unreasonable debates on land use for fodder production using continuously disappearing cultivable land. Vegetable markets, households and hotel/restaurant are three different sources of FVW, the former found to be the most economic, especially in respect to

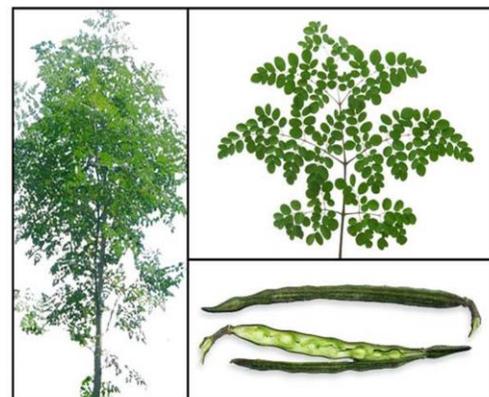


Fig1: Locally designed FVW blending and drying machine

their availability of biomass in a market place, estimated to be about 0.3% of the total vegetable transacted. Collection, processing and value addition systems including mechanical devices (Fig1) are developed for recycling FVW into animal feed; that may contains 14.0% to 16.9% crude protein & 63.3% to 66.8% total digestible nutrient (TDN) and may be 80.0% digestibility in the rumen. The FVW feed, thus produced, contains chromium, led and Aflatoxins (B1, B2, G1, G2) at 13.3 ng/Kg, 1.53 ng/Kg and 3.08 µg/Kg, respectively) lower than the maximum residual level recommended by the Bangladesh Standard and Testing Institute (BSTI).The FVW-feed was fed to growing cattle @1.06 Kg/day/head as supplement to roughage and dry matter and protein digestibility of the diet was 64.6% & 68.0% compared to 55.8% & 65.5%, respectively, of a conventional diet. The average blood urea nitrogen or sugar and triglyceride of the animals fed FVW-feed was 19.5 mg/dl, 4.07 mmol/L & 23.67 mg/dl, respectively, compared to 23.7 mg/dl, 4.22 mmol/L & 26.6 mg/dl, respectively, of the animal fed the conventional diet. The kidney and liver function of the animals of both the group was similar.The average cost of production was estimated to be 0.28US\$/Kg feed, while the market price of wheat bran, a feed of similar nutritional value was 0.38US\$/Kg. A market transaction of 100 ton vegetable daily may support production of about 13.0 ton animal feed without any use of cultivable land, saving about 0.12 million US\$ cost of waste disposal, and reducing 16000 ton CO₂ equivalent greenhouse gas emission annually. The support of private sector and local authority is important help implementation of FVW feed production system recycling vegetable wastes.

3. Study of Moringa plant fodder agronomy and its feeding to ruminants

Fibrous feeds and cereal by-products available in the country may support an average diet of 7.74 MJME/Kg DM and 2.32% digestible crude protein (Huque, 2014) having metabolizability not exceeding 0.4, an unlikely plane of nutrition supports farmers` slogan of more milk from a cow or more meat from a bull. High yielding food producing animals must get support of diets of higher nutrient concentration and metabolizability, and it requires annual supply of high ranking feeds and fodders, like Alfalfa; that are extremely unavailable in the country. Science and research, so far, strongly recognizes *Moringa oleifera* as a high ranking plant fodder for food producing farm animals but, year round production and supply of its biomass to farmers is still challenging. It requires systematic screening of available germplasm of Moringa, on-farm system of production confronting unreasonable debates on using continuously disappearing cultivable land, and value additions for market availability of Moringa feed. It was found that Black (BSM) compared to White Seed Moringa (WSM) is more suitable for fodder biomass production throughout the year having peaks in biomass production during March to October along with discoloration and defoliation of leaves during pouring in the



monsoon in well drained sandy & loamy soil, and its growth stunts during winter months (December & January). Moringa seeds may be collected during June and July, and having 70% to 80% germination rate saplings may be raised in polythene bags and they may be transplanted in lines of well ploughed land at plant density of 200000 to 250000 saplings per hectare. The seed germination rate declines to 30% in the following year, seeds and saplings may be infected with fungus (*Chaetomium globosum*, *F. Oxysprum*, *Aspergillus flavus*, *Penicillium sp* & *Rhizopus sp*). They cause dieback of Moringa and may be prevented by using appropriate pesticides. Growth compensation after spring rainfalls minimizes benefits of irrigation during the winter when growth declines but weeding helps biomass production cost effectively. Lopping of plants at 40cm height at a plant density of 250000 plants/hectare may yield 40 ton dry matter ha⁻¹year⁻¹ at an initial growth period of 120 days followed by eight harvests in the rest of the period of a year. Urea fertilization increases biomass production up to a level of 90 Kg urea nitrogen/hectare. Moringa feed containing 18.6% crude protein (CP) and 34.3% acid detergent fibre (ADF) is 1.64 times better in terms of its production performances of biomass, its feeding response to farm animals, reduction in enteric CH₄ emission and feed cost than Maize silage. Further research and demonstration on-farm may establish Moringa plant as high ranking fodder cost effective feed in the country.

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

Bangladesh has a great demand of beef. In the last few years, the price of beef in Bangladesh is increasing tremendously due to insufficient production and supply of beef and the low carcass yield of native cattle. 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. Brahman crosses are being produced to support increased productivity of the animals, but strategic approach for breed development that needs screening of multiple genotypes is ignored. Thus, along with Brahman some other exotic beef sires were selected to produce cattle genotype for beef production cost effectively. To achieve the objectives of the project, 76 straws of frozen semen of Simmental (red), Charolais (white) and Limousin (light wheat to darker red) were procured from Australia. Furthermore, a total of 25 doses of American Brahman supplied by DLS were also introduced under this breeding program. To determine the best performing exotic beef breed(s) for production of 300.0 kg live weight progeny at 2 years of age, a total of 40 native dam of BLRI Cattle Breed-1 (BCB-1) was selected. Two years of age; an age limit for sacrificing cattle especially from the social and religious point of view of the consumers. For genetic variation study, a total of 93 blood samples from 4 generations of BCB-1, Sirajgong, RCC and Sahiwal as control were collected. The ISAG-FAO recommended 20 bovine microsatellite markers were selected for this study. Up to now, a total of 51 numbers of AI were performed. Out of 28, 23 were diagnosed for confirm pregnancy. The non-return rate was calculated based on first-service and the value was as 71.42 %. The first-service conception rate was calculated as

56.52 %. The service per conception rate was estimated as 1.28. About 64 % cows and heifers are pregnant to deliver their calves and out of them a total number of 4 crossbred progenies of Limousin, Charolais and Simmental are produced in the farm. Finally, a suitable beef cattle genotype that will yield an average carcass weight of 150Kg by 24 months of age will be developed.

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

The traits of interest in dairy cattle i.e., milk yield and quality are generally sex-limited and have low heritability. Genetic improvement of these 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 time-consuming and expensive. To overcome these barriers, it is necessary to have a tool for genetic selection of dairy traits within or between diversified dairy cattle population and, thus, a DNA marker based selection tool may be developed and adopted at farm condition. Among 18 sets of primers, 6 sets of *SCD* and 5 sets of *DGAT1* primers were standardized and amplified well. The rest 3 sets of *DGAT1* and 4 sets of *ABCG2* 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 of high yielding cows. Phenotypic variation within the existing RCC herd of BLRI has identified based on the partial data of milk yield and quality. So far, average lactation yield varies from 527 to 1436 Kg and lactation yield has categorized into three groups, they are >500 kg; >700 kg and >1000 kg. About 18% of lactating cows showed an average of >1000 kg per lactation. There are also variations in fat, protein, SNF and lactose percentage. After completion of lactation period of each cow, phenotypic variation within RCC herd will be identified on the basis of milk yield and quality. After DNA sequencing, identification and genotyping of single nucleotide polymorphisms for phenotypic and genotypic association study will be performed. Finally, genetic markers will be developed to assist the selection of high yielding dairy cows in breeding program.

6. Study on livestock manure management practices in Bangladesh and their impacts on climate

Livestock manure, containing up to 45% of dietary nutrients, used mostly as fertilizer and burned fuel, and pollutes environment threatening public health. It was found that about 75.2% of livestock manure before using in crop fields kept in solid storage allowing annual emission of 5.645 kg CH₄ per animal. Manufacturing of cakes and sticks using manure in addition to burning allow annual emission of 7.62 kg CH₄ per animal. Liquid slurry, another form of livestock manure, consists of farm wash and effluents, estimated to be 1.65% of the total manure, remains unused in open lagoons or fields and contributes annually 4.978 kg CH₄ per animal. Anaerobic digestion, a recently introduced livestock manure based biogas production system, has been using about 4.80% of the total manure, that allows emission of only 0.56 kg CH₄ per animal annually in the environment, and help alleviation of climate pollution to some extent. It empowers women, improves public health and sanitation system. Without litter, a system of

manure management, specifically, used for poultry farming, contributes annually 0.0198 kg CH₄ per bird. The above livestock manure management systems contribute a total annual emission of 150.08 Gg CH₄ in the country. However, globally livestock manure is considered as sources of nutrients and new energy, and that may widen the basket of key performance indicators of livestock in addition to milk, meat and eggs, and help production system more profitable, environment friendly and sustainable. Bio-fertilizer, improves soil health and reduces chemical fertilizer use or bio-condensed natural gas, that may save fossil fuel use to some extent; are yet to be adopted in livestock farming systems. This requires undertaking strategic approaches for livestock manure management in the country that needs formulation of policies and action plans keeping consideration of other related policy document of the country.

B) Animal Health Research Division

1. Avian Influenza Viruses Monitoring in Possible “Bridge” Species of Wild and Domestic Birds in Bangladesh

Avian influenza virus was identified from possible bridge species of wild and domestic birds and concurrently the virus also isolated from HPAI vaccinated chicken flocks in Bangladesh. A total of 2993 swab samples from possible bridge species of wild and domestic birds, 132 swab, 132 serum and 8 trachea samples from dead birds of HPAI vaccinated chicken flocks of different districts of Bangladesh were collected. Results shows that duck, native chicken, migratory bird and heron act as bridge species for avian influenza virus. H5N1 HPAI virus was isolated from duck, commercial chicken and quail. Novel H7N9 AIV was not found during this study. HPAI H5N1 is still circulating in Bangladesh but H9N2 LPAI is dominantly circulating. Sequence analysis of the H5N1 isolates of the 2014 revealed that isolates belonged to 2.3.2.1a clade which is different from previous circulating clade 2.3.2.1. H5N1 HPAI was isolated from vaccinated flocks which indicated that HPAI vaccinated chickens can be infected with HPAI or other subtypes of avian influenza virus.

2. Prevalence of *Salmonella* spp. in poultry and poultry products in Savar Upazilla of Bangladesh

The study was undertaken to determine the prevalence of *Salmonella* spp in poultry and poultry products in Savar Upazilla of Bangladesh. A total of 355 samples comprising 150 cloacal swabs of poultry, 50 egg shells and egg content from 50 eggs, 30 intestinal content, 30 liver swabs, 30 broiler meat samples and 15 swabs from slaughter house were collected. Out of 355 samples, over all positivity was 25.35%. 32% cloacal swab samples of poultry, 28% egg shells, 0% egg content, 36.66% intestinal content, 23.33% liver swabs, 20% broiler meat samples and 26.66% swabs of slaughter house were found positive for *Salmonella* spp. Ready-to-eat foods should be free of *Salmonella* spp. So, the presence of *Salmonella* spp in poultry and poultry products is harmful for human. Continuous monitoring & improvement of biosecurity in poultry farms and proper cleaning & disinfection of slaughter houses can improve the prevalence of *Salmonella* spp. in poultry and poultry products.

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

Peste des Petits Ruminants (PPR) is a highly fatal viral disease of goat and sheep in Bangladesh. The pilot project on PPR control was implemented in 5 selected villages of Jessore and Manikgonj district. After awareness building among farmers on PPR, a mass vaccination program (where 5000 goats were vaccinated) was carried in all goats of over 2 months of age after initial sero-surveillance. After 15 months of vaccination, the average antibody titer was 90% at vaccinated villages and 58% at control villages. Goat farmers of vaccinated villages gained BDT 13,300 per household. Kid population increment at vaccinated villages was 92.4% and in control villages was 57.75%. It is reflected that locally produced PPR vaccine confers sufficient herd immunity that can protect PPR disease in goat. Highlights of the technology are (a) All goats and sheep over 2 months of age should be vaccinated at a time (b) Vaccination must be finished within two hours after vaccine dilution (c) Broad-spectrum anthelmintics should be provided to goats every 4 months of interval and along with other health management must be followed (d) Cool-chain should be strictly followed during vaccine collection, transportation and preservation.

4. Development of biologics for the diagnosis of Peste des Petits Ruminants (PPR)

In Bangladesh, Peste des Petits Ruminants (PPR) was first detected in the year 1993. Due to lack of molecular PPR virus diagnostic technology in the field level of Bangladesh, a polyclonal antibody (Pab) based specific, sensitive and rapid diagnostic test has been developed to detect the PPRV antigens from field samples at field condition. PPR virus can be detected from nasal, ocular and feces samples of PPR suspected goat by Pab based technique. This technique was tested at room temperature in the field level. Pab based PPRV detection system can be used as useful and low cost technique for the diagnosis of PPR outbreak in the field which will be helpful for the control of PPR disease in Bangladesh. Characteristics of the technology are (a) PPRV can be detected in the field level within one and half hours (b) Pab was used instead of Mab (c) glass slide was used instead of polystyrene ELISA plate (d) low cost technology.



C) Socioeconomic Research Division

1. Marketing and Value Chain Analysis of Live Poultry in Savar Upazila

Savar upazila is the leading area of poultry production and trading in capital city Dhaka and its surrounding districts. Various poultry farmers incurred production cost per quintal of live poultry were BDT 7,300, BDT 17,063 and BDT 9,488, respectively for native chicken, sonali and broiler which indicating that native chicken rearing is based on scavenging that requires low production

cost compared with broiler and sonali production. The average production cost was BDT 11,283. Per quintal net return was found BDT 5,182, BDT 3,714 and BDT 1,123, respectively for native, sonali and broiler meaning that rural women keeping native birds in their backyard as additional income. The average net return was BDT 3,340. Majority of the consumers (56%) showed negative opinion in case of processed poultry meat and remaining (44%) had positive attitude. Process poultry meat market development is a tameable decision. As live poultry marketing brought serious health diseases where near about 58% of market actors suffered different diseases. For sustainable and environment friendly poultry production and business, it needs to follow bio-security, halal method and hygienic way of poultry processing.

D) Training, Planning and Technology Testing Division

1. Impact of farmers training on adoption of BLRI developed technologies

The study was conducted to know the impact of farmers training on adoption of dairy rearing and management related technologies in the field condition. A total of 200 dairy farmers of Shajadpur & Belkuchi under Sirajgong, Badargonj under Rangpur, Rupsa under Khulna, Dinajpur Sadar under Dinajpur and Satkania under Chittagong district were selected those taking part training on dairy rearing & management from 2011 to 2013. After having training, 43.7% and 38% in milk production (l/d) and birth wt. (kg) were increased, respectively. Fodder land (acre) use and fodder production (ton/year) were also increase 166% and 51.3%, respectively. Income from the sources of milk, cattle sale, cow dung and compost were increased 127.2%, 129.6%, 43.1% and 134.3%, respectively. The total annual income significantly increases from Tk. 154738.5 to Tk. 346938.3. After having training, the farmers were in better position to earn more income and lead a better life than before. As a consequence, their household expenditure was increased. On an average the total annual household expenditure increases from Tk. 97528.2 to Tk. 119143.0. Educational expenses were much more than before also. Impact study results clearly indicated positive response to the BLRI technology to increase dairy productivity to a great extent. Farmer's awareness for dairy production related technology adoption through training was found also good.

2. Evaluation of existing livestock and poultry policies and provide guidelines for development in Bangladesh

This study was undertaken 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. Total 377 respondents interviewed in addition seven FGDs (Focus Group Discussions) and some Key Informant Interviews (KII) was administered with different stakeholders in seven divisions of Bangladesh. The survey result revealed that the proportion of farmers having Govt. registration was 36% whereas in case of hatchery owner it was 100%. Fifty eight percent farmers said that they do not have any idea about slaughter act whereas 85% farmers said sanitary inspector never visit slaughterhouse.

More than 80% butchers said they used antibiotics, hormones and opined that slaughterhouse is not environment friendly. More than 82% meat processor said that they did not have modern facilities for the processing plant. Regarding feed act, about 70% farmers said that feed prices are fluctuating throughout the year. About 70% said that there was no lot number to identify animal feed. More than 80% dealers and distributors said they did not see any authorized officers visiting and collecting feed samples for quality testing which is the violation of animal feed act. Knowledge about Feed Act is considered as binary (dependent variable) and others as endogenous variable. None of these endogenous variables have significant effect on the knowledge of farmers about slaughter act except education as $P < 0.05$ and also knowledge about poultry development act. So the educated farmers have higher probability of getting known about the feed act. The most of these endogenous variables are insignificant. Only yearly income is significant at 5% level of significance as $P < 0.05$. So it may indicate that distributors with higher income have the probability of getting known about the poultry development act. It can be concluded that the population of respondents in particular area that less than 50% of them have knowledge about feed act, slaughter act and poultry development act. Proper implementation of act and policies will help ensure livestock sector development in Bangladesh to a great extent.

E) Poultry Production Research Division

1. Laying performances of BLRI layer-2 (Shorna) under farmers condition

Bangladesh Livestock Research Institute (BLRI) has been developed 2nd layer strain having brown egg shelled named BLRI layer-2 or “Shorna” with the auto sexing advantage and considering the more market demand of brown layers. The on-station trial of the strain found encouraging. After that the field trial of the strain (from day old to 72 weeks of age) at different locations (Sarishabari, Jamalpur; Babuganj, Barisal, and Kalihati, Tangail) of the country were performed. The average egg laying performances were – auto sexing -100%; age at first egg- 135 days; live weight at 20 and 70 week of age 1530 and 1950 g/bird respectively; feed intake- 118g/bird/day; annual egg production- 280egg /hen; total egg weight- 18 Kg per hen per year; egg weight at 72 week- 70g; feed conversion efficiency - 2.32 and mortality -3 %) (production period). Considering the above results particularly auto sexability at day-old, annual egg production, feed intake, total egg weight, feed conversion efficiency and livability of the BLRI layer-2 (Shorna), it may be suggested that the layer strain seems to be promising for commercial production.

2. Detection of heavy metals in poultry feed, meat and eggs

The poultry feed, meat and egg samples were collected from the major poultry raising areas of the country to know the presence of heavy metals especially arsenic (As), lead (Pb) and chromium (Cr). A total of 360 elemental samples for As, Pb and Cr were analyzed in the laboratory. The heavy metal contents (As, Pb & Cr) of all the tested samples were found positive. But, the levels were below the Maximum Permitted Concentration (MPC) in most cases. The layer and broiler ready feed samples found safe from those elements; On the other hand, the “Cr”

and “Pb” content in 14% and 11% loose feed samples were 7-70 and 3 times higher respectively than that of MPC. Notes worthy, the egg samples were also found safe from those elements. Of the tested samples 14% broiler meat and 50% spent hen samples found slightly higher level of “As” and 4-6 times “Cr” respectively than the MPC. In conclusion, the poultry farmers are suggested to buy poultry feeds from the reputed feed company and discourage to use loose feeds. Moreover, feed marketing channel particularly loose feed marketing should be monitored properly by the regulatory authority.

3. Conservation and improvement of native chicken

3.a. Performance of fourth generation

Study was conducted at Bangladesh Livestock Research Institute, Savar, Dhaka with the objectives (i) to assess the performances of three Indigenous Chicken genotypes under intensive management, (ii) to select parental birds (males and females) and breed them in an assortative design for the production of fourth generation birds, and (iii) to estimate realized responses to selection to improve 3 Indigenous Chicken genotypes. A total of 1050-day-old chicks comprising of 3 types of chicken namely Naked Neck (NN), Hilly (H) and Non-descript Deshi (ND) were hatched in one batch for this study. In fourth generation (G_4), selection was practiced at 40-week of age on the basis of an index comprising the parameters of age at first egg (AFE), body weight (BW), egg production (EP) and egg weight (EW). Improvement target of egg weight was to increase by 1g, egg production rate was to increase by 2 % per generation. Day old chick weight was significantly highest in H (32.73 ± 0.60 g). Significant body weight differences among the genotypes were observed at 4th, 8th and 12th weeks of age, with the highest body weight observed for H genotype (252.66 ± 2.05 , 674.68 ± 6.41 and 1193.74 ± 36.34 g) than other two genotypes in all stages of age. The realized responses in terms of changes in breeding values in egg production and egg weight over generations were 0.722% and 5.349g, respectively. However, the results indicated that the genetic improvement of Indigenous Chicken for egg production will be effective through selection and breeding program. It may be concluded that the economic traits of Indigenous chicken could be improved in future generations through proper selection and planned mating.



Naked Neck



Hilly



Common Desi

4. Conservation and improvement of Quail

4.a. Performance of fourth generation

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. The parent males and females were being maintained in cages for single pair mating through close breeding system for production of its generation. For production of fourth generation (G_4), parent quails of each genotype were selected from the 3rd generation (G_3) on the basis of breeding value according to their 6th week body weight. Hatching eggs were collected from every single pen of the selected parent quails. A total of 1876-day-old chicks comprising of 4 types of quail namely J, W, Br, and Bl were hatched in one batch. Body weight of quails at 2nd, 4th, and 6th weeks of age were significantly influenced by genotype. Significantly higher body weight was found in W and Bl followed by Br and J quail genotypes at different period of age. The hatchability rate were significantly higher in J (67.41%) compared to other three genotypes of W (61.30%), Br (65.26%) and Bl (45.25 %), respectively. Feed intake was not affected by genotype but egg production was significantly influenced by genotype. Selection differential varied from 4.0g body weight in Black quail male to 13.1g body weight in Brown quail male. Phenotypic standard deviation varied from 6.8g in Black male to 15.3g in White female. The intensity of selection varied from 0.36 to 1.10 in this population. 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 production of a suitable meat type quail genotype in our country.



Dhakai



White



Japanese

5. Conservation, improvement and feeding system development of native duck genotype

This study was under taken to evaluate the laying performance of BLRI developed native duck (G_1) and vis-a-vistodevelopthe feeding system of native duck in hoar areas. For next generation (G_2) a total of 550 Rupali and 260 Nageswari ducks were hatched. Productionand egg quality performance of generation 1 revealed thatNageswari duck starts laying at higher age (153 days)

compared to Rupali duck (149 days) genotype. Duck weight at sexual maturity and egg weight at first lay were also higher in RupalithanNageswari duck but egg production (24-48 weeks) was found almost similar in both genotypes (Rupali 97.36 and Nageswari 98.72 in number respectively).Rupali duck produced heavier eggs (66.37 g) than Nageswari (63.47 g) duck.In egg quality aspects HU, yolk index, shell thickness and breaking strength found no differences among the genotypes. The average initial body weight of day old ducklings of Rupali and Nageswari were 33.3 and 32.67 g,respectively.Meandaily and total gain at 0-8 weeks of age were 24.92 and 22.45 and 1231.43 and 1166.28 g respectively for Rupali and Nageswari duck genotypes. There was no variation in feed intake and FCR among the duck genotypes.

Duck production and evaluation of feeding system were studied at Nasirnagar in the district of Brahmanbaria. The main objectives were to evaluate the existing feeding system and identify the major problems and make a short profile of duck farmer's of that upazila. Surveyed results showed that majority of the farmer(15.87%) included in young aged group and most of the farmers (12.70%) did not receive any education and also showed that 16.17% of the duck farmers were housewives. Most of the land of the farmers (1554.76 dcm) belongs to middle group.The larger number of duck (2207.14) belongs to the group three (>1000) practiced distant grazing 6.30 months. Dependency on natural feeds, maximum (64.17%) occurred in 1st (5-500) group and major (55.00%) dependency on ready feed occurred in 2nd group (501-1000) and maximum profit gain from group three (>1000).



Nageswari duck with wing bend



Rupali duck with wing bend



Farmer's fill up the questionnaire

6. Effect of developed and commercial vitamin mineral premix on the growth performance, meat yield traits and internal organ development of broiler chicken

Very small percentage of dietary vitamin-mineral are needed for proper functioning of the body such bone development, immune function, muscle contraction and nervous system function. They have positive effect on the growth performance of chickens in terms of improving feed utilization and metabolism, stimulating the immune system and minimizing many stresses (Sahinet *al.*, 2003).Chickens are more susceptible to vitamin deficiency because gut flora can synthesize very little amount of vitamins, and therefore complete absence of dietary vitamins in chickens kept intensively undergoes many stresses (Ward, 1996). The study was conducted to

determine the effect of vitamin mineral premix (VMP) on growth performance, meat yield traits and internal organ development of broilers. All the individual vitamins and minerals were purchased and VMP was formulated following the recommendation of BSTI (2005) for broiler chicken. A total of 270 day-old broiler chicks were randomly weighed and assigned to six dietary treatments Control and combination of DVMP+CVMP in a group of 45 birds each according to following CRD experimental layout. Each dietary treatment had three replicates of 15 birds. The experimental design was Completely Randomized Design (CRD) and the substituting vitamin mineral premixes were both developed one, DVMP and commercial one, CVMP with day old broiler. Significantly reduced feed intake was calculated in diet 5 with increased WG (2145 g/b) and lowest FCR (1.51:1). No remarkable variations in internal organ development were noticed except small intestine. Increased CP in breast meat was found compared to thigh meat in diet 5 (Figure 1). The DVMP showed suitable and about 75% of it may be substituted in the diet of broiler chicken. These findings will indirectly reduce the dependency of imported vitamin mineral premixes and to enhance broiler production in Bangladesh.



Dietary (VMP) groups
Broiler chicks

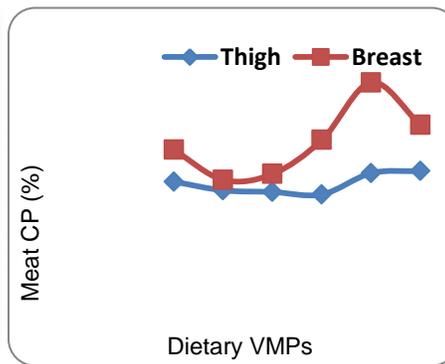
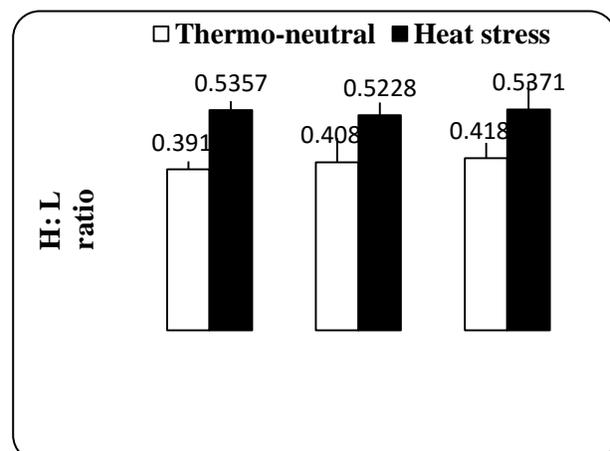


Figure 1. Dietary VMPs & meat CP

7. Effects of strains and ambient temperature and their interaction on production performance, egg quality and physiological response of laying hens

The present experiment was undertaken to compare the performance, egg quality, heat tolerance ability and stress responses between the BLRI developed layer strains and commercial layer strain under thermo-neutral and heat stress condition of Bangladesh. A total of 192 ready to lay pullets were randomly assigned to a 3×2 factorial arrangement of treatments (4 replicate/treatment; 8 birds/replication) consisting of three layer strain (Shuvra, Shorna and commercial white leghorn



layer strain) and two ambient temperatures (heat stress 30-32°C; thermo-neutral 18-20°C). Results showed that body weight was significantly ($P<0.05$) increased in Shorna than that of Shuvra and commercial hens. The interaction between strain and temperature were not significantly influence the rate of egg production. The effect of strain on egg weight was significant ($P<0.01$) and thus increased egg mass production by the Shorna than that of commercial strain. These results also indicated that Shuvra and Sharna improved egg quality, serum phosphorus, antibody titer level and numerically decreased H:L ratio with increased egg mass production as evidenced by measured performance and physiological parameters. Thus, the present results indicated that Shuvra and Sharna are comparable with the commercial strain, suggesting physiologically adaptable under existing environmental condition of Bangladesh.

F) Goat and Sheep Production Division

1. Study on the performances of Boer and Jamunapari goat at BLRI

The objective of the study is to evaluate the productive and reproductive performances of pure Boer goats and their progenies compared to that of the locally available Jamunapari goat under Bangladesh conditions. The study was conducted at the Goat Research Station of BLRI, Savar, Dhaka from January 2014. The body hair coat color of Boer goat was white with reddish-brown heads, ears and necks and the body hair coat color of Jamunapari goat was variety of color. Both Boer goat and Jamunapari goat have horn. The body weight was significantly ($P<0.001$) differed between Boer goat (52.36 ± 5.97 kg) and Jamunapari goat (39.26 ± 3.00 kg). The Body length, height at wither, chest girth and ear length of Boer goat were 69.96 ± 2.09 cm, 67.98 ± 1.19 cm, 78.39 ± 2.04 cm and 19.43 ± 0.90 cm, respectively where as Body length, height at wither, chest girth and ear length of Jamunapari goat were 72.13 ± 1.63 cm, 69.69 ± 1.29 cm, 79.18 ± 2.04 cm and 21.23 ± 0.66 cm respectively. The Birth weight was significantly ($p<0.001$) differed between Boer goat (3.40 ± 0.23 kg) and Jamunapari goat (1.73 ± 0.08 kg). The growth rate of Boer goat (0.168 ± 0.01 kg/d) was significantly ($p<0.001$) higher than Jamunapari goat (0.070 ± 0.00 kg/d). The weaning weight of Boer goat (18.50 ± 1.42 kg) was significantly ($p<0.001$) higher than Jamunapari goat (7.90 ± 0.23 kg). The weaning age of Boer goat (90.40 ± 2.82 days) was significantly ($p<0.001$) lower than Jamunapari goat (127.30 ± 7.19 days). The litter size was significantly ($p<0.01$) differed between Jamunapari goat (1.89 ± 0.16) and Boer goat (1.52 ± 0.07). The kidding interval of Jamunapari goat (226.50 ± 13.24 days) was significantly ($p<0.05$) lower than Boer goat (272.85 ± 12.78 days). The post partum heat period of Jamunapari goat (63.00 ± 7.00 days) was significantly ($p<0.001$) lower than Boer goat (145.33 ± 43.88 days). Phenotype wise Boer goats have distinct meat characteristics and have higher birth weight, growth rate, weaning weight. However, litter size and kidding interval were significantly lower in Boer goats than Jamunapari goats.

2. Conservation of farm animal genetic resources (FnGR) hilly region at Naikhonchari

2.a. Conservation and improvement of Hilly chicken at Naikhongchari regional station

The Hilly Chicken management was divided into two systems (cage and floor system). Intensive management system was followed in open sided poultry house. There were no significant differences of body weight between hilly chicken and naked neck hilly chicken in growing period (up to 20 weeks of age). The mortality of hilly chicken was slightly lower (5.44 ± 3.75) than that of naked neck hilly chicken (7.37 ± 3.19) up to 20 weeks of age and also lower in hilly chicken than previous year (6.11 ± 3.75) and higher in naked neck hilly chicken than previous year (7.14 ± 2.14). There was no significant difference of hatchability between hilly and naked neck hilly chicken hatched by broody hens. However, the lower hatchability in Naked Neck Hilly Chicken (57 ± 22) might be due to the reason of summer season affected on natural hatching process. The adult body weight of hilly chicken at 30 weeks of age was higher (2244 ± 134) than that of naked neck hilly chicken (2005 ± 79) but the difference was not significant. However, the egg production of hilly chicken and naked neck hilly chicken was reduced than previous year (hilly chicken: 42.46 ± 1.28 ; naked neck: 49.68 ± 1.0). There was no significant difference of the age at first egg, feed consumption and mortality between hilly chicken and naked neck hilly chicken. From the results of this study, it may be suggested that both hilly (feathered) and naked neck hilly chicken need to be conserved and improved further through selective breeding and better management system.

2.b Community based sheep production in hilly area at Naikhonchari

The environment is very friendly to rearing of sheep at hilly areas. So the research program was conducted to establish the sheep rearing system at hilly region at Naikhongchari. The socio economic status of selected farmers were studied initially, where the educational level of selected sheep farmers are 12.5% illiterate and 62.5% from class six to class ten, the occupation of the farmers found highest in agriculture (50%) and lowest in service (12.5%), the minimum land area of the farmers below hundred decimal at 25%. The most of the sheep farmers (50%) have the number of family members from 1-5 and income nearly 50,000-1, 00,000/- per year. Under this project, it will observe the change of the socio economic status of the selected farmers through rearing native sheep in hilly area at Naikhongchari. The productive performances of native sheep at farm and community level were studied, where the average birth weights of farm and community sheep are 1.34 ± 0.04 kg and 1.39 ± 0.03 kg, respectively. The litter size of farm sheep was higher (1.54 ± 0.14) than community sheep (1.33 ± 0.17). The three months, six months, nine months body weight of farm sheep and community sheep are more or less similar. The average body weights of adult sheep at farm and community level were 20.82 kg and 23.37 kg respectively. Total numbers of supplied sheep in community farmers was 53 and at present it increases up to 100 numbers. The last one year the community farmer's income Tk. 3000 to 22,000. The problems of sheep rearing at community farmers are scarcity of fodder at rainy seasons and dog biting. In the community level, the BLRI native sheep is being well adapted.

G) Biotechnology Division

1. Production of calves through transfer of *in vitro* produced cattle embryos

Ovum pick up based *in vitro* embryo production (OPU-IVP) technology is used for rapid multiplication and distribution of high yielding cows. The technology hasten genetic progress through increasing population size of high yielding cows. Considering this facts, BLRI is conducting researches on OPU-IVP for distribution and production of high yielding dairy cows. The oocyte aspiration protocol, ovarian follicular dynamics and IVP protocol were adopted at BLRI. The present research was designed to produce calves through transfer of IVP embryos. To achieve the above objective, IVP embryos were produced and transferred into 5 recipient cows. Estrus of recipients were synchronized and two embryos were transferred per recipient. Result showed that, the pregnancy rate at 60 day following embryo transfer was 20%. Successful adoption of the technology and its on-farm application will facilitate dairy development in Bangladesh.

H) BLRI Research Farm

1. Conservation and improvement of Munshiganj Cattle

Among the prospective varieties of indigenous cattle genetic resources in Bangladesh, Munshiganj cattle (MC) and Red Chittagong cattle (RCC) are well known for their distinguished genetic and phenotypic characteristics. Although some initiatives have so far been taken to conserve and improve of RCC, but no steps have yet been done for MC. The numbers of MC are declining gradually day by day due to indiscriminate crossbreeding; hence they are under the threat of extinction. Therefore, BLRI has started a project to conserve and improve MC by establishing a mini nucleus herd consisting of 10 cows, 4 heifers and 2 breeding bulls. The performance records so far evaluated found that average estimates of daily milk yield and contents of fat, lactose and solids not fat (SNF) to be 4.5 litres, 5.61%, 6.19% and 11.43%, respectively. Moreover, MC gives birth yearly up to 12-15 calves per life time, have more resistance to diseases and a farmer can easily manage it. Hence, more emphasis should be given to conserve and improve this valuable indigenous genetic resource in *ex-situ* and *in-situ*.

I) Buffalo Development Project

1. Development of feeding system and least-cost balanced ration with locally available feed ingredients for different selected regions

1.a. Development of Feed Master Android Application (Thumb rule Version)

Feeding is one of the most important factors for profitable animal production. Feeding of animal economically requires proper feed formulation according to animal requirement considering their age, sex and stage of production. In conventional animal production system, farmers are not conscious enough about their animal's requirement and available feed sources. So an approach

was taken to develop an Android Feed Master Application for farmers as well as stakeholder to feed their animals in proper way.

2. Conservation and improvement of native buffalo through selection

2.a. Study on estrous synchronization, conception rate and live birth weight of crossbred & native buffalo calves

Considering fat and total solid contents, buffalo produces two times higher milk than indigenous cattle of Bangladesh. However, their average lactation yield is very low compared to high yielding exotic buffalo breed. The Government has taken “Buffalo Development Project” to improve the genetic potential of indigenous buffalo for increasing milk and meat production through crossbreeding with Mediterian Murrah buffalo. For this purpose, artificial insemination (AI) is conducting in the project areas. However, poor estrus detection in buffalo owing to weak estrus symptom and seasonal estrus, limiting AI efficiency at farm condition. Therefore, this study was conducted to adopt buffalo estrus synchronization protocol along with evaluation of efficiency of on-going AI programme. Results, showed that, about 80.0% buffalo come into estrus when treated with hormone. Conception rates were higher in buffaloes when AI were done in naturally heated animal (50.91%) than synchronized buffalo (16.67%). Birth weight of crossbred buffaloes (37.15 kg) was higher than indigenous (21.82kg) buffalo calves. The above findings inferred that the efficiency of AI in buffaloes was moderate.

J) Conservation and development of locat sheep through community and commercial farming

1. Community based sheep production in hilly area at Naikhonchari

The study was undertaken to establish the sheep rearing system at hilly region at Nikhonchari. The study was conducted at BLRI regional station, Nikhonchari, Bandarban. At starting period, a total of 40 ewes and 10 rams of native sheep (4 ewes and 1 ram of each) were distributed to community farmers’ level and remaining 16 ewes and 4 rams are being reared at regional station research farm. The socio economic status of selected farmers and productive and reproductive performances of native sheep at farm and community level was studied. The study shows that, the community farmers’ income increases from 3000- 22,000/- in the last year. It may be concluded that, in the community level, the BLRI native sheep is being well adapted. The study is going on and more data will be collected up to the significant result.

2. Development of effective lamb production system in Bangladesh

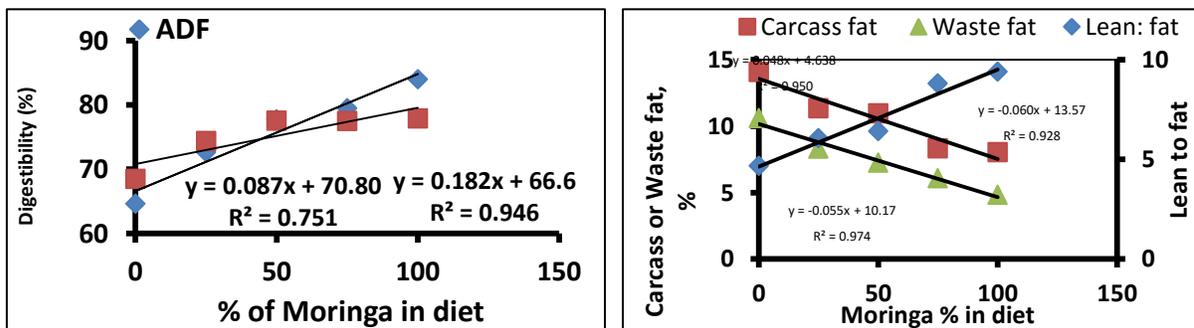
2.a. Effect of different plane of nutrition from late pregnancy to lactation stage on the performance of ewes and their lambs until weaning

Thirty-six native ewes between 2 and 5 parity were randomly allocated to four treatment groups (T₀, T₁, T₂, T₃) at about 7 weeks before parturition. Ewes of all the treatment group were

supplied *ad libitum* German grass (*Echinochloa polystachya*) but T₁, T₂ and T₃ group were supplemented a concentrated mixture (Crushed Maize 40%, Soybean meal 26 %, Wheat bran 22%, Rice polish 10%, Salt 1%, Vitamin-mineral premix 0.5% and DCP 0.5%), at 1.0, 1.5 and 2.0% of their body weight, respectively. So, group T₀ considered as control group. Chemical compositions of the experimental diets are presented in the table 1. After parturition, lambs were supplemented a creep mixture (Crushed maize 68%, Soybean meal 30 %, Vitamin-minarel premix 1%, Salt 1%) from the age of 2 weeks at 20g/lamb/day with an weekly increment of 10g /lamb. Beside this, small amount of German grass were also provided to the lambs *ad libitum* basis from the age of 4 weeks. Milk yield were measured over a 24h period by suckling method and repeated weekly over the entire lactation period. The results of this experiment indicated that supplementation of concentrate significantly increase DM intake of ewes, daily gain of lambs and lambs final weight. Comparing different parameters like, DM intake of ewes, lambs birth weight and daily gain with ewes milk production, the group (T₂) fed *ad-libitum* German grass with concentrate at 1.5% of their body weight performed better compare to other groups. Further studies on a larger set of data with higher levels of nutrition during the last stage of pregnancy and lactation are recommended to specify actual trends that influence the study, taking the economic advantage into account.

2.b. Effect of replacement of conventional concentrate in a straw diet by Moringa foliage on lamb production performances

The study was undertaken with the objective to determine the effect of replacing conventional concentrate with dried moringa foliage on the performance of growing native sheep. A total of thirty growing native sheep of 3 to 6 months of age were randomly allocated to five groups with six lambs per treatment. The design of the experiment was a completely randomized design (CRD). A control diet containing 30% molasses mixed rice straw (2.5% molasses) and 70% concentrate mixture of broken maize-42%, soybean meal-38%, wheat bran-17%, vitamin-1%, DCP-1% and salt-1% was fed to a group of sheep. The concentrate was replaced with moringa foliage (moringa foliage-97%, vitamin-1%, DCP-1% and salt-1%) at 25, 50, 75 or 100% on DM



basis. Thus, five dietary treatments consisted of varying proportion of moringa foliage (MF) and concentrate (C), were T₁ (100MF); T₂ (75MF:25C); T₃ (50MF:50C); T₄ (25MF: 75C) and T₅ (100C). The duration of feeding and growth trial was 93 days. After completing the feeding trial, digestibility trial was carried out. Four animals from each treatment were randomly selected to

slaughter for evaluating the carcass quality. The result revealed that, replacing conventional concentrate with Moringa foliage in growing sheep diets may result in desirable leaner carcass with a higher proportion of meat and lower weight of fat to improve carcass characteristics. Thus, moringa foliage may replace conventional concentrate partially or entirely in a straw diet of sheep.

3. Establishment of health management package for native sheep of Bangladesh

3.a. Development of herbal anthelmintic against internal parasites-GI nematodes of sheep

Primarily, it was found from a research conducted on 200 sheep having gastrointestinal nematodes egg per gram (EPG) of faeces ranging from 750 to 3200 that neem (*Azadirachta indica*) leaves, betel (*Piper betle*) leaves, pineapple (*Ananas comosus*) leaves and bitter gourds (*Momordica charantia*) juices (50gm blended in 200ml of clean drinking water in each case) were effective to significantly reduce the EPG counts on day 7 after treatment when used orally once @ 3ml/kg body weight, 5ml/kg body weight and 10ml/kg body weight. So, all four herbal drugs @ 3ml/kg body weight, 5ml/kg body weight and 10ml/kg body weight may be used orally as anthelmintics in sheep population against the internal parasites-GI nematodes. However, the best option is 10ml/kg body weight.

4. Project Title: Development of blended yarns and fabrics from jute, cotton and native sheep wool

Wool is a potential by product of sheep which is being used throughout the world for producing yarn and fabrics. A research has been taken for commercial use of wool in Bangladesh through yarn and fabrics production with the joint collaboration of BLRI and BJRI. The aims of the research work are to produce blended yarn and fabrics; determine the physical properties of blended yarns and fabrics; Compare the blended properties with respective 100% cotton, jute and woolen properties and increase the diversified use of wool and cotton blended products with small entrepreneur. In this regard wool was collected from Goat and sheep research farm of BLRI and also different sub-station of sheep project. To produce fine yarn and fabrics wool was mixed with jute and cotton in the ratio of 30:30:40. By using cotton processing system blended yarn was produced. After determination of the properties, yarns were used in weaving machine (loom) to produce blended fabrics. Shawls and pant pieces were produced successfully. Blanket is being produced.



Shawl



Suiting Fabric



Yarn

K) Fodder Research and Development Project

1. Collection, conservation, multiplication of high yielding fodder and evaluation their production performances under different agronomical practices

1.a. Study on the effect of organic manure on production performance of BLRI-Napier-4 and comparative economic analysis of fodder production with rice

Baghabari is one of the important milk pocket areas of Bangladesh has a huge demand of green fodder for dairy cattle production. Traditional green grasses in pasture land have been reducing gradually and the demands of cultivated fodders in these areas are increasing. To enhance production of high yielding cash crops, farmers are supposed to use chemical fertilizers; consequently soil fertility is reducing day by day. To mitigate this problem it is necessary to use organic manures to regain soil fertility. Thus a study was performed to assess the effects of different manures (biogas slurry, broiler litter, layer litter and chemical fertilizer as control) on production performance of BLRI Napier-4 fodder and comparative economic analysis with rice cultivation. Results showed that the ranking of manures based on performance was layer litter>biogas slurry>broiler litter>fertilizer with higher BCR than rice.

1.b. Effect of feeding different high yielding fodders on the growth performance of growing Brown Bengal goats

The brown coloured goat known as hilly goats are reared for meat, skins and manure found in hilly regions of Bangladesh. They live mainly on naturally grown grasses, tree leaves, shrubs and bushes. However, pasture land of the hilly areas are decreasing gradually due to housing, rubber gardening, horticulture and other agricultural interventions. So, it is necessary to meet up the requirements by supplying with high yielding fodders. Thus, the study was undertaken to evaluate the feeding effect of HYV fodders on the growth performance of hilly goats conducting a feeding trail to 16 growing kids feeding with four experimental diets at BLRI Regional Station, Naikhongchari, Bandarban. The goats fed with four different fodders (Napier-3, Napier-4, Ruzi and natural grass) had no significant differences for weight gain and FCR with an average gain of 48.63g/d. Thus, all of those fodders can equally be fed.

1.c. Sub-title: Study on the adaptability, biomass yield, nutritive value of HYV fodders cultivars under different saline condition in Southern districts of Bangladesh

Salinity intrusion due to climate change is an increasing problem in Bangladesh. The coastal zone of Bangladesh is already under the constant threat of salinity. In changing climate scenarios, fodder production may decrease and disease and mortality rates may rise, which may threaten the viability of the livestock production in future. To address the feeds and fodders problems in the Southern districts of Bangladesh, an agronomic study was conducted to find out the adaptability of HYV fodder cultivars in three different salinity locations; Bagherhat, Khulna and Stakhira. Five selected high yielding fodder cultivars (BLRI-Naper 1, 2, 3, German and Para) were cultivated among 15 innovative farmers having 5 farmers in each location. The

results showed that significant variation in survivability was found among different cultivars, while BLRI-Napier 3 (hybrid) performed better than the other adapted cultivars.

2. Development of community based fodder production model and demonstration fodder preservation technology in Haor areas of Bangladesh

2.a. Study on the effect of organic manures on biomass yield and nutritive values of BLRI Napier -3 and feeding effect in dairy cows

The north eastern parts of Bangladesh are known as haor characterized by water logging in most period of a year. The traditional livestock feeding system in hoar areas is mainly based on rice straw and natural grasses supplemented with a little amount or without concentrates, although availability of natural grasses fluctuate seasonally, consequently acute shortage of feed supply during the dry season is prevailed. Keeping the problem in mind, a research was directed for the development of fodder production model with native or other suitable varieties of fodder in haor embankment to ensure the availability of green roughages throughout the year. A positive impact was found by increasing 37% daily milk production from existing 2.3 ltrs to latterly 3.2 ltrs. The study also revealed that the biomass yield and nutrient content in BLRI Napier-3 fodder were higher applying cow dung manure than those of other organic manures and chemical fertilizer.

3. Project Title: Development of salt tolerant Napier cultivar for coastal area through genetic engineering

3.a. Screening of salt tolerance and genetic divergence of HYV fodders through hydroponic, tissues culture and RAPD markers

Napier grass is an important high yielding perennial fodder in Bangladesh, extensive research is necessary to develop moderate to high salinity tolerant fodder germplasm in the country with high biomass yield. To develop salt tolerant fodder germplasm by utilization of existing fodder resources at Bangladesh Livestock Research Institute, three different studies were conducted; i) Screening of BLRI Napier-1, 2, 3 and 4 for their salt tolerance level, ii) establishment of tissue culture technique for propagation of fodder crops and iii) study the genetic divergence among Napier cultivars. BLRI Napier-4 and BLRI Napier-3 showed better performance and highest biomass yield at upto 7 dSm⁻¹. Highest callus were induced when leaf roll and node of two Napier grass were cultured in MS medium supplemented with 5% coconut water and 2 & 4mg L⁻¹ 2, 4-D. The 10 primers (RAPD) used produced 115 bands. Of these, 111 were polymorphic (96.52%) and 4, monomorphic (3.48%). Genetic relationships among the genotypes at the average distance of 46.0 showed two major clusters (C₁ and C₂). BLRI Napier-1 and BLRI Napier-2 represent the major cluster C₁ while the major cluster C₂ included rest of all seven genotypes.

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

4.a. Sub-title: Seasonal dynamics feed resources utilization and management as influenced by different river basin areas of Bangladesh

Due to acute shortage of feeds and fodder, more efficient utilization of available crop residue based feeds and native pasture is utmost necessary for livestock improvement in our country. To know the real picture of livestock status and their feeding and management system, a baseline survey was conducted among 1000 farmers in 20 upazilas from 10 river basin districts of Bangladesh. The findings of the survey indicated that although, more than 90% households in the surveyed areas keep livestock, but feeding and management of their livestock has not yet been improved. Acute feed shortage along with both quality and quantity during the dry season is the foremost constraint for exploitation of production potential of their livestock. The results also revealed that high yielding seasonal and perennial fodder cultivation need to be adopted in those areas providing appropriate motivation, training and technological supports to the farmers.

5. Development of cost effective crop residues based complete feed for Ruminates

5.a. Feeding effect of silage and soybean straw based total Mixed Ration (TMR) on the growth performances of growing calves

Crop residues and cereal by-products are the main constituents of ruminant diet in our country and their quality improvement by means of supplementation, treatment, transformation etc. is essentially important to compensate the nutritional problem of livestock. Thus, a study was undertaken to formulate, process and develop a total mixed ration (TMR) for fattening cattle by using locally available crop residues. For this purpose, five types of TMR were prepared based on different ratios of roughage and concentrate composed as 70:30, 60:40, 50:50, 40:60 and 30:70. A total of 30 growing bull calves were selected and equally divided into 5 groups for feeding five types of TMR having 6 bulls in each group. Although, the duration of the study as far conducted was not sufficient to draw a concrete conclusion, but the preliminary results showed an average daily weight gain of 0.892 kg, while 60:40 TMR performed better.

L) Research on FMD and PPR in Bangladesh Project

1. Outbreak and Distribution of Foot and Mouth Disease Virus Serotypes in Bangladesh (FMD & PPR Project)

Foot and mouth disease (FMD) is one of the most important transboundary animal diseases that cause severe economic losses in Bangladesh. The present study was undertaken to investigate molecular epidemiology and genotyping of circulating FMDV serotypes in Bangladesh during January' 2011 to December' 2014. Out of 134 samples, 98 (73%) samples were found positive for FMD virus. Three different serotypes of FMD virus are currently prevalent in Bangladesh. Among the positive FMD virus isolates, serotype O and Asia 1 accounts for about 31% each followed by A (7%) and mixed infection (31%). Phylogenetic analysis of partial VP1 nucleotide

sequences demonstrated that all BLRI/FMDV serotype O isolates were closely related to PanAsia strains, including those that originated from Bangladesh, Bhutan and India. For serotype A BLRI/127 isolates, it showed a close resemblance from isolates originated from India. FMDV type Asia 1 isolates were most closely related to FMDV isolates collected in Bangladesh during 2013.