

Deliverable # 4

Livestock & Dairy Business Structure Analysis Report for Bangladesh

**Agro Business Planning, Technologies and Marketing
Advice and Implementation Support, under
Livestock and Dairy Development Project (LDDP)**

Package: SD-67

**Department of Livestock Services (DLS),
Ministry of Fisheries and Livestock,
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Abbreviations

ADB	Asian Development Bank
AFC	Agriculture and Finance Consultants
AI	Artificial Insemination
AIV	Avian Influenza Virus
BARC	Bangladesh Agriculture Research Council
BAU	Bangladesh Agricultural University
BBS	Bangladesh Bureau of Statistics
BDFA	Bangladesh Dairy Farmer Association
BDT	Bangladesh Taka
BMPCUL	Bangladesh Milk Producers Co-operative Union Limited
BMPIL	Bengal Meat Processing Industries Limited
CIP	Country Investment Plan
DLS	Department of Livestock Services
DLO	District Livestock Office
DSCC	Dhaka South City Council
DNCC	Dhaka North City Council
BLRI	Bangladesh Livestock Research Institute
BAU	Bangladesh Agricultural University
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign Direct Investments
FMD	Foot and Mouth Disease
GDP	Gross Domestic Product
GOB	Government of Bangladesh
HF	Holstein Friesian
ILST	Institute of Livestock Science and Technology
LTI	Livestock Training Institute
LDDP	Livestock and Dairy Development Project
ND	Newcastle Disease
NDDB	National Dairy Development Board
NLPMI	National Livestock and Poultry Management Institute
PPR	Peste des Petits Ruminant
NGO	Non-Government Organization
SAARC	South Asian Association of Regional Cooperation
TMR	Total Mixed Ration
ULO	Upazilla Livestock Officer
VMCC	Village Milk Collection Centre
VTI	Veterinary Training Institute
WTO	World Trade Organization

Executive Summary

Bangladesh is a high-density livestock populated country with approximately 282 animals per square kilometer¹ contributing 1.44% to the GDP and provider of direct employment to 20% and indirect employment to 50% of the population. The livestock derived products has a huge domestic market in fast growing Bangladeshi economy. The initiatives taken by the relevant agencies in the country has brought out several positive changes in the sector in terms of productivity and value addition. However, there is a significant potential for increasing levels of business and entrepreneurship² across the livestock sub-sector. The main objectives of the report are: (a) To study the status and structure of livestock and dairy businesses in the country, (b) To study the structure of service delivery to the farmers, (c) Analyze the competitiveness of the livestock and dairy sector, both domestically and internationally and (d) Make recommendations for the future development of livestock and dairy business in a sustainable way.

The Department of Livestock Services (DLS) is the nodal agency and has a countrywide network dedicated to providing technical advisory services³ to livestock farmers and responsible for overall improvement in business related structures. Commercialization pathway to improve dairy and beef farming activities was introduced with new millennium which was well supported through adaptation of modern methods of feeding, breeding (artificial insemination), vaccination and other animal health related activities. There was a significant improvement in poultry industry and modernization of small sized feed mills due to innovative approach in their business structure. There was remarkable change in cultivation of fodders over recent years which led to silage making as a highly valuable method of conserving fodders. The dairy industry in the country is still in nascent stage⁴ and processing only around 485,000 liters milk per day. This led to import of milk powders from countries such as New Zealand, Australia, Ukraine (pre-war), India and Denmark to meet the demand.

There are four major structures with distinct features, drivers and strengths that are operating within the country's livestock sector, they are led by: (1) Government, (2) Private Businesses, (3) Producer Organizations, and (4) Public-Private-Producer Partnerships. Each of these structures offer considerable promise which could be strengthened to improve their contribution in developing the sub-sector. There is a growing realization within the development community that the current business structures need acceleration through strengthening commercialization activities and providing enabling policy environment⁵. The role of the private sector and producer organizations are recognized in driving livestock business sector through innovations in marketing, technology and facilitating investments.

The major bottlenecks of developing the efficient livestock sector business structure identified in this study which are in the same line with the observations made in various previous studies

¹Present populations of cattle, buffalo, goats, and sheep are 24.5, 1.5, 26.6 and 3.7 million, respectively.

² These relate to changes in farm size and productivity, farm structure, milk and beef marketing structures, milk and beef processing structures, breed improvement and fodder production activities.

³ Extension activities include providing AI services, vaccinations and other health services, farmer training and certain fodder production inputs. Private sector service providers, mainly NGOs, also provide advisory services to farmers.

⁴ There are a total of 15 dairy processing factories across the country with a combined capacity for 1.27 million litres of milk per day.

⁵ Developing infrastructural facilities, research & development activities along with expanding markets are core areas where government intervention can be effective in improving the sub-sector.

are: (a) lack of competitiveness in livestock industry due to small farm sizes, poor hygiene and quality control of products, poor health care, and inefficient value chains, (b) domination of informal market, high input cost, low product price and poor marketing system, (c) low level of investment due to perceived high risks and transaction costs of working with large number of small farmers, and (d) low profit margin of farmers and reduced productivity of livestock as a consequence of climatic hazards.

The Livestock & Dairy Development Project (LDDP) has been tasked to identify the key areas related to livestock business structures which are as follows:

- a) Business structures for supporting access to animal genetic resources by all the livestock farmers.
- b) Hybrid structure of extension services and allow the entry of private sector along with the DLS, research centres and nongovernment agencies.
- c) Support enabling investment structure to attract private sector and allow foreign direct investments (FDIs) into the livestock sector.
- d) Market and value chain development structures in livestock sector is extremely crucial to introduce price discovery mechanism for the benefits of the smallholder farmers.
- e) Streamline regulatory structures to support modernization of the sectors especially in the areas of biosecurity of milk and meat processing.
- f) Long term outlook for improved market structures by incentivizing entry of private sector business entities in the sector.
- g) Skill development and knowledge management structures need to be simplified for all the actors in livestock value chains.
- h) Introduction of mitigation measures for reducing the disaster impacts due to climate change which reduces productive performance of livestock.

1. Introduction

1.1 Background

Bangladesh is a small country with a surface area of 147,570 sq.km and 165.15 million population, where the annual growth rate is 1.22 percent. Growth of domestic products of the country stands at 7.8% over the last decade and recently achieved the status of low middle income country and aims to achieve the developed country status by 2041. Livestock population in the country is currently estimated to comprise 24.70 million cattle, 1.50 million buffaloes, 26.77 million goats, 3.75 million sheep, 311.80 million chicken and 63.84 million ducks (Table 1).

Table 1. Livestock Population in Bangladesh (in lakh number)

Name of Species	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Cattle	233.41	234.88	236.36	237.85	239.35	240.86	242.38	243.91	245.45	247.00
Buffalo	14.50	14.57	14.64	14.71	14.78	14.79	14.86	14.93	15.00	15.08
Sheep	31.43	32.06	32.70	33.35	34.01	34.68	35.37	36.07	36.79	37.52
Goat	252.77	254.39	256.02	257.66	259.31	261.00	262.67	264.35	266.04	267.74
Total Ruminants	532.11	535.90	539.72	543.57	547.45	551.33	555.28	559.26	563.28	567.34
Chicken	2490.11	2553.11	2617.70	2683.93	2751.83	2821.45	2892.83	2966.02	3041.06	3118.00
Duck	472.54	488.61	505.22	522.40	540.16	558.53	577.52	597.16	617.46	638.45
Total poultry	2962.65	3041.72	3122.92	3206.33	3291.99	3379.98	3470.35	3563.18	3658.52	3756.45
Total livestock	3494.76	3577.62	3662.64	3749.90	3839.44	3931.31	4025.63	4122.44	4221.80	4323.79

Source: Department of Livestock Services, 2021

The density of livestock population per acre of cultivable land is 7.37, which is well above the average for many other countries of the world. But due to low productivity of both in milk and meat production, the country suffers from a shortage of livestock products like milk, meat and eggs.

The livestock sector, which contributes 1.90% to GDP at constant prices and make up 16.52% of agriculture GDP, plays a vital role in the agricultural intensification process through the provision of household nutrition, employment generation, poverty alleviation, women empowerment, and producing renewable energy and manure. Livestock also contributes to food security through increased output of livestock products viz. milk, meat and eggs. More than 20% of total population of the country are directly and 50% indirectly dependent for their livelihood on livestock rearing (Table 2).

Table 2. Contribution of livestock and poultry in the national economy of Bangladesh (2021-22)

Contribution of Livestock in Gross Domestic Product (GDP) (Constant Prices)	1.90%
GDP growth rate of Livestock (Constant Prices)	3.10%
Share to Livestock in Agricultural GDP (Constant Prices)	16.52%
GDP volume (Current Prices) (Crore BDT)	67,189

Employment (Directly)	20%
Employment (Partly)	50%

Source: Planning Section, Department of Livestock Services, 2022

The economic transformation of Bangladesh from lower income to upper middle-income country and achieving the per capita income of 2824 USD (BER, 2021) pose the structural change in the livestock sector with particular emphasis to dairy sector. The livestock improvement with more attention to milk and meat production is the key agenda for “Livestock and Dairy Development Project (LDDP)”. Livestock productivity improvement, achieving self-sufficiency in milk and reaching the exporting capacity in meat through revising existing policy towards making congenial environment for supporting the livestock stakeholders and ensuring nutrition security to all have been targeted through this project.

Ruminant production is integrated with crop production systems and the majority of ruminant population is non-descriptive indigenous type, mostly small in size with low productivity. They are traditionally maintained with or without proper housing and fed principally on agricultural crop residues and wastes and cereal by-products. Rice straw contributes 87% of the roughage feed to those animals.

Fodder crops are grown in the farming areas and concentrates are purchased from outside. No feeding standards are maintained, rather animals are fed based on Thumb rule based on milk productivity. In commercial dairy farms pure Holstein Frisian (HF) and Jersey are reared on modern sheds and feeding system. In this condition animals are maintained by feeding cultivated Napier grasses, maize fodder and silage as roughage and concentrate feed ingredients are supplied following daily milk production of the cow (Khan, 2008).

The poultry is one of the fastest growing and most promising industries in Bangladesh which has been recognized by all corners as a profitable enterprise and most popular income generating activity for the rural poor particularly, for the women and unemployed youths. It has achieved a growth rate of 12 to 15% annually in recent times (BBS, 2020). Equipped with the new technology and know-how, the industry has been taken to a level of international standard. Broiler production has become a specialized and speedy business at present time for the people. Short life cycle of the broiler and requirement of relatively less amount of capital attributed to its popularity to the farmers. At present the country possess 1,50,000 poultry farms with annual production of 320,000 metric ton meat and 20.6 billion eggs (Islam, 2022)

A total of 290 registered feed mill has been operating in the country with the capacity of 8–12-ton compound feed per hour and creating employment to thousands of people. As an important sub-sector of livestock production, the poultry industry plays a crucial role in economic growth and simultaneously creates numerous employment opportunities. As per DLS report six million people are dependent on this sector for their livelihood and approximately 20% of the protein consumed in the country originates from poultry. At present chicken contributes 51% of total meat production of the country. Ruminant livestock contributing towards food, agriculture and national income includes cattle, buffalo, goat and sheep contributing 13% of total foreign exchange earnings.

Table 3. Livestock production in Bangladesh

Products	Unit	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Milk	Lakh MT	50.7	60.92	69.7	72.75	92.83	94.01	99.23	106.8	119.85	130.74
Meat	Lakh MT	36.2	45.21	58.6	61.52	71.54	72.06	75.14	76.74	84.4	93.65
Egg	Crore No.	761.74	1016.8	1099.52	1191.24	1493.31	1552	1711	1736	2057.64	2335.35

Source: Department of Livestock Services, 2022

1.2 Objectives of The Report

The Livestock and Dairy Sector is one of the major economic contributors in the country. The sector has grown toward self-sufficiency in livestock products like meat, milk and egg. Now it needs transformation into 'commercialization' and to improve its business structures in the areas such as milk, meat and egg production, marketing, food safety and quality standards. Private sector participation for commercializing the sector is strong. So, the main objectives of the report are the following:

- To study the status and structure of livestock and dairy businesses in the country
-
- Analyze the existing structure of the businesses and changes in production and marketing, including strengths and weaknesses
- Analyze the competitiveness of the livestock and dairy sector, both domestically and internationally
- Make recommendations for the future development of livestock and dairy business in a sustainable way

1.3 Methodology

Literature review

Extensive literature review was done by studying the government documents, research documents from the research organizations, university, government farms, research findings from other countries in the region, etc.

Field visits

LDDP teams have made regular field visits to different parts of the country, met with all related stakeholders, interacted with the livestock and dairy farmers, private sector entrepreneurs and service providers. Team members have conducted Focus Group Discussions, and also visited private sector establishments such as dairy and poultry processing plants. Also visited were different DLS establishments throughout the country, both at an office level, as well as in the field, and Research Institutes. Teams interacted with scientists regarding technological advancements in the livestock, dairy and poultry sector. Industry entrepreneurs and other related stakeholders were also visited to prepare this report.

Consultation

Consultations was done with the livestock and dairy professionals, government officials of Department of Livestock Services (DLS), Bangladesh Livestock Research Institute (BLRI),

Bangladesh Agriculture Research Council (BARC), Government Livestock Farms (dairy cattle, buffalo, goat, sheep), Agriculture University, Bangladesh Dairy Farmers Association (BDFA) and several private sector organizations in dairy farming, dairy processing, poultry processing, beef fattening farms etc.

Personal communication

Several professionals, farmers, and processors, marketers were also consulted during the course of preparing this report.

Focus Group Discussions (FGDs)

LDDP teams visited different districts and Upazillas and held FGDs with livestock farmers about key industry issues they were facing. These issues have since been highlighted throughout this report.

2. Livestock and Dairy Sector in Bangladesh

2.1 Institutional Development in Livestock Sector

Livestock keeping is an age-old way of life for millions of farmers in Bangladesh and being the source of high value foods (milk, meat and egg), draft power and manure for agriculture, fuel for household and source of cash income. Now livestock keeping and dairy production is not only a way of livelihood, but it is transforming into businesses. Milk and meat marketing, processing, distributions are the other business for millions of people. Marketing of green grasses, silage, TMR are the emerging micro level business in rural and peri-urban areas of the country.

With these changes, role and structure of the government and private sector actors in the field of livestock and dairy development has also changed.

2.2 Government Structure for livestock and dairy development

The Department of Livestock Services (DLS) is the apex body of government for livestock development under Ministry of Fisheries and Livestock. DLS is mandated for developing and managing the livestock and dairy development activities in the country. DLS is headed by Director General with its Districts and Upazilla level Livestock Offices across the country.

Main mandate of DLS is to plan, implement, monitor and report the livestock and dairy activities in the country, protect the livestock from animal diseases, marketing of livestock products and provide the safe food to the people. DLS has large network of organizations and physical infrastructure across the country with large number of technical and administrative manpower. There are several Directorates and Divisions with clear mandates for each of them at DLS head quarter. DLS has its service delivery structure throughout the country. The role of DLS continued to expand according to the need of the time. Modern day DLS has its structures at Division Level, District and Upazilla Level. Besides, DLS has Training Centers, Livestock Farms, Veterinary Laboratories, Vaccine Production Laboratories, and Artificial Insemination Centers etc.

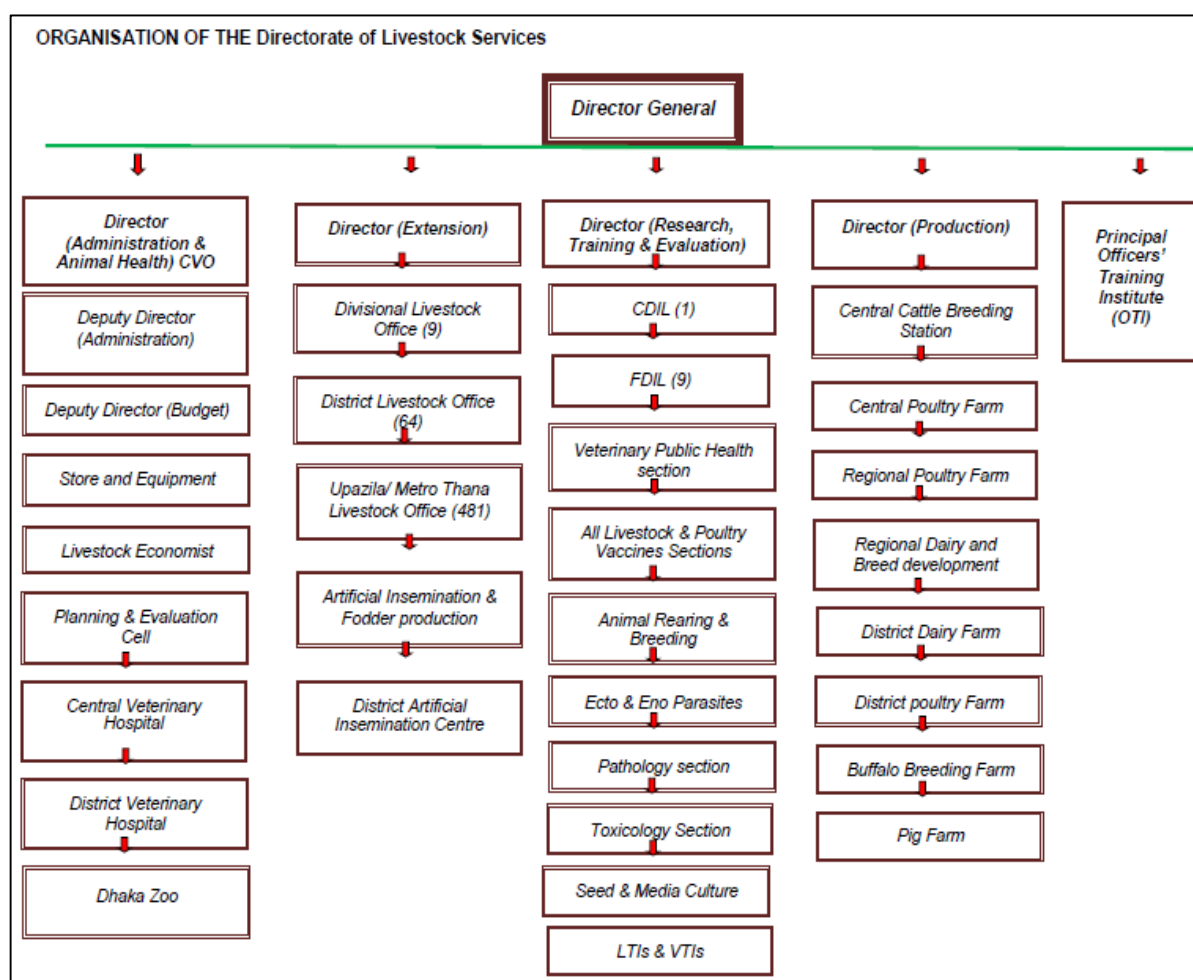
The Division Directors in each of the 8 Divisions who are responsible for implementing, monitoring and reporting of the livestock activities in their respective Divisions. At district level, 64 District Livestock Offices (DLO) who are responsible for implementing, monitoring and reporting the livestock activities of their respective Districts. At Upazilla level, there are 492

Upazilla Livestock Office (ULO) who are responsible for implementing, monitoring and reporting the livestock activities of their respective Upazillas.

Organogram of the Department of Livestock Services (DLS)

The DLS is established under the Ministry of Fisheries and Livestock (MoFL) as the Veterinary Authority for animal health services and is also responsible for animal production and veterinary public health.

Figure 1. Organogram of the Department of Livestock Services (DLS)



Reference: OIE (2016) - PVS (Performance of Veterinary Services) Gap Analysis Report – Bangladesh. OIE World Organisation for Animal Health, June 2016.

The Field Animal Health Service consists of one Director (Extension) under the DG, DLS with 8 Divisional Livestock Offices, 64 District Livestock Offices/Hospitals, 492 Upazila Livestock Offices/Hospitals, and 9 Thana Livestock Offices. A proposed new organisational structure has been drafted and includes the posting of a veterinary para-professional (animal health technician) at each of the 4,550 union councils, in an attempt to extend access to basic animal health services to most farmers in the country.

Veterinary Diagnostic Laboratory Services are provided by one Central Disease Investigation

Laboratory (CDIL) and the 9 Field Disease Investigation Laboratories (FDILs). The Livestock Research Institute (LRI), which produces a wide variety of animal (including poultry) vaccines, has been established as a separate Directorate outside of DLS. The Director of BLRI reports directly to the Secretary of the Ministry of Fisheries and Livestock. The DLS also has an Animal Nutrition Laboratory, which undertakes feed quality testing, the Central Artificial Insemination Laboratory and the Rajshahi Artificial Insemination Laboratory, which support several AI centres supplying frozen semen to district and upazilla clinics.

Other units under the DLS where there is a combination of animal production and veterinary activities are the Central Cattle Breeding & Dairy Farm, the 22 district Artificial Insemination Centres, 433 Artificial Insemination Sub-Centres, 623 Artificial Insemination Points, 6 Dairy & Cattle Development Farms, one Buffalo Breeding & Development Farm, Goat Development Farms, one Pig Development Farm, 10 Poultry Breeding Farms, 20 Poultry Rearing Units, one Central Duck Breeding Farm, 3 Regional Duck Breeding Farms, and two Zoos.

Since the PVS evaluation was undertaken in 2011, the DLS has partially established 24 Border Inspection Posts (BIPs) at 18 Land Crossings, three Airports, two Seaports and one Rail Entry Point.

The DLS has also been authorised (under the Animal Slaughter and Quality Control of Meat Act, 2011) to license and inspect abattoirs and all other types of slaughter facilities and meat processing plants and to carry out ante and post-mortem meat inspection and certification. Under the Diseases of Animals Act (2005) and Diseases of Animals Rules (2008), the DLS is empowered to license and inspect milk processing and retail facilities.

However, in practice, there is currently no authority which has a full complement of staff trained to perform slaughterhouse inspections or to undertake ante- and post-mortem meat inspection effectively. Furthermore, although there is a 'veterinary section' identified within the Bangladesh Drug Authority, there has been no clear registration or control of the sale and use of veterinary medicines and biologicals.

2.3 Agricultural Universities

Agricultural Universities and some Science & Technology Universities are producing the needed technical manpower for livestock development. Bangladesh Agricultural University (BAU) was established in 1961 at Mymensingh, and was the first of its kind in producing graduates of animal science and veterinary science. Now there are 7 public and one private Agricultural Universities in the country producing these graduates. In addition, 6 Science and technology Universities and two other Universities are producing animal and veterinary science graduates. Besides teaching, these universities also conduct both academic and field research and develop technologies. Some of them are also involved in doing farmer extension work at a limited scale through their Extension Departments.

2.4 Bangladesh Livestock Research Institute (BLRI)

New technology generation is needed to increase the livestock production. With an objective of doing research and generating new technologies in the livestock sector, BLRI was established in Savar, Dhaka in 1984. Mandate of BLRI is to do research in livestock production, animal health, animal breeding, animal nutrition, fodder production and in socio economic field. Research findings of BLRI is taken to the livestock farmers by DLS. BLRI has its Regional Research Centers in Naikhongchori in Chattogram Hill Tract and at Baghabarighat of Sirajgang

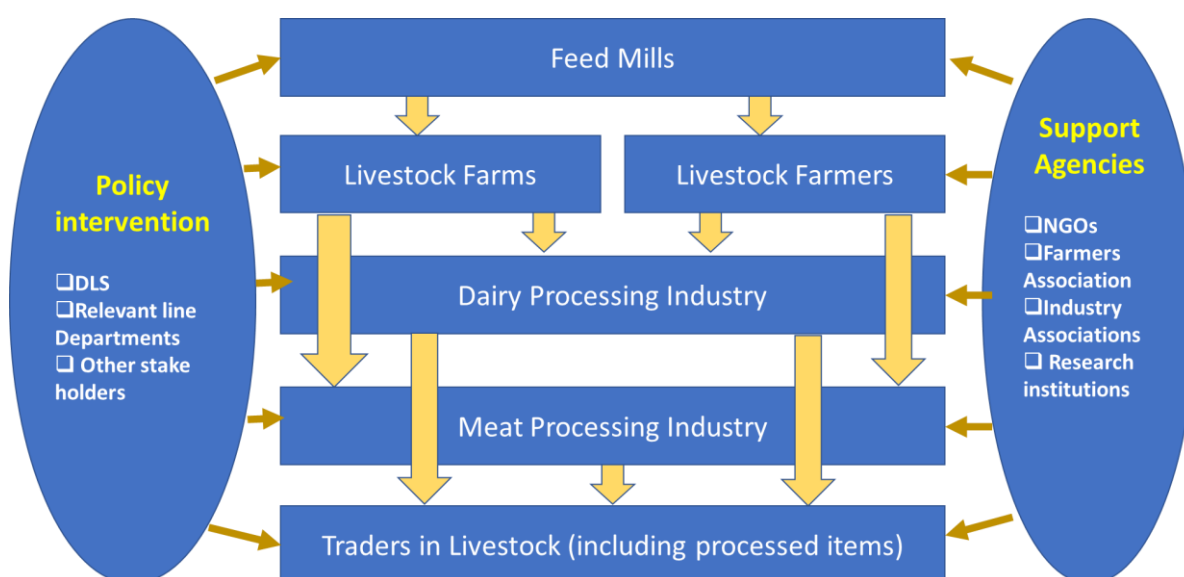
district.

The Government of Bangladesh has given priority to livestock research. In the periodic plan of government, like 7th and 8th Five Year Plans, Perspective Plan of Bangladesh and Bangladesh Country Investment Plan (CIP) have emphasized in livestock research and promoting extension services. BLRI and University research findings are taken to the farmers through the extension network of DLS.

2.5 Private sector actors in livestock development

The actors in the private sector play an important role in supporting livestock development. However, the nature and complexities of the livestock sector in Bangladesh is a challenge to the private entities to scale up their operation with the existing structure. Small scale livestock farmers are the largest private sector (more than 80% of total farmers in Bangladesh). There is an increasing trend in livestock farms, particularly the dairy and beef fattener farmers, however the major challenge is availability of feed due to a smaller number of feed mills and non-availability of raw materials. The figure below provides a glimpse of the private actors and support system in livestock development.

Figure 2. Private Sector Actors in Livestock Development



The Dairy processing industry is quite mature in Bangladesh and transformed to a profitable formal sector. At present, there are 15 large and medium size dairy processing industries in the country in the private sector with a processing capacity of 1.27 million liters of milk per day which are however running at around 38% capacity. Some large processing industry like PRAN is also providing additional services to the farmers like Artificial Insemination (AI), vaccination, deworming, training, and supply of fodder seed. The meat processing industry is still in its nascent stage due to the lack of availability in scientific slaughtering facilities for the big animals. However, the growth in chicken meat industry is phenomenal and the actors are extremely active due to the high level of demand. Livestock trading is an important business activity which are however limited in the wet markets with a high potential to improve with

channeling investments in the SME sector.

As the support agencies are actively participating in livestock development process alongside the positive policy interventions by the government, it is believed that the sector will achieve its objectives as envisaged in the long-term policy outlooks.

Livestock farmers

Livestock farmers are the biggest private sector in the country who are active across the country in livestock production. More than 80% of them are small farmers. Number of bigger livestock farmers, particularly the dairy and beef fattener farmers, are in increasing trend.

Dairy processing industries

Dairy processing had informal structure in the past where traditional products like different types of sweets, ghee were produced and marketed. Milk Vita was established in 1974 as the first dairy processing industry in cooperative model in Bangladesh. Now there are 15 dairy processing industries in the country in the private sector. These dairy plants have a combined daily processing capacity of 1.27 million liters of milk per day. But at present they are processing about only 485,000 liters of milk per day which is 38.1% of the capacity. These dairy processing industries produce different dairy products like pasteurized milk, butter, cheese, ice cream, panir, yoghurt, etc. Some of these processing industries are also producing powder milk, fermented and flavoured milk. Some large processing companies, such as PRAN, are also providing some services to farmers, such as Artificial Insemination (AI), vaccination, deworming, training of farmers, and supply of fodder seed and cuttings.

Meat processing industries

Large slaughter houses are in operation in large metropolitan cities like Dhaka, Chattogram and Rajshahi. Wet markets are often a consumer-preferred place to buy meat in Bangladesh.

Marketing of meat is directly related with the meat production facilities which in turn depends on the infrastructural facilities available at both public and private sector. The slaughtering facilities are limited and almost unorganized for large ruminants (beef cattle and buffaloes), and slightly better for small ruminants (goats and sheep) and poultry (Box 1). The slaughtering activities are performed under the jurisdiction of Local governments. Usually, the city corporation and municipality maintain data of day-to-day slaughtering activities of their own. However, the local government does not maintain compilation of daily slaughtering of animals throughout the country. The other important factor affecting the marketing efficiency is the variable seasonal demands for meat products, for example during the festive seasons⁶ the demands are high and impacted the price stabilization process.

Box 1. Organized Animal Slaughtering facilities in Dhaka city

Few of the big cities and municipality areas in Bangladesh has the basic facilities for organized animal slaughtering either in slaughterhouses or slaughtering slabs. The two city corporations of Dhaka city (DNCC and DSCC)⁷ offer the facilities of slaughtering to the registered butchers and traders. However, these limited facilities are not enough to match the average daily demand of the city dwellers. It was reported that the on an average the capacity of both the facilities together is to slaughter/process about 750 cattle, 1920 goats, 535 sheep and 1 million poultry birds.

⁶ Religious festivals (Eid, sheb-e-barat, khanka/ Darga sharif etc.), family and social ceremonies, etc.

⁷ From the household census of 2022 it is obtained that population of DNCC is 5.97 million and in DSCC 4.3 million. respectively and population in Bangladesh is 165.158 million.

(Source: AFC-SSIL submission to LDDP: Report on slaughtering facilities in Bangladesh, 2022)

The business development services (BDS) for the meat market in Bangladesh are of not identical, meat market system varies on place, area, customers' classes, market structure, availability of physical facilities. The most common butcher shops (small meat shop) exist in the wet markets throughout the country. Meat market in super shop consisting with a corner/ separate segment. These are comparatively more organized and hygienic having cooling and refrigeration facilities. Meat is also sold in open space specially in village weekly markets. The generic marketing of eligible animal begins with farmers/ producers, who sell the animal to first animal trader (local small *bepari*). The first animal trader either sells the animal to slaughterhouse/ butcher or to second animal trader (large *bepari*). The second animal trader supplies the animal to slaughterhouse/ butcher. From the slaughterhouse carcass (slaughtered animal) are purchased by meat wholesaler. From wholesaler the retail butcher purchase carcasses to sell. In very limited cases farmers/ producers directly sell the animal to the retail butcher sells meat to the consumers (resident/ hotel etc.).

Feed mills

The use of concentrate feed has increased with the development of large poultry sector. Now the larger dairy farms with improved breeds of cows are increasing their use of concentrate feed. There are 290 large feed mills in operation in the country (DLS, 2022) with a capacity of producing 8 to 10 metric ton of concentrate feed production per hour.

Livestock traders

Live animal traders are operating the livestock markets. These traders collect the animals from the individual farmers and local markets (Haat), and supply to the end market like Dhaka and other metropolitan cities. During festivals, live animal markets operated at a large scale.

Non-Governmental Organizations (NGO)

NGOs are involved in livestock development mainly through micro credit delivery, training of farmers and in animal health services.

Bangladesh Dairy Farmers Association (BDFA)

BDFA has 92000 farmers as active members across the country. BDFA organizes training and provides fodder seed and cuttings to the livestock farmers.

2.6 Policies and Acts in Livestock and Dairy Sector

Policies are needed to guide and regulate the development of the livestock and dairy development in the country. In Bangladesh there are 18 Policies, Acts, Regulations and Ordinance (Table 4) in the livestock sector. Some of them are very old and have been formulated and enacted long before the birth of the country. Some of them are being implemented, most of them are in drafts stage and waiting for the approval of the government, and some are approved but waiting for implementations.

Table 4. List of Policies & Acts in the livestock sector

S.No	Policies	Status of the Policies	
		Final	Draft
1	National Dairy Development Policy, 2019		✓
2	National Breeding Act, 2019		✓
3	National Livestock Extension Policy, 2013		✓
4	Animal Slaughter and Meat Quality Control Act, 2011	✓	
5	Fish Feed and Animal Feed Act, 2010	✓	
6	Bangladesh Zoo Act, 2009		✓
7	National Poultry Development Policy, 2008	✓	
8	Animal Disease Rule, 2008	✓	
9	Avian Influenza Compensation Strategy and Guidelines, 2008	✓	
10	National Livestock Development Policy, 2007	✓	
11	Animal Disease Act, 2005	✓	
12	Bangladesh Animal and Animal Product Quarantine Act, 2005	✓	
13	Bangladesh Veterinary Practitioners Ordinance, 1982	✓	
14	Prevention and Cruelty to Animal Ordinance, 1982	✓	
15	Animal Slaughter and Meat Control Act, 1957	✓	
16	Bengal Cruelty to Animals Act, 1920	✓	

The above policies are formulated to facilitate mainly for livestock development and also to encourage small scale livestock entrepreneurship development and livestock business development. The policies, acts and regulations are in 10 different areas in the livestock sector, as shown in the table above. These include Dairy Development (1), Animal Breeding (1), Livestock Extension (1), Poultry Productions (2), Animal Feed (1), Meat/Slaughter House (2), Animal Disease (3), Animal Quarantine (1), Veterinary Practice (1) Cruelty of Animal (2) and Zoo animal (1).

3. Major Livestock Development Activities

Livestock production is a dynamic economic activity. It is changing in faster in Bangladesh. Several changes are visible in the emerging livestock and dairy business. Government institutions should be able to serve this dynamic sector through its structure and activities.

3.1 Breed improvement

Demand of milk and meat has increased with the increase in human population and increase in income of the people. To increase milk production by improving the productivity of indigenous Deshi dairy cattle the Government introduced AI in the country in the 1960s with semen of exotic breeds.

Government has the structure for frozen semen production and distribution throughout the country. AI program has its central facility to collect and process frozen semen of HF and other breeds at Central Artificial Insemination Laboratory, Savar (Dhaka). There are 22 AI centers operating in the country. Frozen semen is distributed to ULOs and AI workers through these AI centers. There is a network of semen and liquid nitrogen distribution for doing AI throughout

the country. In year 2020/21, total AI from the DLS is 4218104. Success rate of AI is estimated at about 37.5%. Besides DLS, private sector organizations also did 6304851 AI in the year 2020/21. So, total AI in the Fiscal Year 2020/21 was 10522955. Out of this, number of AI by government and private sector are 40% and 60% respectively. AI centers maintain their own bulls also. So, they are also using liquid (warm) semen in limited scale.

3.2 Animal health

Livestock disease is one of the major issues in livestock production in Bangladesh. Outbreak of several diseases such as Foot and Mouth Disease (FMD), Hemorrhagic Septicemia (HS), anthrax, brucellosis, tuberculosis, mastitis and black quarter are very common in Bangladesh. Internal parasites like liver fluke and ascariasis are also a serious problem in the country. In goat and sheep Peste des Petits (PPR), pox, enterotoxaemia, internal and external parasites is a problem. In poultry, Avian Influenza (AI), Newcastle Disease (ND), Gumboro, aka Infectious Bursal Disease (IBD), and Fowl Pox are the major diseases.

Animal health service is provided through DLOs and ULOs across the country. Inadequate health care and veterinary services are serious constraints to sustainable livestock development in the country. DLS has one of the main mandate of providing animal health services to the farmers. Only 1-2 qualified veterinarian(s) along with 2 – 3 para veterinarian of DLS are available at Upazilla level, covering almost 0.7 million animals in about 200 villages (LDDP, 2022). Veterinary capacity at the Upazilla level does not fulfill the manpower requirements set up according to the plan. Since veterinary services are hospital based and usually not delivered to the farmer's doorstep, farmers have to bring their animals to the hospitals which is inconvenient to the farmers with large animals.

3.3 Feed and fodder development

Shortage of fodder is one of the major constraints in livestock and dairy development in Bangladesh. Another serious issue associated with it is high cost of production of milk and meat. Rice straw in different forms is still a major source of fodder among small farmers. Realization of the importance of green fodder is widely accepted now by farmers and by all the stakeholders in livestock and dairy development. It is also well accepted by the farmers that concentrate feed is expensive in Bangladesh. So, use of concentrate should be minimized and fodder production need to be increased. DLS is doing farmer training, distributing of cuttings of Napier and some fodder seed distribution as part of fodder extension. But needs more aggressive programs on fodder extension.

Fodder production has changed a lot in recent years. Now there are some noticeable changes in forage production.

- Some farmers have started to grow Napier as a main crop in cropland.
- Selling of green Napier grass in the market has started
- Making silage mainly from Napier grass and some maize has also started. Larger dairy farms are producing silage in trench silo and in industrial plastic drums of about 100-kilogram capacity.

3.4 Capacity building

DLS conducts training program for the farmers at different level. All field level training is done in Upazillas. At grass root level Uthan Baithak (an open air meeting in the field) is common.

Uthan Baithak is conducted by the ULOs in the field. Different issues of the livestock farmers are discussed in such training. Other training through POs are also organized in the field.

DLS has training institutes such as the Veterinary Training Institute (VTI), Livestock Training Institute (LTI), Institute of Livestock Science and Technology (ILST), and National Livestock and Poultry Management Institute (NLPMI). LTI Sylhet is merged with Veterinary College in Sylhet and LTI Gaibandha is merged with ILST, Gaibandha. LSPs are trained by ILST. In addition, ILST also train Sub Assistant Livestock Officer. NLPMI provides training of farmer.

3.5 Livestock extension

DLS has infrastructure and human resources in all the 64 DLOs and 492 ULOs across the country. Livestock extension is provided to the farmers through these DLOs and ULOs. Extension plays a key role to educate, encourage, motivate, support to the livestock farmers to make the livestock keeping business attractive, sustainable and profitable. There is great emphasis in research and promoting extension services in all periodic plans like, 7th and 8th Five Year Plans, Perspective Plan of Bangladesh have and Bangladesh Country Investment Plan (CIP)

Major DLS extension activities now includes advisory services, training of farmers, breed improvement through AI, fodder production, vaccination, deworming and treatment of animals. In the field it found that there is a shortage of frontline extension workers. Livestock extension service is provided through Producer Organizations formed by LDDP, through cooperatives and to an individual farmer.

4. Business Structure Analysis

This section describes the business structure and competition structure in dairy and meat sub sector in Bangladesh.

A business structure refers to the legal structure of an organization that is recognized in a given jurisdiction and characterised by the legal definition of that particular category. An organization's legal structure is a key determinant of the activities that it can undertake, such as raising capital, avail government incentives, responsibility for obligations of the business, as well as the amount of taxes that the organization owes to tax agencies. The main forms of business structures in livestock and dairy business in Bangladesh include:

- Informal: sole proprietorship
- Semi-formal: Producer groups
- Formal: cooperative, limited liability company.

The bulk of producers engaged in dairy and livestock business are individual unregistered sole proprietors. LDDP has embarked upon formation of 5500 producer groups. PGs are the basic form of aggregating producers so that they become an effective conduit to receive inputs and advisory services, pool in resources to produce and organise sales of produce according to market conditions. A producer group will have a maximum of 20 members.

A producer group is a business organization often owned and managed by smallholder producers or small entrepreneur for their mutual benefit to access to common facilities like infrastructure, capacity building, hand-holding, financial support & market linkages on a sustainable basis.

Organising producers into groups offer significant advantage in organising production, information gathering, marketing efforts and service delivery. Specifically, by organizing into producer groups, individual enterprises are often able to (Field and Knopp 2002):

- improve their access to and reduce the cost of inputs through bulk procurement;
- increase their efficiency by sharing knowledge, skills and networks;
- enhance their product's quality and marketability by adopting common quality standards, production processes, and market driven product specifications;
- increase access to institutional and bank finance, preferably on concessional terms;
- identify and acquire critical business development services (BDS) through embedded or pay for use mechanisms; and
- improve their market attractiveness by having the quality, quantity, and types of products that multiple buyers demand.

The producer groups would be federated and eventually registered as cooperatives under the Co-operative Societies Act, 2001 (most recently amended in 2013).

Cooperatives in Bangladesh involve diverse sectors including agriculture, fisheries, thrift and credit, dairy, handicraft, etc. In accordance with the Fundamental Principle of State Policy concerning cooperative ownership, the Government of Bangladesh also issued a National Co-operative Policy, 2012 replacing the earlier National Co-operative Policy, 1989 and National Co-operative Policy, 2003, which envisions a broader role for the cooperative movement. The policy is for implementation by all departments that work with cooperatives taking into account their specific context and needs.

As per Department of Cooperative, in 2021-22, there were 161,058 cooperatives with 14,984,318 memberships. Agricultural cooperatives accounted 43% of the total registered cooperatives, while dairy accounted only for 1.5% of the registered cooperatives. There are 2443 dairy cooperatives with a membership of 125, 895 persons. The per capita share capital and the average paid up capital of dairy cooperatives was 663 Taka and 34168 Taka respectively. A third of dairy cooperatives still active are selling most of the milk collected from farmer members in the open market for higher rates instead of supplying it to the state-run Milk Vita or other organisations.

One of the pioneering dairy enterprises in the country is the Bangladesh Milk Producers Co-operative Union Limited (BMPCUL). Presently, BMPCUL operates in six milk shed areas of the country viz Tangail, Manikganj, Tekerhat, Baghabarighat, Rangpur, and Sreenagar. It collects milk through networks established by its primary co-operative societies. BMPCUL is the central union of a total of 345 Primary Milk Producer's Co-operative Societies and has a membership of about 40,000 milk-producing farmer-members. To become a member of a rural primary society, farmers have to own a milking cow and have to buy a share of Tk 10.00 and pay Tk 1.00 as admission fee. To maintain membership, a farmer has to supply at least 150 litres of milk in a year. BMPCUL markets milk and milk products under the brand name Milk Vita.

The Bangladesh LLC is the most preferred legal entity used by entrepreneurs setting up businesses in Bangladesh. A LLC requires at least 2 shareholders and 2 directors, who can either be individuals or legal entities. Usually most companies formed in the country are private limited companies. About 100% foreign investment is allowed in the dairy sector, and repatriation of profit and capital is allowed. There are 14 local companies that produce and

supply dairy, milk, and pasteurised products to the urban market. Among the large corporates are Milk Vita, Pran, Aarong, Danish Dairy, Farm Fresh, Aftab Milk, Igloo Dairy and American Dairy.

There are 18 dairy companies which procures 538,000 litres of milk daily, mainly from middlemen (see Table 5). The local cows are low in yield providing 2-5 litres of milk per day. The companies are generally not engaged in improving the breed of animals. An exception is Pran which works with 12,000 farmers in five dairy hubs in four districts—Rangpur, Natore, Pabna and Sirajganj—to improve productivity.

Table 5. Dairy Liquid Milk Collection by Private Companies

Sl.	Dairy (establishment year)	Avg. milk collection (litres/day)	Procurement source
1	Amomilk (1996)	15,000	Middleman based
2	Aarong–BRAC Dairy (1998)	160,000	Producers structured based
3	Ultra–Shelaidah Dairy (1998)	20,000	Small producers based
4	Aftab Milk (1998)	25,000	Middleman based
5	Pran Dairy (2001)	140,000	VMCC/HUB based
6	Grameen (1999)	12,500	Small producers based
7	Rangpur Dairy (2007)	10,000	Middle men
8	Akij Food Group (2007)	120,000	Small producers based
9	Grameen Danone (2007)	7,500	Small producers based
10	Eon Foods (2021)	2,500	High Tec. Milk Producers
11	Dutch Dairy (2018)	500	High Tec. Milk Producers
12	Ichhamoti Dairy and Food Products (PURA)	4,500	Middleman based
13	American Dairy Limited (MOO)	3,500	High Tech. Milk Producers
14	Danish Dairy Farm Ltd (Ayrar)	5,000	Middleman based
15	Igloo Dairy Limited (Igloo)	5,000	Middleman based
	Total	531,000	

Source: Annual reports of different dairy processing companies

The demand for milk is 15.668 million metric tons while the supply is 13.074 million metric tons. The gap between supply and demand is largely met by milk powder imports of about 20 000 tonnes annually, valued at some US\$70 million. Imports represent 0.16 million tonnes of

liquid milk equivalent annually, feeding some 6-7 percent of total consumption and accounting for an estimated 55 percent of the formal dairy market. There are nine companies that supply milk powder to the markets. The nine companies are Arla Food (Dano), New Zealand Dairy (Diploma), Meghna Group (Fresh), Abul Khair Group (Marks), Partex Group (Danish), Brac Dairy (Aarong), Nestle Bangladesh (Nido), Pran Dairy and Milk Vita. Of the local brands, only Milk Vita and Aarong have their own plants for producing milk powder, while other brands do only packaging with imported bulk milk powder. Dano, Nido and Marks are the dominating brands in the milk powder segment.

The features of sole proprietorship, producer groups, cooperatives and private limited companies is illustrated in the table 2 below. Sole proprietorship is suitable for micro businesses which does not require external debt finance. Producer groups are quasi informal arrangements. Cooperatives are suitable such businesses where external equity requirement can be met by share subscription of members, or donations by government, bilateral and multilateral agencies and philanthropic organisations. The cooperatives have significant tax advantage over all other forms of organisations because of lower tax incidence. Private limited companies allow greater control of investors, and allow access to capital market for equity, and debt.

Table 6. Business Structure Comparison Chart for Bangladesh

Aspect	Sole proprietorship	Producer groups	Cooperatives	Limited company
Business succession	By heirs upon the death of the proprietor.	Ends with the death/withdrawal of the member	Perpetual in nature	Perpetual in nature
Share allotment	Not Applicable	Not Applicable	Applicable	Applicable
BD citizenship requirement	Must.	Must.	Must.	Open to foreigners
Voting	Not applicable	Voting allowed, but generally works on consensus.	One member, one vote.	One share, one vote.
Liability for business debts and obligations	Unlimited liability	Unlimited liability	Limited liability	Limited liability
Income tax rate	For income over 4 lacs taka, rate is between 5% and 25%.	30% on business income, if income exceeds threshold level.	Registered cooperatives, other than agricultural or cottage sector - 15%	Private, unlisted company tax rate 35%. Listed company -25%.
AGM and filing of annual returns	No	Nil	Yes.	Yes
Issue of shares	No	No	Yes	Yes
No. of members	1	Between 5-20 persons	Minimum 20, no max	Up to 50 members
Source of capital	Own	Own, grants	Members, donations	Shareholders, investors

Aspect	Sole proprietorship	Producer groups	Cooperatives	Limited company
Credibility to banks, investors and clients	Little, dependent on individual.	Low	Moderate	High credibility with stakeholders.

Source: SSIL/LDDP, 2022

Currently, Bangladesh milk and meat is not competitive neither in South Asia, nor in the world market. The average price of milk price in Bangladesh is USD 1.47 compared to USD 0.82 in India, USD 0.89 in Pakistan, USD 1.45 in the Netherlands, and USD 1.64 in Australia⁸. The average price of per kg beef in the international market is around \$5-5.50, but in Bangladesh it is around \$7-\$7.50⁹. Inefficient business and market structure is one of the reasons for uncompetitive prices of milk and meat in the country.

5. Market Structure

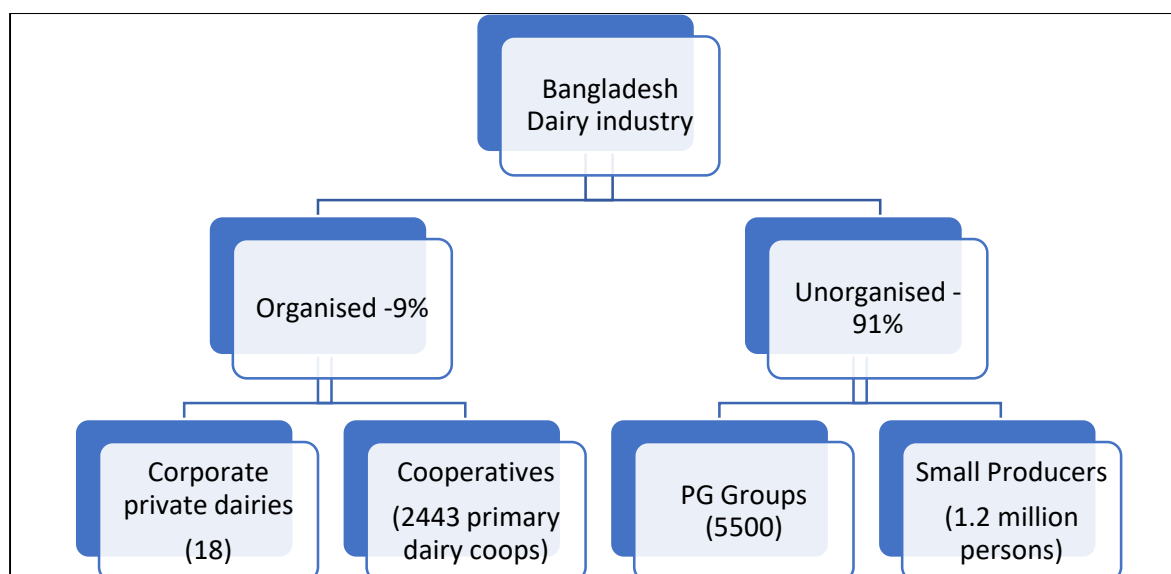
A Market structure refers to all elements that may influence the conduct and execution of the organizations working in an industry. The competitiveness of the market shows the degree to which individual firm has power to impact market price or the terms on which its product is sold. The market structure has great influence on the behaviour of individuals firms in the market. The market structure will affect how firm price their product in the industry. Market structure means how firms are differentiated and categorized based on the type of goods they sell (homogeneous/ heterogeneous) and how their functions and operations are affected by external factors and elements. Market structure makes it easier to understand the different characteristics of diverse markets.

As can be seen from figure 3 below, the Bangladesh dairy industry is heavily influenced by the unorganised sector (93%), since most of the milk supplies come from small producers.

Figure 3. Structure of Dairy Industry in Bangladesh

⁸ Source: https://www.globalproductprices.com/Bangladesh/milk_prices/

⁴ Why is beef so expensive in Bangladesh? <https://www.dhakatribune.com/commerce/2022/05/11/why-is-beef-so-expensive-in-bangladesh>, May 11, 2022



Three types of market structures are witnessed in Bangladesh milk market namely perfect competition, oligopsony, and oligopolistic competition.

Perfect competition: In a perfectly competitive market, the forces of supply and demand determine the number of goods and services produced as well as market prices set by the companies in the market. According to DLS, there are 1.7 million dairy farms in the country and 420,000 households are directly or indirectly involved in the industry (see Table 7 below). Approximately 84% of the dairy owners have only 1-5 cattle, followed by 15% of farms having 6-10 cattle, and 1% of the dairy farms have between 10-20 cows. There are also large dairy farms having more than 20 cattle, however, DLS does not maintain any data on such farms. Recent years have witnessed the emergence of specialised dairy farms, milk production being the main activity of the farm, having 20 or more cows. There are a handful of integrated dairy farms with own fodder production, milk processing and chilling facilities. The number of these integrated farms are only a handful. Approx. 81% of these farms are located in Chattogram (41%), Dhaka (14%), Rajshahi (13%) and Khulna (13%).

Table 7. Bangladesh dairy cattle ownership

SL #	Division	Category-wise Number of Dairy Farms			Total
		1 to 5 Cows	6 to 9 Cows	10 to 20 Cows	
1	Rangpur	132905	9742	2288	144935
2	Rajshahi	177820	39512	4689	222021
3	Khulna	209040	9215	2571	220826
4	Barishal	39776	2667	792	43235
5	Dhaka	210251	29239	5789	245279
6	Mymensingh	86697	5970	1428	94095
7	Sylhet	29609	6310	669	36588
8	Chattogram	542288	147034	2374	691696
9	Grand Total	1428386	249689	20600	1698675
10	Total Households	300000	100000	20000	420000

Source: Department of Livestock Services, 2020

Oligopsony: The small producers, mini and commercial dairies face oligopsony.

An oligopsony is a market structure in which the number of buyers is small while the number of sellers are very large. Milk market has large numerous suppliers competing to sell their product to a small number of buyers. Many of the sellers are indebted to the buyers for social obligations and emergency loans. This allows few buyers to maintain their hold on the sellers.

Oligopolistic market in pasteurised milk products: The market share of three companies Milk Vita (40%), Arong (24%) and Pran (24%) together accounts for 88%. These three companies are the most powerful firms with finance, physical resources, and brand name that create barriers to entry for new firms.

The table below summarises the characteristics of different types of competition observed in Bangladesh.

Table 8. Market Structure for Milk in Bangladesh

Perfect competition	• Many producers with total freedom of entry/exit • Homogenous good – perfect information • Small producers are price takers • Homogenous products • Demand curve is horizontal • Normal profit • No government control on the ground
Oligopsony	• Village traders and sweet makers functions only in limited geographies through affinity bonding (religion, caste, neighbourhood feeling) • Freedom of entry/exit • Homogenous good – perfect information • Great control on the purchase price of milk, but less on other inputs • Higher profit due to bonding through debt advance, value addition in sweets, yogurt • Minimal government control exercised by food/health inspectors
Oligopoly in branded and pasteurised milk	• Three large firms dominate the market (Milk Vita, Pran, Aarong) • Low sunk costs • Differentiated and undifferentiated products • Some barriers to entry due to branding, and high end products (strong product differentiation, presence in high end products) • Demand curve downward sloping, inelastic, hence can dictate prices to consumers • Government control through licensing, taxes, price regulation of milk, and vigilance over collusive price fixing

Source: SSIL/LDDP 2022

The interplay of market power is visible in the trend for milk prices in recent years (see Figure 2 below). Cattle feed amounts to 70% of farming cost. Prices of all types of feed have risen by at least 50% in the past five years. Between 2018-2022, veterinary medicines costs escalated by more than 25%, labour costs by 100% and utility bills by at least 200%. But milk collection rates at the farmers' level have not increased at that pace. Due to increasing competition, the small producers are not able to recover their production costs by selling milk. The corporate milk processors are however, able to pay a low price for milk but extract higher prices from the customers. This situation will eventually lead to closure of many small and medium sized commercial dairies.

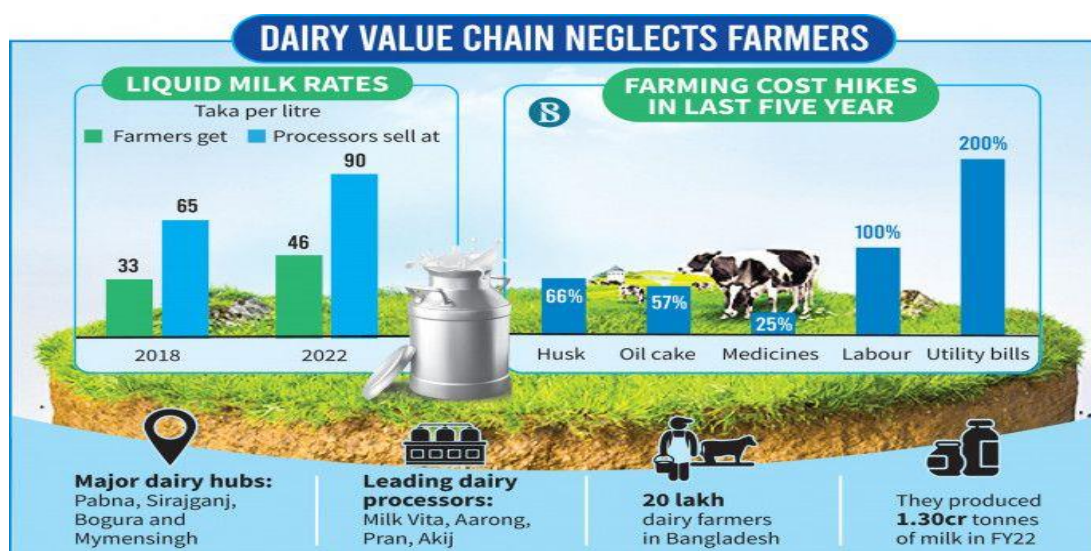
The formal sector of milk marketing is collecting about 9 % of the total milk produced in the country and 91% of it is marketed through the informal marketing channel. The key marketing organization in the informal sector is the traditional sweet meat industries which has network across the country. Sweetmeat industries are using to produce different sweets which also increase the shelf life of the milk products like sweet. Bangladeshi society likes different sweets. So, it is marketed throughout the country.

To increase the marketing share by the formal sector, there needs to be investment in the development of infrastructure for collecting the milk, particularly milk chilling network. Private sector will cautiously invest in meat and milk sector as there may be more profitable to invest in other sectors instead of investing in perishable commodities like meat and milk. Share of formal sector will only grow slowly as in the case of other SAARC countries.

One of the major issues in milk marketing is that the farmers are not getting the fair price of milk. Their actual cost of production is higher than the price they are getting from the formal and informal dairy industries.

High cost of production is due to high cost of inputs like feed and fodder, veterinary care, price of dairy animals and low production efficiency of livestock etc. These costs can be only managed by strengthening the service delivery from the government. So, both the organized sector and the farmers have role to play to increase milk marketing by the organized sector. For example, the organized sector needs to develop their milk collection network by establishing the cool chain system in wider scale. The farmers as a milk producer group should be supported to increase productivity and improve the quality of milk by the DLS extension system.

Figure 4. Smallholder dairy farmers are struggling with rising input prices in Bangladesh



Source: <https://www.dhakatribune.com/commerce/2022/05/11/why-is-beef-so-expensive-in-bangladesh>

Several sections in this report describe in detail the competitive environment for milk and meat industry. A number of recommendations are made to improve productivity, price realisation and efficiency of the milk and meat enterprises.

5.1 Problems Relating to Milk Marketing

There are several issues in milk marketing and processing. Only 9% of the milk produced in the country are collected and processed by the formal sector. On the other hand, large quantities of powder milk is imported in the country. There are several reasons why powder milk is imported. These issues are mainly related to collection problems, high prices of raw milk and poor quality of milk.

Table 9. Problems relating to Milk Marketing in Bangladesh

S. No.	Issues	Description
1	High price of raw milk	Medium level and big farmers raise exotic breed cows and use concentrate feed to maintain the productivity. Concentrate feed is expensive. So, mainly due to high cost of feed, cost of production of milk is high. Productivity of native cattle is low. But they need feed and care round the year. So, cost of production is high among small farmers also.
2	Poor quality of milk and lack of awareness of farmers about it	Milk hygiene is poor particularly in small scale of production. There is a lack of programs for creating awareness for hygienic milk production. Poor quality milk cannot be used for processing good quality dairy products. There is lack of awareness particularly among the small farmers which results in low milk yield and poor quality of milk.
3	High cost of raw milk collection	Milk is produced in small scale by the small farmers in every parts of the districts. So, the collection cost of milk is high and quality of milk is also poor.
4	Strong traditional local market	Traditional local production of different sweets also competes with marketing of milk by formal sector. So, traditional market is the main market for farmers where great percentage of the 91% of the milk is used.

6. Dairy Sector Structure

6.1 Dairy cattle

Dairy cattle is the main ruminant livestock in Bangladesh. Cattle population has increased by 5.82% in the last 10 years. There are changes in dairy cattle farm size, particularly in medium size ones. There are three types of dairy cattle available in Bangladesh: local deshi, cross-bred and pure exotic breeds.

Local Deshi cattle

More than 80% of the dairy cattle farms are small size farms mainly Deshi breed. Due to increase in farm mechanization use of cattle for draft power is decreasing. Productivity of these Deshi/Native breed is poor due to its genetic makeup, poor feed sources, livestock diseases

and poor management. Average milk production of Deshi breed cattle is 200 to 250 liters per lactation. However, these native Deshi cattle are the major contributor in milk production. It is not due to its productivity, but their population is more than 80% of the cattle population. In FY 2021/22, share of Deshi cattle in total milk production is about 74% (DLS, 2022).

Among the local Deshi cattle there are a few native breeds of dairy cattle from specific locations like Chittagong Red Cattle (CRC) from Chittagong. There are other native breeds in Pabna, Sirajgang, Munshiganj and North Bengal (Gray Cattle) which are native breed but are more productive than the common Deshi breeds. But due to the high preference and priority for Holstein Friesian (HF), these native breeds are under threat. (As these are productive native breeds, it is recommended they be conserved and used for milk production.)

Cross-bred cattle

With an objective of increasing the milk production in the country, local cattle were crossed with exotic breeds, mainly Red Sindhi, Sahiwal, Jersey and HF. Now HF is the most preferred dairy cattle breed by the farmers and government is also giving priority to this breed. Although the general understanding is that the ideal level of HF blood in dairy cattle is 50% (Pers comm, DLS officials), but in the field this blood level varies from around 25% to 77%. So, the population composition of dairy cattle is changing from Deshi to crossbred with exotic breeds. With this change in breed composition, productivity of milk of the national dairy herd is also changing.

Average milk production in HF crosses ranges from 6 liter to 10 liters/day (LDDP Reports, 2022). Hamid et al, 2017 reported that the average lactation yield of 1,500 to 3,000 liter/lactation for crossbred HF.

Pure breed cattle

In recent times a few of the private farms have been upgrading to modern facilities and technologies using pure breeds, mainly HF. The average lactation yields of these cows is 3,500 to 4,000 L/lactation.

6.2 Dairy buffaloes

Buffalo is another source of milk in the country, but the population in the country is only about 1.5 million, and the buffalo breed in Bangladesh is not highly productive. So, contribution of buffalo to milk production is only about 3 to 4%. Buffalo milk is marketed only in limited areas.

In recent years there have been several efforts to promote buffalo in Bangladesh. These include establishment of the Buffalo Breeding and Development Centre at Savar, the Buffalo Development Project at DLS, and import of Murrah buffalo heifers from India.

Figure 5. Buffalo being fed rice straw in a village and mixed roughage in a Govt. farm



Although buffalo can survive on fairly poor-quality fodders, they will grow and produce milk much more efficiently when fed higher quality green fodders such as Napier or Para grass and when given concentrate feeds.

6.3 Dairy cattle farming

In recent years, there have been changes in the structure of livestock sector particularly in dairy cattle and beef production. With the introduction of exotic breeds of dairy cattle and investment from private sector, highly productive breeds like HF, the picture in dairy cattle production has changed. Number of bigger commercial dairy farms and beef fattening farms are emerging. Dairy cattle production is in the path of commercialization with increased herd sizes and some level of mechanization. Herd sizes are increasing with exotic breeds of cattle in commercial farms. Commercialization of dairy cattle production has started mainly with HF breed.

Figure 6. Holstein-Friesian cows in Mymensingh (L) and in Pabna (R)



Table 10. Livestock farm sizes in Bangladesh

	Cattle		Goat		Sheep		Fowl		Duck	
Farm Size	No. of HH	%	No. of HH	%	No. of HH	%	No. of HH	%	No. of HH	%
Small	2382622	89%	1475830	91%	97445	90%	3028744	91%	1743603	90%
Medium	276957	10%	135868	8%	10207	9%	274783	8%	175261	9%
Large	24660	1%	11880	1%	996	1%	23331	1%	15427	1%
Total	2684239	100%	1623578	100%	108648	100%	3326858	100%	1934291	100%

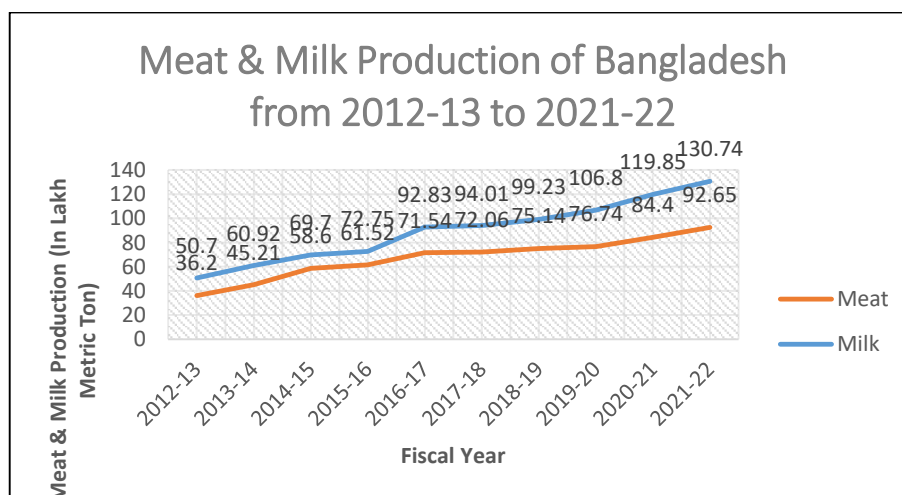
Source: Statistical Yearbook Bangladesh 2021, Bangladesh Bureau of Statistics (published June 2022)

6.4 Milk Production

Present milk production in Bangladesh is 11.98 million metric tons/year (DLS, 2021). In the last 10 years, cattle and buffalo population has increased by 5.82 % and 3.95% respectively (DLS, 2022) and in the same period milk production by 157.87% or 2.58 times (Figure 2). This is a big achievement in milk production in Bangladesh. This indicates that the number and productivity of cross-bred cattle is increasing.

Dairy cattle are the major livestock and milk is the most important livestock product. More than 70% of the milk is produced by small farmers in the rural area. Dairy cattle are the main source of milk in the country which produces more than 90% of it. Only about 9% of total milk reaches the urban areas through a formal path of processing. But the milk collected and processed by the industries is not enough to meet the demand. To meet the demand, Bangladesh is importing large quantity of powder milk which are reconstituted into fluid milk and also used to prepare different dairy products. Import of powder milk increased by 86% to 104,000 metric tons in the 2015-16 period from 56,330 tons in 2009 -10 (The Daily Star, Monday, June 6, 2022).

Figure 7. Meat and milk production trend in Bangladesh



As mentioned above, buffalo is another source of milk, but this only comprises approx 3 to 4% of total. About 6 to 7% of total milk is produced by goats. Average milk production by goat is 200 to 300 grams/day/doe and in rare cases it is even 1 to 1.5 liters/day for a lactation period of 2 to 3 months. But goat milk does not enter the market and it is utilized for home consumption. So, Dairy cattle is the main source of milk in the country.

About 74% of the milk comes from Deshi breed cattle (DLS 2022). Deshi breed of dairy cattle produces an average of 2 to 2.5 liters of milk per day (LDDP 2022) or the average production is 200 to 250 liters per lactation. Average milk production by crossbred cows is 5 to 6 times more than the native Deshi cows.

Structure of dairy cattle is changing now with the introduction of exotic breeds, particularly HF. Every year about 10 million AI is done in the country by government organization and private sector. So, the composition of dairy cattle will continue to change toward exotic breed and also the contribution of Deshi cattle in total milk production is expected to change.

There are several problems being faced by the milk production sector. These mainly relate to milk yields and costs of production and are further described below.

Table 11. Problems being faced by the milk production sector

No.	Issues	Descriptions
1	Low productivity of native Desi breed	Majority of farmers raise native Desi cattle. Their genetic makeup is of low productivity with 200 to 250 liters of milk/lactation.
2	Subsistence level of farming. Small scale operation with low milk yield	Small farmers are poor in resources. Livestock keeping is a way life for these farmers rather than business-oriented activities.
3	Shortage of feed and fodder	Crop residues and by products are the main feed resources. Small farmers do not have land for green fodder cultivation. Even with medium level and bigger farmers also have the shortage of green fodder.
5	High cost of production	Productivity of native cattle is low. But they need to be maintained, taken care of round the year. So, the cost of production of milk is high. Medium level and big farmers use concentrate feed to maintain the productivity. Concentrate feed is expensive. So, their cost of production is also high.
6	Inadequate animal health services	There is high incidence of diseases like FMD, anthrax, mastitis, zoonotic disease like tuberculosis, etc. There is no adequate animal health services available on time. Vaccination coverage is not enough. Productivity is affected by these diseases and in some cases farmers lose their animals.
7	No livestock insurance policy	There is no insurance policy in Bangladesh. Livestock diseases are common. Sometimes a valuable animal dies. This is a big loss to the dairy farmers.
8	Slow rate of breed improvement	AI services do not cover all the farmers in all parts of the country. Conception rates from AI are also relatively low. So breed improvement is slow.
9	Breeding policy	There is no approved breeding policy. But the general understanding among the policy makers and technicians is that 50% exotic blood are suitable in

No.	Issues	Descriptions
		Bangladesh condition. But in the field it is found from around 25% to pure 100% HF breed.
10	Lack of capacity development programs to the livestock farmers	Technical and management capacity building of the farmers are not adequately addressed.
11	Conservation of local productive breeds	There are some location specific local breeds of dairy cattle which have acceptable level of milk production. For example, Chittagong Red Cattle, cattle from Munshiganj, Pabna, Sirajganj and Nort Bengal (Gray cattle) from the northern part of the country. If these breeds are crossed with exotic breed, these valuable genetic material will be lost forever.

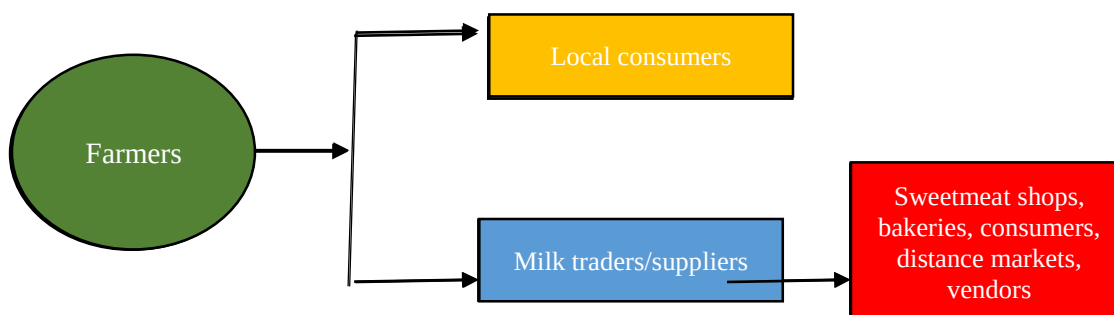
6.5 Milk Marketing Structure

There are two path of milk marketing and processing in Bangladesh. The informal path is the traditional system and the formal path is the modern system operated by the big dairy processing plants.

Informal Processing Structure

In the informal model, small holder milk producers sell their milk directly to the consumers or to the middle men. Then the middle men sell the milk to local sweetmeat shops, bakeries, consumers and to milk vendors. In most cases middlemen also provides loan to the farmers.

Figure 8. Informal path of milk marketing in Bangladesh



Traditionally, milk is converted into different local dairy products like cream, ghee, khoa, dohi and varieties of sweets to increase the self-life of the milk products and meet the need of the consumers. It is estimated that about 91% of the nation's milk production is marketed by informal market. Sweet shops convert the milk into different sweets and yoghurt. Bangladesh is famous for different types of sweets and yoghurt which is marketed across the country. With the establishment of several dairy processing plant in the country, the volume of traditional marketing is expected change gradually.

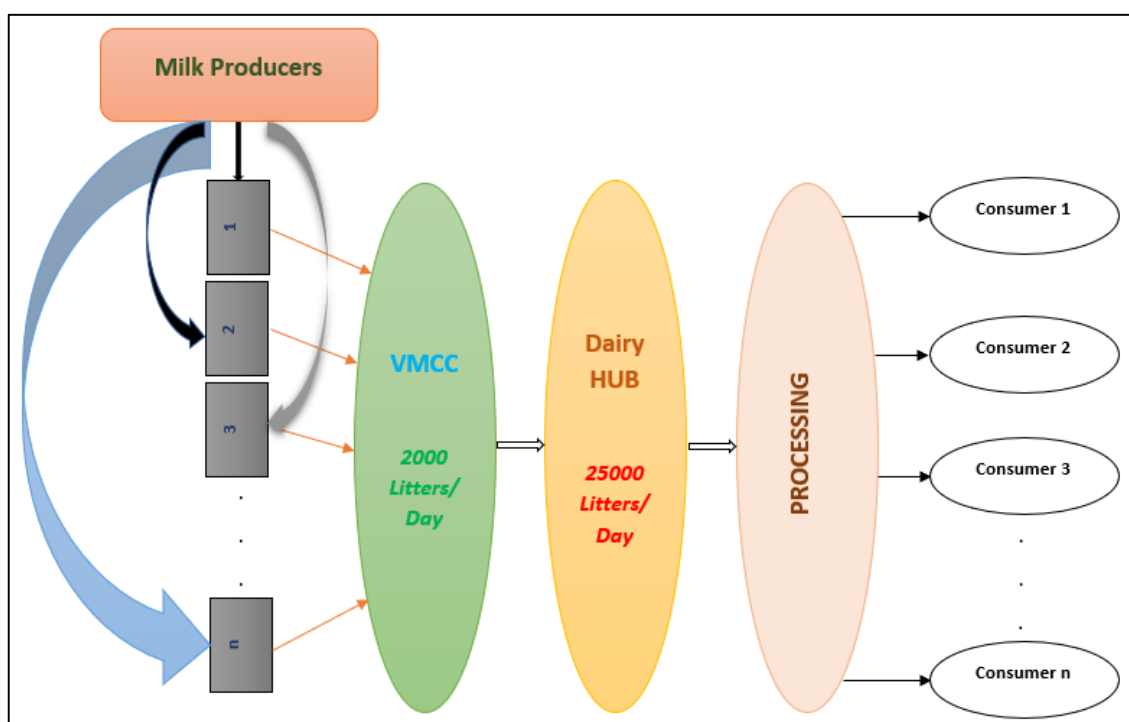
Formal Milk Processing Structure

There are several milk marketing industries in the formal sector with their own models. Milk Vita is the leader which is the biggest milk marketing and processing plant established in 1974. It started to work with very poor landless farmers with all packages for production and marketing system. It is working in 46 districts of the country.

Since the establishment of Milk Vita, 14 other processing industries of different capacities are established to date (Table 7). The combined daily processing capacities by these 15 processing plants is 1.27 million liters per day (Table 7). But now they are processing only 485,000 liters per day which is about 38.1% of their actual capacity. Out of these, the top four processing plants Milk Vita, BRAC Dairy, PRAN Dairy and Akij Dairy are processing about 76.2% of the total daily milk processed.

The path of milk to the formal milk processing plants are different among the processing industries. BRAC dairy usually operate through middlemen for collecting the milk. They pay the basic price to the milk producer. PRAN Dairy in Bangladesh is the pioneer for introducing the VMCC and Dairy Hub model of milk marketing.

Figure 9. VMCC and Dairy Hub Model for milk collection in Bangladesh



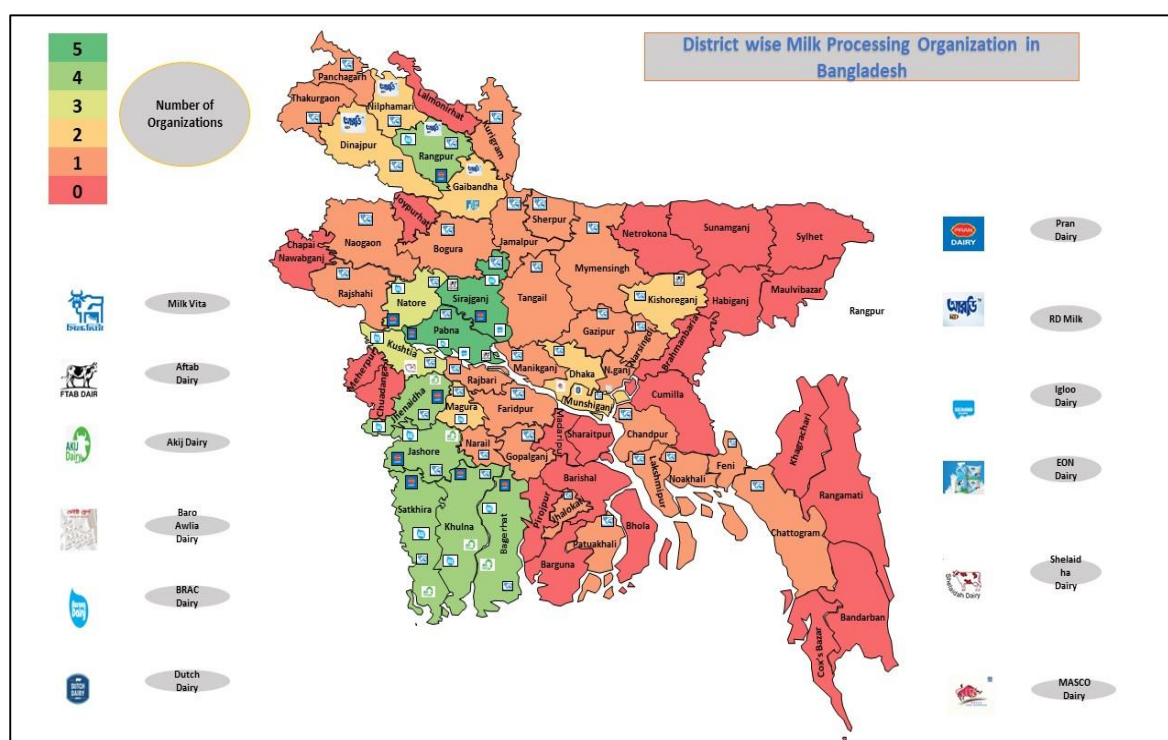
Presently, PRAN is collecting liquid milk from its 103 VMCC and 05 Dairy HUBs. For example, PRAN collects the milk through VMCC where milk is tested and cooled. Then it is sent to Dairy Hub for further chilling before sending it to the main processing plant. PRAN is also helping dairy farmers for AI, fodder production, vaccination, deworming and treatment of animals and training.

Table 12. Milk processing industries in Bangladesh

Name of Organization	Actual Milk Processing Capacity (lt/day)	Present milk collection (lt/day)
Milk Vita, Baghabari	350,000	150,000
BRAC Dairy	250,000	100,000
PRAN Dairy	200,000	70,000
Akij Dairy	150,000	50,000
RD Milk	50,000	30,000
Shelaidaha Dairy	80,000	20,000
EON Dairy	25,000	10,000
Egloo Milk	50,000	25,000
Aftab Milk	50,000	15,000
Ichamoti Dairy	20,000	5000
Dutch Dairy Ltd.	10,000	5000
MASCO Dairy	5000	1000
Baro Awlia Dairy	20,000	Presently no collection
Govt, Savar Dairy	5000	2000
Military Dairy Farm	5000	2000
Total	1,270,000	485,000

Source: Annual Reports of the dairy processing companies.

Figure 10. Location of main Milk Processing Organizations across Bangladesh



The VMCC and Dairy Hub is the acceptable model of milk marketing in Bangladesh now. This model is already in used by PRAN. This model of collection, testing, chilling and transportation to Dairy Hubs is scientific and hygienic. So, it would be appropriate to plan the milk marketing strategies based on already proven system in the country. There is a provision within LDDP for Matching Grants for establishing VMCCs and Dairy Hubs. LDDP also has provision for selecting districts/locations for future establishment of 300 VMCCs and 20 Dairy Hubs for accelerating the milk marketing in the country in the future.

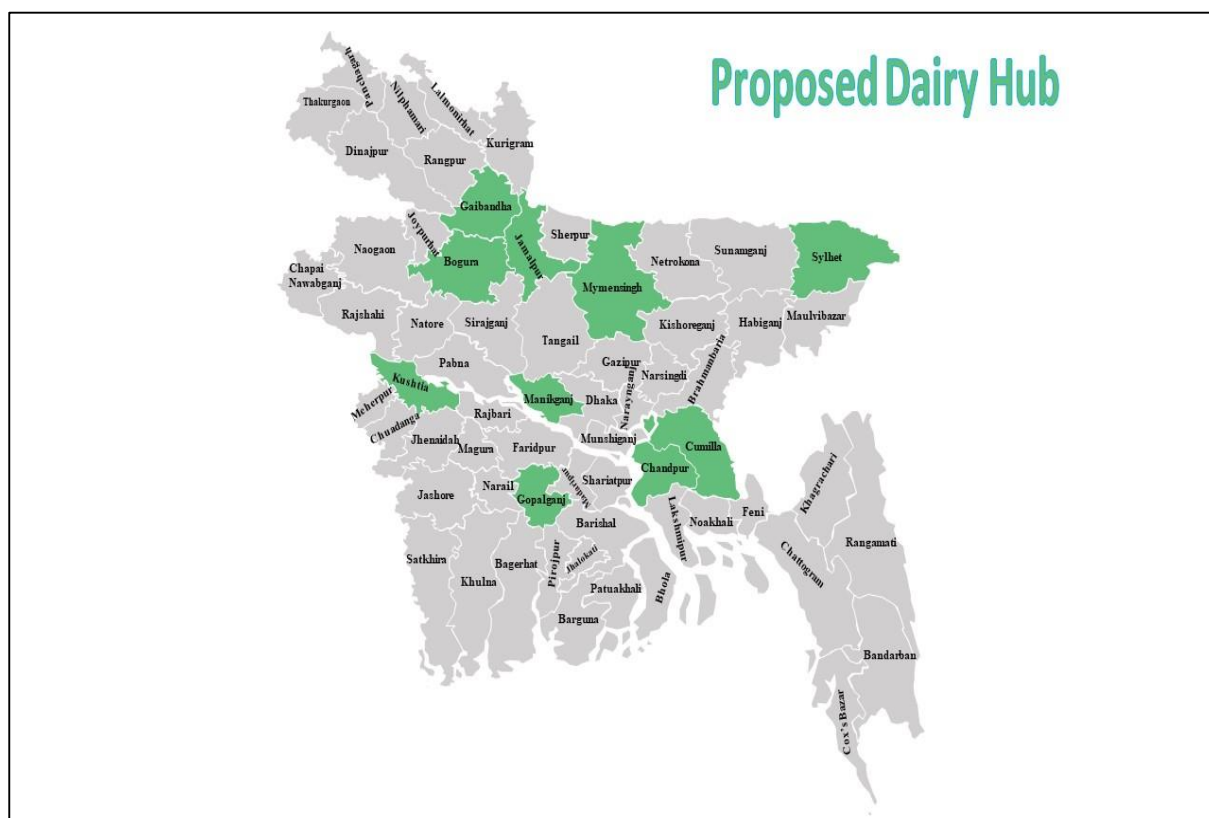
PRAN also provides different services to its member farmers. This system looks appropriate in Bangladesh conditions. So, it was discussed in the project and made a consensus to identify the districts for the proposed VMCC and Dairy Hubs.

Following criteria were agreed for the identification of new VMCC and Dairy Hubs:

- Proposed districts should not overlap with the existing VMCC and Dairy Hubs.
- Districts with high milk production.
- Districts with greater concentration of dairy cattle and buffalo.
- Districts with higher number/concentration of crossbred animals.
- Districts/areas with potentiality of growing year round fodder
- Districts where private sector will be willing to invest in VMCCs and Dairy Hubs.

Based on these criteria, ten districts are identified for the proposed VMCC and Dairy Hubs. These are Cumilla, Chandpur, Gopalganj, Kushtia, Manikganj, Bogura, Gaibandha, Jamalpur, Mymensingh and Sylhet.

Figure 11. Map showing the proposed districts for VMCC and Dairy Hubs



7. Other Livestock Production Structure

Source of meat in Bangladesh is large ruminants like cattle and buffalo, small ruminants like goat and sheep. Poultry and duck are other sources of meat. About 80% of poultry meat comes from chicken and rest from duck. Besides the commercial poultry, other meat production activities are yet to be commercialized. However, beef production is in the path of commercialization.

In the past, large ruminant animals were used for ploughing and other draught power. Due to the development of farm mechanization, the use of animals as farm power has been decreasing. So, large ruminants are now used for meat and milk production.

As will be seen in Table 15. **Breakdown of meat supply to the consumer market in Bangladesh (2020-21)** (8 pages below), total meat production was 8.44 million MT in 2020/21. In the last 10-year meat production has increased by 2.55 times (DLS 2022). Beef is the main source of meat which supplies 66.46% of the meat. The combined share of small ruminants is 11.07% and share of poultry and duck combined is 16.51%, share of buffalo is 5.96%. Per capita availability of meat is 136.18 grams/day which is equivalent to 49.7 kg/person/day. (DLS 2021).

Production of meat during the period 2012-13 to 2021-22 registered a significant growth which indicates that there was a big change in the productivity of the livestock and poultry sector (Figure 1). Compared to the meat production status of FY 2012-13 (36.2 Lakh MT) to FY 2021-2022 (92.65 Lakh MT), it is seen that within a decade meat production increased by two and half times. This substantial growth can be attributed to the breed improvement programme of the Government of Bangladesh and enabling policies to support the livestock farmers through public and private sectors.

7.1 Beef Cattle Production

Beef is the main meat in Bangladesh. Approx. two thirds of the total meat consumed in the country comes from beef. There is a big domestic market for beef. Farmers often purchase 6–12-month-old calves and fatten for about 1-2 years, reaching weights of up to 600-700 kg, although shorter fattening periods and lighter slaughter weights are also common. Traders generally travel to farms to buy the animals.

Although the major marketing period is during the festival times of Eid-ul-Fitr and Eid-ul-Adha, demand for beef continues throughout the year. Bengal Meat Processing Industries Limited is processing and exporting beef to the Maldives, UAE and Qatar. Consequently, this has opened a door to the export of beef and a future path for development of this business in Bangladesh.

Figure 12. Beautiful big Sahiwal x Brahman bulls in an 80 head commercial feedlot near Dhaka



These bulls are approx. 2.5–3.0 years old and gaining weight at 1.1-1.3 kg/head/day. All animals in this feedlot are bulls and were purchased from local markets at 6-12 months of age. Bulls are generally fattened for up to 2 years in order to meet specialist markets for very heavy cattle. They are kept tethered the whole time, kept on concrete without bedding of any kind, and fed a grain-based concentrate supplied by a commercial feed mill, together with plentiful chopped Napier grass. This is a good example of one of the more advanced and professional medium sized businesses within the emerging beef fattening industry of Bangladesh. The largest beef feedlots in Bangladesh have a capacity to fatten around 150-160 animals at the one time.

7.2 Goat Production

Goat production in Bangladesh is very popular. Almost all the goat farmers are women. Goat population in Bangladesh is 26.6 million which has increased by 5.92% in the last 10 year (DLS 2022). About 90% of the goats in Bangladesh are Black Bengal and rest are crosses with Jamunapari and other Indian breeds. Black Bengal is known for its good quality meat. It is a prolific and hardy breed where twins and triplets are common. The concentration of goats is more along the western part of the country along the border with India. The contribution of goat meat to total meat production is approx. 10% . Goats provide an employment to the women farmers. Most small farmers have 3 to 5 goats per family (Heifer International 2015, LDDP 2022). There are several problem issues with goat production in Bangladesh, such as high kid mortality, shortage of breeding bucks, and lack of modern technology among farmers.

Figure 13. Black Bengal breeding does and lactating doe with twin kids



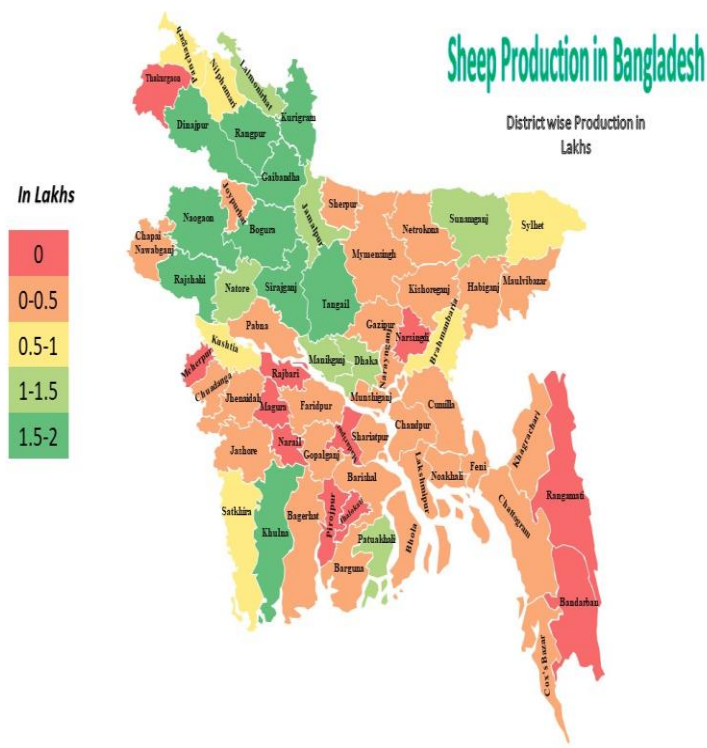
The Government gives priority to goat production in Bangladesh and has established 5 goat farms in the country. These farms produce pure Black Bengal bucks to distribute them for breeding purposes to goat farmers at a subsidized price.

7.3 Sheep Production

There are about 3.7 million sheep in Bangladesh (DLS 2022). In the last 10 year sheep population has increased by 19.37% (DLS 2021) which is highest among all ruminants. Sheep are sparsely distributed all over the country. Most of the sheep are of indigenous Ghorale breed. Sheep is primarily raised for meat production, but sheep meat is generally not preferred in Bangladesh. No government program for the improvement of sheep has yet been started (Rahman, 1989). So, sheep production is rather neglected in the overall livestock development activities.

Major issues in sheep production are shortage breeding rams, shortage of feed and fodder, grazing land, diseases like FMD, PPR, enterotoxaemia, pneumonia etc. and lamb mortality is high.

Figure 14. Major sheep production area of the country



7.4 Poultry production

Poultry industry in Bangladesh is highly commercialized. There are several grandparents and parent stock farms which supply DOC to the layer and broiler farms. Broilers and layers are raised in large farms and contract farms. Feed cost is high. Raw materials produced in the country is not enough. So, most of the protein sources and some of the corns are imported. Poultry production is one of the fast-growing sectors in Bangladesh.

Backyard poultry is produced throughout the country and 80% of the household in rural area rear few local chickens. Native Deshi chicken are raised in free range system and they are naturally hatched. Total poultry population in the country is 375.65 million (311.80 million chicken and 63.85 million ducks), according to DLS (2021/22).

High mortality in the backyard farming of poultry, inadequate vaccination coverage and lack of training to back yard poultry farmers are the major issues for non-commercialized poultry production.

7.5 Duck Production

Ducks are produced throughout the country with major concentration in Haor area (higher water bodies area). Larger areas of water bodies provide natural feed resources for ducks and encourages farmers for creating parts of livelihoods from duck production business. Duck eggs and live birds have great demand round the year. Both male and female members of the family

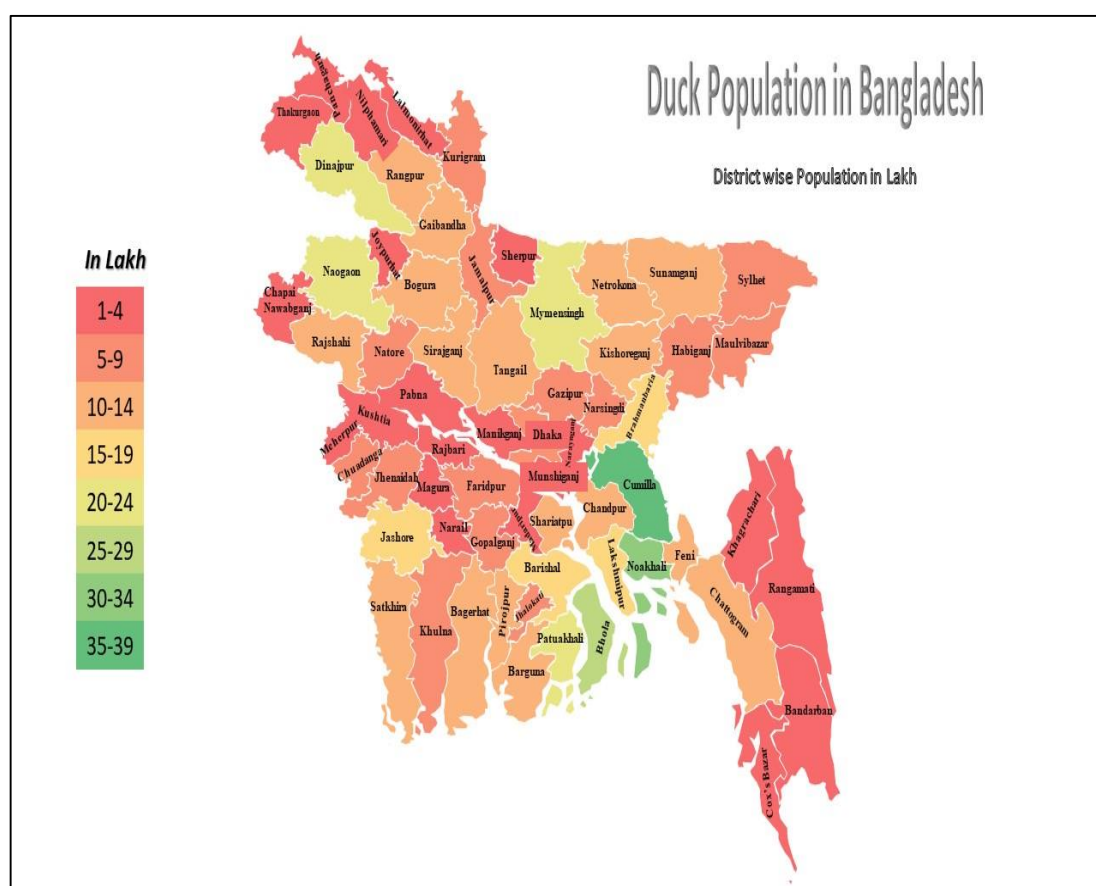
are involved in duck production and marketing. On an average one indigenous local duck lays 70 to 80 eggs in per year. Khaki Campbell lays 180 to 190 eggs/year.

Farmers produce 'hatching egg' and 'table egg'. Farmers are hatching Day Old Ducklings (DOD) by using rice husk incubator. Egg producer farmers supply hatching eggs to the local duck hatcheries operated mainly by rice husk incubators. Some DOD producers also raise duck pullet.

Ducks and duck egg marketing has two systems i.e., the traders come to farmers to purchase ducks and egg, and in other system the farmers take their eggs and ducks to traders at market for selling. Present egg sale price is TK 12 for hatching egg and TK 10 for table egg. Market price of live duck is TK. 300 to 350 per Kg.

Kishoreganj is one of the major area for duck production which produces about 26% of the total duck eggs in the country (LDDP 2022). About 1.42 million DOD are also produced per month by duck farmers in Kishoreganj. There are 74 duck hatcheries established in Karimganj and Tarail Upazilas of Kishoreganj district. These hatcheries are operated by rice husk incubator. Besides these, Government duck farm in Kishoreganj has a modern hatchery with a capacity to produce 28,000 DOD per month.

Figure 15. Major duck production area of the country



Source: Department of Livestock Services, 2022

8. Meat Production Sector Structure

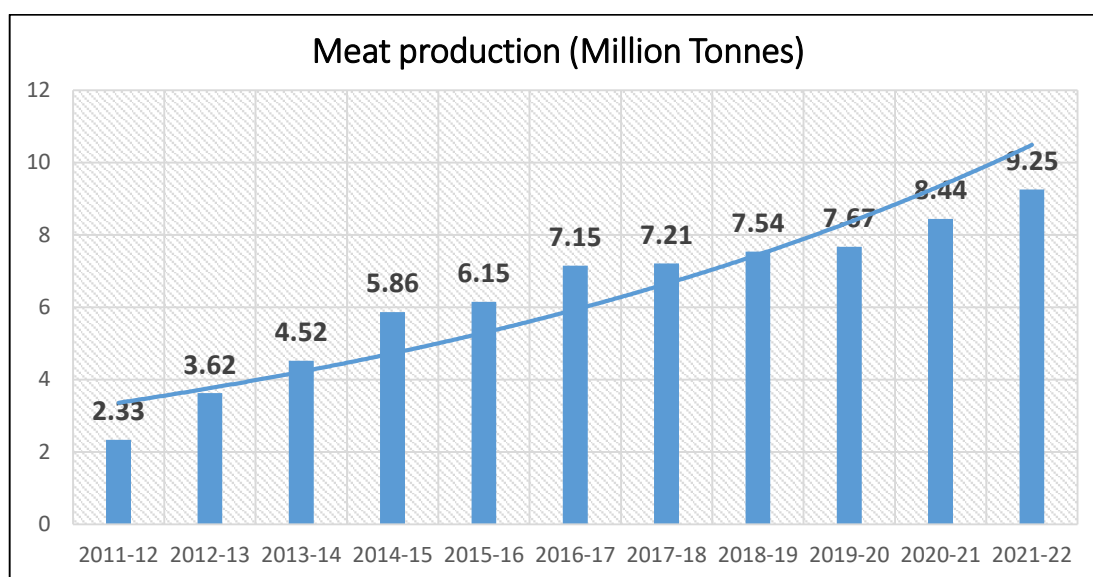
8.1 Meat Production and Consumption

Meat is the most valuable livestock product as it is composed of protein, amino acids, minerals, fats/ fatty acids, vitamins and other bioactive components, and small quantities of carbohydrates. From the nutritional point of view, meat is the richest source of protein which contains essential amino acids, highly bioavailable minerals and vitamins.

Meat sector in Bangladesh is uniquely placed with dependence on ruminants and poultry animals¹⁰. Chicken meat¹¹ is more popular due to its easy processing and availability at the doorsteps. Domestic production of meat is in general meet the demand for meat consumption. However, imported canned meat is also available in some super stores in the big cities which is negligible in terms of its contribution to consumption.

Meat production during the period 2012-13 to 2021-22 registered a significant growth which is an indicator of paradigm shift in the productivity of the livestock and poultry sector (Figure 16). While comparing the meat production status of 2012-13 (3.62 million tonnes) with 2021-2022 (9.26 million tonnes), it is observed that the meat production increased by two and half times. This substantial growth can be attributed to the structural changes in the service delivery programme (breed improvement, vaccination and enabling policies) to support the livestock farmers through public and private sectors.

Figure 16. Total meat production by year in Bangladesh



Source: DLS, 2022

As per the report available from the Department of Livestock Services (DLS), Government of Bangladesh, the estimated demand and availability of meat for the year 2021-22 shown below indicates that the availability of animal meat exceeds the demand.

¹⁰ Ruminant includes cattle, buffalo, goat, and sheep whereas poultry meat supplies mainly by chicken and duck.

¹¹ About 80% of poultry meat comes from chicken and rest from the duck.

Table 13. Demand, production, availability of meat in 2021-22

Name of the Product	Demands	Production	Availability
Meat	7,520,000 Metric Ton (120gm/day/head)	9,265,000 MT	147.84 (gm/day/head)
# The estimated population of the country in July 2021 was 165.158 million ¹²			

Source: DLS, 2022¹³

8.2 Meat Marketing in Bangladesh

Marketing of meat is directly related with the meat production facilities which in turn depends on the infrastructural facilities available at both public and private sector. The slaughtering facilities are limited and almost unorganized for large ruminants (beef cattle and buffaloes), and slightly better for small ruminants (goats and sheep) and poultry (Box 1). The slaughtering activities are performed under the jurisdiction of Local governments. Usually, the city corporation and municipality maintain data of day-to-day slaughtering activities of their own. However, the local government does not maintain compilation of daily slaughtering of animals throughout the country. The other important factor affecting the marketing efficiency is the variable seasonal demands for meat products, for example during the festive seasons¹⁴ the demands are high and impacted the price stabilization process.

Box 1. Organized Animal Slaughtering facilities in Dhaka city

Few of the big cities and municipality areas in Bangladesh has the basic facilities for organized animal slaughtering either in slaughterhouses or slaughtering slabs. The two city corporations of Dhaka city (DNCC and DSCC)¹⁵ offer the facilities of slaughtering to the registered butchers and traders. However, these limited facilities are not enough to match the average daily demand of the city dwellers. It was reported that the on an average the capacity of both the facilities together is to slaughter/process about 750 cattle, 1920 goats, 535 sheep and 1 million poultry birds. (Source: AFC-SSIL submission to LDDP: Report on slaughtering facilities in Bangladesh, 2022)

8.2.1 Meat Marketing Channels and Structure

The business development services (BDS) for the meat market in Bangladesh are of not identical, meat market system varies on place, area, customers' classes, market structure, availability of physical facilities. The most common butcher shops (small meat shop) exist in the wet markets throughout the country. Meat market in super shop consisting with a corner/separate segment. These are comparatively more organized and hygienic having cooling and refrigeration facilities. Meat is also sold in open space specially in village weekly markets. The generic marketing of eligible animal begins with farmers/ producers, who sell the animal to first animal trader (local small *bepari*). The first animal trader either sells the animal to slaughterhouse/ butcher or to second animal trader (large *bepari*). The second animal trader supplies the animal to slaughterhouse/ butcher. From the slaughterhouse carcass (slaughtered animal) are purchased by meat wholesaler. From wholesaler the retail butcher purchase

¹² Bangladesh Household survey/ Census 2022

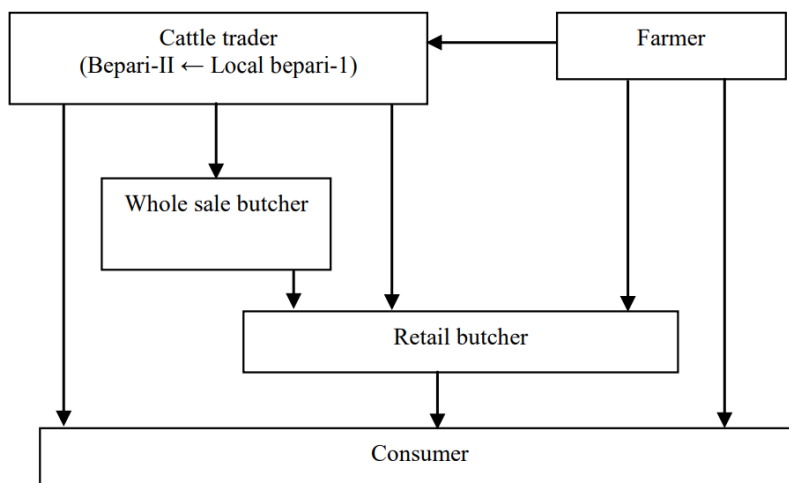
¹³ http://dls.portal.gov.bd/sites/default/files/files/dls.portal.gov.bd/files/a7c2c046_864e_41c5_adcc_c9858ebc7887/2021-08-18-05-41-28ed36a96d0db342b627f416f5d1f97a.pdf

¹⁴ Religious festivals (Eid, sheb-e-barat, khanka/ Darga sharif etc.), family and social ceremonies, etc.

¹⁵ From the household census of 2022 it is obtained that population of DNCC is 5.97 million and in DSCC 4.3 million. respectively and population in Bangladesh is 165.158 million.

carcasses to sell. In very limited cases farmers/ producers directly sell the animal to the retail butcher sells meat to the consumers (resident/ hotel etc.). The figure below shows the generic marketing channel of beef cattle, goats and sheep in Bangladesh.

Figure 17. Generic marketing channel of beef cattle in Bangladesh



Source: AFC-SSIL submission to LDDP: Report on slaughtering facilities in Bangladesh, 2022

The marketing structure of meat consists of seven types of marketing channels existing in the country, which are shown in the following table.

Table 14. Different Marketing Channels for Beef Value Chain

<u>Marketing Channels</u>	
1	Producer > bepari > butcher > consumer
2	Producer > butcher > consumer
3	Producer > bepari > producer (fattening) > bepari > butcher > consumer
4	Producer > bepari > producer (fattening) > butcher > consumer
5	Producer > producer (fattening) > bepari > consumer
6	Producer > producer (fattening) > bepari > butcher > consumer
7	Producer > consumer

Source: AFC-SSIL submission to LDDP: Report on slaughtering facilities in Bangladesh, 2022

8.2.2 Domestic Market Size

The total supply of meat to Bangladeshi consumers is approximately 2.2 million tons (2020-21), including all types of commonly consumed animals: cattle, buffalo, sheep, goats, and poultry. As the Table 13 below shows, about 66% of the meat supply is cattle beef, considering about 40% of the national cattle herd slaughtered annually. Poultry makes up the largest number of animals slaughtered (16.5%) although due to their smaller size, chickens and ducks represent the second largest category of meat supply to the nation. The following table shows the meat supply and breakdown of consumer's market.

Table 15. Breakdown of meat supply to the consumer market in Bangladesh (2020-21)

Species	National livestock population (A)	Annual Average (%) Slaughtered (B)	Number slaughtered (C=A * B)	Av. Weight of Carcass (Kg) (D)	Meat supply (E=B*D) (X1000 Kg)	Share of meat supply (%)
Cattle	24,545,000	40.00%	9,818,000	150	1,472,700	66.46
Buffalo	1,500,000	40.00%	600,000	220	132,000	5.96
Sheep	3,679,000	35.00%	1,287,650	20	25,753	1.16
Goats	26,604,000	55.00%	14,632,200	15	219,483	9.91
Poultry	365,852,000	100.00%	365,852,000	1	365,852	16.51
Total	422,180,000	-	392,189,850	-	2,215,788	100.00

Source: Extrapolated from DLS data, 2021

8.3 Potential for Meat Export

India's ban on cattle export or smuggling to Bangladesh, has encouraged many farmers, traders and unemployed educated youths to take up cattle farming and its backyard and forward businesses to turn the crisis into an opportunity from beef production. In an estimation it is said that each year about 10 lack cattle have been remained remain surplus¹⁶ during each Eid-ul Adha, which creates expectation to export of beef after filling our local demand. In Bangladesh, one industrial meat processing company (Bengal meat) has come forward as pioneer to export meat in some of the middle east countries. Through meat export Bangladesh earned about USD2.1 million¹⁷.

9. Competitiveness of The Livestock and Dairy Sector

9.1 Global Competitiveness Rankings

There are various methods of ranking countries in terms of their International Competitiveness.

9.1.1 IMD World Competitiveness Rankings

One of the best-known methods is the procedure used by the International Institute for Management Development (IMD), which regularly analyses and ranks countries according to their capacity to "create and maintain an environment which sustains the competitiveness of enterprises". IMD publish yearly World Competitiveness (WC) Rankings, and in 2022 ranked 63 countries. Unfortunately, Bangladesh was not ranked (mainly due to its inability to provide fully reliable data). However, comparable countries such as India, Indonesia and Philippines are ranked, as shown in section 1.2 below.

A key message is that the IMD procedure to rank enterprise competitiveness is highly complex. Initially there is a basic division of the national environment into 4 main factors: A.) Economic Performance, B.) Government Efficiency, C.) Business Efficiency, and D.) Infrastructure. Each of these factors then have 5 sub-factors, with a grand total of 334 assessment criteria.

¹⁶ The Financial Express August 25, 2019

¹⁷ <https://www.google.com/search?q=status+of+meat+export+from+bangladesh&oeq=status+of+meat+export+from+bangladesh&aqs=chrome.69i57j33i160l2.18569j0j15&sourceid=chrome&ie=UTF-8>

This serves as a reminder of the many components of the structure of the Livestock & Dairy Businesses of Bangladesh, and the need for many of these to be working efficiently and sustainably in order to improve the competitiveness of the country's beef, dairy and poultry industries.

9.1.2 World Bank's 'Ease of Doing Business' Rankings

The World Bank's 'Ease of Doing Business' (EODB) Rankings is another well-known global index. Bangladesh has been ranked at # 168 in the world, among a total of 190 countries ranked. Interestingly, from this it is possible to get a broad indication of where Bangladesh might rank on the IMD World Competitiveness scale (if the country did have sufficient data to justify an assessment). This could be done by looking at the numbers below. Unfortunately, although the assessment criteria are quite different in several ways, Bangladesh is not among the ranking countries.

	<u>IMD WC rank</u>	<u>WB EODB rank</u>
India	37	62
Indonesia	44	73
Philippines	48	95
BANGLADESH	-	168
Venezuela	63 (last)	188
Somalia	-	190 (last)

9.2 Threat of Imports to the Livestock Sector

Figure 18. Wide variety of IMPORTED Dairy & Meat foods in 'Unimart', Dhaka in Dec 2022



Figure 19. Fresh LOCAL Bengal Meat on display in 'Unimart', Dhaka in Dec 2022



The top two photos above illustrate the threat to the local livestock industries of Bangladesh posed by imported dairy and other meat products. But on the other hand, local companies such as Bengal Meat are now supplying highly presentable products in modern packaging which are managing to out-compete the imported alternatives.

The present livestock production system is predominantly subsistence oriented where cost of production and marketing cost is high. Although milk production has increased at a very fast rate in the last 10 years, there are issues of poor quality of milk, high collection cost and high price of raw milk. Due to these factors, local dairy processing industries are reluctant to collect more milk and they are running only at 38% of their capacity. Bangladesh Dairy Farmer Association (BDFA) says, this situation encourages the traders to import more powder milk from abroad which will be at the cost of the local farmers' in the country.

Bangladesh is already importing a large quantity of powder milk every year. In the year 2018, Bangladesh imported 66,454 tons of powder milk. Bangladesh also imported USD 365.87 million worth of powder milk in 2019. Powder milk imports in 2020/21 were 138,000 tons¹⁸. This is a clear threat to the Bangladesh dairy industry. So, if the production efficiency is not improved, import of powder milk may further increase and will discourage farmers to invest in dairy farming and eventually the country might be more dependent on imported powder milk.

Improving the quality of products and resource efficiency can help lower the cost of production for the domestic players to achieve competitiveness, along with increasing brand value. Every country tries to protect their livestock industry by policy and regulatory intervention. Although Bangladesh is a member of World Trade Organisation (WTO), it should also protect the rights of its livestock farmers. So, particularly for the importation of products like powder milk, this practice should be minimized through policy interventions.

9.3 Factors affecting Competitiveness of the Livestock Sector

Major factors which are working against increasing the competitiveness of the livestock sector in Bangladesh is dominance of subsistence farming system, low productivity of all types of livestock, poor genetic make-up of native breed of livestock, high feed cost, shortage of feed and fodder, high incidence of livestock and poultry diseases and high cost of production. In

¹⁸ The Business Post, June 23, 2022

case of milk, difficulty in marketing is another issue. A holistic approach of the government is needed to make the domestic livestock production business competitive

9.3.1 The way forward

The competitiveness of livestock industry should come from the production and marketing system within the country. Interventions are needed to make the domestic production and marketing system efficient. One of the major factor in the path of increasing competitiveness is that about 70% of the livestock farmers being at subsistence level. The percentage of large and medium livestock farmers in the country is about 1% and 10% respectively. These medium and large farmers are raising productive breeds of animals, they have the access to production inputs and better linked with market. Their production efficiency is better. There is an increasing trend of such farmers in dairy and beef production. So, all effort has to be concentrated to multiply the number of such category of farmers.

9.3.2 Policy intervention

Every country tries to protect their livestock industry by policy and regulatory intervention. Although Bangladesh is also a member of WTO, a free market organization, but also has the right to protect its livestock farmers. So, particularly for import of products, like powder milk should be minimized through policy interventions.

The competitiveness of livestock industry should come from the production and marketing systems within the country. Interventions are needed to make the domestic production and marketing system efficient. One of the major factors in the path of increasing competitiveness is that about 70% of the livestock farmers being at subsistence level. The percentage of large and medium livestock farmers in the country are about 1% and 10% respectively. These medium and large farmers are raising more genetically advanced breeds of livestock. They have the access to higher quality inputs (such as feeds and animal health products) and better linkages with markets. Their production efficiency is also better. There is an increasing trend of such farmers in dairy and beef production. So, all effort has to be concentrated on multiplying the number of such categories of farmers.

9.3.3 Existing Marketing Channels

In the dairy sector, 75% of the milk is processed through the traditional channel, 15% by modern channel and 10% of total milk demand is imported as milk powder¹⁹. The traditional processing channel is dominated by smallholder livestock farms, intermediate product processors and sweetmeat makers, mostly in an informal way.

Wet markets serve as a predominant channel. At the grass root level, smallholder farms require a major intervention where the manpower requirement is less than 5 per farm on average. There is a big variation in the level of livestock production, resources, and access to markets, investment, and level of use of technology between small, medium and large livestock farmers.

9.4 Challenges Being Faced

Major factors affecting the competitiveness of the livestock sector in Bangladesh is dominance of subsistence farming system, low productivity of all types of livestock, poor dairy yield from native breed of livestock, high feed cost, shortage of feed and fodder, high incidence of

¹⁹ <https://www.unido.org/sites/default/files/files/2019-05/Bangladesh%20dairy%20and%20beef%20vc%20report%20%28Wei%27s%20final%20version%29%20.pdf>

livestock and poultry diseases and high cost of production. In case of milk, difficulty in marketing is another issue. A holistic approach of the government is needed to make the domestic livestock production business competitive. Some of the aspects are discussed below.

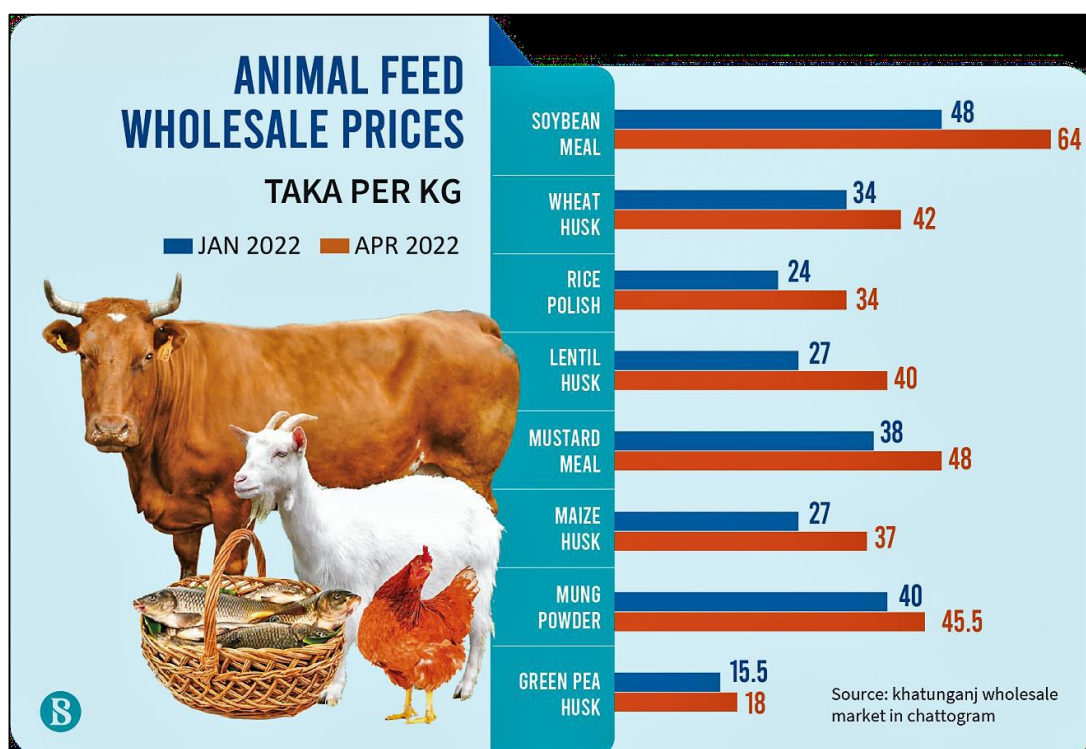
9.4.1 Limited Skills and Capacity

There is a need for capacity building at different levels of operation such as business management, staff management, product improvement and other marketing tools. The availability of skilled labour is observed to be a key challenge for sustained business operations. For example, there is high demand for highly skilled and trained butchers at all levels from wet markets to modern slaughterhouses.

9.4.2 Misalignment of Production Cost and Market Price

The key problem that deeply affects the dairy industry in Bangladesh is that the farmers are being deprived of fair prices for their produce. On top of this, costs of production have risen sharply in recent years, driven by increasing prices of fodder and raw feed ingredients. Low milk prices act as a deterrent to farmers to produce milk for industrial processors and maintain the quality of the milk. Dairy and beef cattle farmers have certainly been re-thinking their strategies during 2022, as concentrate feed prices have jumped 30-40% over recent months. Dairy farmers are now claiming they sell milk for only Tk55-60 per litre, whilst costs of production are now around Tk60-65 per litre. (Prices of veterinary medicines have also risen by 20-100%.)

Figure 20. The dramatic rise in Feed Commodity Prices in Bangladesh from Jan – Apr, 2022



9.4.3 Poor Milk Quality

As the informal segment of the industry is dominated by small farmers and market intermediaries, quality control processes are inadequate or non-existent. As a result, the quality of milk is not being ensured. In addition, as farmers often don't get a fair price for their milk, they are often tempted to contaminate milk to artificially increase quality in order to cover their costs or to make a profit. The high incidence of endemic Mastitis in dairy herds is another key reason for poor milk quality.

Box C: Reasons for Poor Milk Quality in Bangladesh

1. **High incidence of endemic Mastitis in herds.** This is commonly the result of poor hygiene standards on farms, in cow barns and at the time of milking. Sharma et al (2012) reported a prevalence mastitis of approx. 18% in 1996, but this had risen to approx. 52% by 2010. When mastitic milk is used for manufacturing, common product defects include altered heat stability of milk powders, less efficient processing of milk, and less favourable properties, such as the development of rancidity in milk, a lower cheese yield and reduced shelf life of many dairy products. Casein levels decline in mastitic milk, while lower quality whey proteins (which derive from increased somatic cell counts (SCC) and blood/mammary barrier disruption) increase, which together adversely affect dairy product quality, such as cheese yield, flavour and quality. Calcium and Lactose also decline in mastitic milk, as does Potassium, while Sodium and Chloride increase. All these alterations result in economic damage to the dairy industry. Last but not least, Antibiotic Residues are a mastitis-related public health concern when antibiotics are used in an irresponsible manner in treatment programs and withdrawal times are not adhered to. Antibiotics in milk can lead to severe reactions in people allergic to antibiotics, and the development of antibiotic resistant strains of bacteria.
2. **Poor Feeding Practices on smallholder farms.** This firstly leads to poor milk yields, but also lowered milk protein and fat levels. These milk constituents are strongly influenced by dietary levels of metabolisable energy, degradable & undegradable protein and physically effective fibre.
3. **Poor Cold Chain Management** along the supply chain to market. Raw milk should ideally be refrigerated at 0 – 4° C from dairy farm to Village Milk Collection Centre to Bulk Milk Chilling Centre to Milk Processing Factory. Poor standards of transport infrastructure only serve to add to the high costs of milk collection in Bangladesh and exacerbate the problems of getting high quality milk to processing companies.
4. **Adulteration of Milk.** Unfortunately, this can result from farmers' perceptions of not getting a fair price for their milk and a temptation to contaminate milk to artificially increase quality so as to cover their costs or to make a profit. In a study conducted in the Barisal district, it was observed that 100% of samples were adulterated with water. Other adulterants present were cane sugar (26%), powdered milk (14%) and starch (12%).

9.4.4 Lack of business Integration and Technology Upgrades

Integration and update of technology within business operations is currently limited. For example, more effective utilization of refrigeration and related cold chain technology can increase the shelf-life of dairy and meat products, besides reducing losses in handling and transport.

9.4.5 Limited Value Addition, Product Diversification and Branding

Value addition through product diversification will improve the competitiveness of current business structures, irrespective of the scale of operations. In the meat segment, few value-added products like preserved meat and processed meat exist but at a very small scale.

Product diversification options in the meat segment like canned/tinned foods, pickled meat products and dry-preserved meat products have a huge untapped potential.

Value addition can be done at smallholder livestock farm levels like butter and ghee productions. Safeguarding the value-added products and leveraging the market value of such products can be attained through measures such as modern branding.

9.4.6 Lack of Modern Packaging

Medium and small enterprises in the meat and milk value chains lack satisfactory packing of their produces which indirectly increases the quantity of perished products. Loss of products from handling and transport may be avoided through packaging measures. Benefits of modern, high-tech packaging (such as Tetra Pak cartons) often include:

- Improved shelf life,
- Improved food safety,
- Improved quality,
- Urban market penetration of artisanal products,
- New market opportunities at the global level.

9.4.7 Lack of Improved Standards of Food Safety, Hygiene and Quality Control

Appropriate testing and quality control at all levels, (i.e., producer, processor and end product stages) is needed to ensure the food safety and quality of final products. Cleaning in Place (CIP) is one aspect that can ensure the quality and hygiene of dairies and slaughterhouses/wet markets. However, testing and setting quality checks for the final products alone will not help resolve the issue if the quality of input raw materials remains unchecked. This may mean starting from the quality of feed and fodder production on farms. At the minimum, adherence to the food safety and quality standards of Bangladesh should be enforced. Simple quality control measures such as the use of hot water for milk collecting equipment and refrigerators to store excess milk will help smallholder farmers.

Bangladesh Animal Feed Rules 2013 governs the quality control of animal feeds in Bangladesh. BLRI Quality Control Lab (QCL) is focused on feed safety, quality and nutrient content testing for farmers and feed manufacturers.

9.4.8 Absence of Improved Waste Management practices

Improved waste management practices will help enterprises to gain the following benefits and thereby improve competitiveness:

- ✓ Maintain a clean and hygienic workspace,
- ✓ Avoid health hazards to staff,
- ✓ Achieve environmental safeguarding,
- ✓ Gain community support, and
- ✓ Ensuring energy security.

9.4.9 Improvement in Livestock Support Services

Department of Livestock Services through its District and Upazilla level organizations provide different types of production related support services to the livestock farmers. Such services are provided throughout the country. Major support services include AI, vaccinations, treatment, capacity building of the farmers (Table 11) Besides the government, NGOs also provides some of these services to the farmers.

Table 16. Support services for the Livestock Sector

S.No	Support services	Activities
1	Livestock extension	Livestock extension is provided to the farmers through 64 DLOs and 465 ULOs and to Unions across the country. Extension provides advisory services to the farmers in livestock raising and runs awareness making activities in livestock keeping, feeding, housing, health care, marketing etc. However, because of the shortage of manpower in the field support services coverage becomes a problem. Presently, LDDP manpower is covering the field activities.
2	Animal health services/vaccinations	Government provides vaccination against FMD, anthrax, PPR to the ruminants and avian influenza, fowl pox vaccines to rural poultry and duck cholera vaccines to ducks. Some vaccines are also provided by the NGOs. There existing shortage of vaccines which need to be addressed.
3	Breed improvement services	Provides breed improvement program through AI from government and private sector. About 10 million AI was done in the year 2020/21. Government can't cover the whole country due to shortage of manpower. However, the big NGO, BRAC is providing AI services and also covering many areas of the country
4	Capacity building of the farmers	Training programs to the farmers are provided to the livestock farmers by DLOs, ULOs in the field. They also use Uthan Baithak, which is a open air training organized in the field. The capacity development area should be modernized.
5	Marketing of the products:	Milk marketing is dominated by the traditional marketing system. Milk collection network cannot reach to the small producers. It's a big problem of the dairy business of the country which need to be organized and modernized.
6	Input delivery	Extension service provides some production inputs like fodder cuttings and seeds but that is not sufficient and therefore need to be addressed.
7	Awareness program	The farmers and entrepreneurs. There are many programs on different TV channels. More awareness programs need to be taken.

10. Recommendations for Improving Competitiveness

Bangladesh has a big domestic market of livestock products. There is ample market of the livestock products in the country. There should be an in-house improvement in the livestock production system through several technical, management, financial and policy interventions are needed to increase the production.

10.1 Increase Production Efficiency

High cost of production is a major issue. To decrease the cost of production increase the feed and fodder production and follow the fodder based production system. Animals should be protected from contagious diseases and internal parasites. Maintain productive herd and introduce the farm mechanization in medium and large farms to save the labour.

10.2 Improve the Quality of Livestock Products

Poor quality of milk is also an issue for producing high quality dairy products. Animals should be protected from mastitis and other diseases contagious diseases. Provide routine vaccination and deworming to all types of animals. Educate the farmers about milk hygiene. Expand the milk collection and cooling systems to the interiors of the Districts and Upazillas.

10.3 Policy Interventions

We need to improve the production efficiency at farmers' level through different interventions and decrease the cost of production of milk and meat and other livestock products. On top of this, to protect the livestock industry, thereby to protect the profession of millions of farmers in the country, there needs to be some policy interventions in importing of powder milk. It should be restricted by the government. If the import of powder milk is not restricted, the local milk production will not sustain and dependency on imported powder milk will further increase.

11. Recommendations for Dairy & Livestock Sector Structural & Productivity Improvements

11.1 Updating of Animal & Plant Genetic Resources

- **Breed improvements for Dairy, Beef, Buffalo, Goats & Sheep** via importation of superior bulls, bucks or rams, plus Semen for AI.
- **Breed improvements for Poultry** (broilers, egg layers + ducks) via importation of parent stock day old chicks from global poultry companies such as Aviagen, Ross, Cobb, Hubbard, Hyline, etc.
- **Fodder species** genetic improvements via importation of Grass & Legume Seeds from cultivars well suited to Bangladeshi environments.
- **Cereal & Oilseed** genetic improvements via importation of varieties of wheat, maize, barley, sorghum, oats, soybeans, canola, etc, that are well suited to Bangladeshi environments.

11.2 Updating of Extension Services Provided by DLS, Agricultural Universities, Research Centres & Commercial Companies

- Assistance with updating of **Genetic Resources**, as above.
- Updating of farmer knowledge of practical **Feeding Systems**, nutritional requirements & feed commodity options for Dairy, Beef, Buffalo, Goats, Sheep & Poultry. This would include the role of advanced feed additives such as Enzymes to improve the digestibility of high lignin fodders such as rice straw; Mycotoxin Binders & Deactivators; Mould Inhibitors; Antioxidants; Organic Acids; Anionic Salts; Vitamin & Trace Element Premixes.
- Updating of farmer knowledge of **Animal Health & Biosecurity** issues, particularly the need for selective **Vaccination** programs for Dairy, Beef, Buffalo, Goats, Sheep & Poultry, plus the responsible usage of **Antibiotics** (in view of the global problem of Antimicrobial Resistance).
- Updating knowledge of **Farming Systems** to cultivate the soil, plant, grow, fertilise, irrigate, harvest and conserve (via hay or silage) **Fodder species** (grasses & legumes) for Dairy, Beef, Buffalo, Goats & Sheep.
- Updating knowledge of **Farming Systems** to cultivate the soil, plant, grow, fertilise, irrigate and harvest **Cereals & Oilseeds** such as wheat, maize, barley, sorghum, oats, soybeans, canola, etc. These can be grown as cash crops and/or fed to Dairy, Beef, Buffalo, Goats, Sheep & Poultry.
- Assistance with the formation of **Farmer Organisations** and **Group Marketing** schemes, with a long term objective being to commence Export of animal & plant based products in the near future.
- Continued promotion and support of the Pran/Tetra Pak and BRAC Aarong Dairy models involving **Dairy Hubs, Regional Chilling Centres & VMCCs**, with an increased emphasis on Farmer Education, lowering the feeding costs of production and improving Animal Health and Milk Hygiene standards.

11.3 Creation of an Enabling Environment by Government to Attract Foreign Direct Investment into the Livestock & Dairy Industries

The most beneficial types of businesses for Bangladesh would include -

- **Commercial Feed Mills** (preferably part of a large multinational company). Potentially providing competitively priced, scientifically formulated feed concentrates & supplements to farmers. These companies purchase raw materials in bulk and have sophisticated storage & milling equipment, meaning they can commonly supply rations at prices below what farmers pay at local markets. They also generally provide nutritional and animal health advice to clients as part of the service.
- **Commercial Animal Health Companies** (preferably part of a large multinational company). Providing world class vaccines, animal health products, veterinary advice and often livestock handling equipment.
- **Commercial Seed Companies** (preferably part of a large multinational company). Providing modern genetically advanced seed varieties and often offering full technical and agronomic advice to farmers.
- **Modern Abattoirs and Milk & Meat Further Processing Enterprises** (preferably part of a large multinational company). These would enable greater efficiencies, lowered costs of production and improved standards of Food Safety and Biosecurity within the

value chains for Dairy, Beef, Buffalo, Goat, Sheep & Poultry products. All of these factors are necessary preliminary components needed for the development of Export Markets.

12. Recommendations on Cross Cutting Issues

12.1 Database of Information

Data on livestock sector is needed for the planners, researchers and development workers. Such data base should be in an easy access to all concerned. At present it is not easy to get information on livestock sector from the data base of DLS. Data base on production and productivity, fodder production, milk yield, growth rate, egg production, live-weight and carcass weight, feed utilization, fertility rate, information on outbreak diseases, mortality of animals and birds, seasonal influence in disease out breaks, prevalence of zoonotic diseases, and disease control, different breeds and its production performance, training, research etc. is needed.

12.2 Development and promotion of livestock insurance

Bangladesh has several the problem of different contagious animal diseases. These diseases when not controlled may be fatal to any types of livestock. One of the popular ways of protecting farmers is by insuring the animals. There is no policy of livestock insurance yet. But such policy should be promoted and implemented as soon as possible, particularly under the increased threat posed by global climate change.

12.3 Training and Extension Services

Farming training in disease awareness and identification is critical, especially for globally significant endemic diseases such as Mastitis in dairy cows, which even in the subclinical form can be seriously damaging to milk yields and industry profitability, as well as to milk quality. Sharma et al, (2012)²⁰ reported the prevalence of mastitis in Bangladesh herds as being approximately 17% in 1996 and 52% in 2010. However, many smallholder farmers are currently unaware of the disease's presence and how to best prevent and manage it.

12.4 Promotion of smallscale Business Management for farmers

Dairy farming is not only a way of life but it should be a business. So farmers should be encouraged to maintain business diary and to learn at least the basics of cost accounting and business management. Farmers should also record herd or flock data to help improve animal performance.

12.5 Farmer training in Livestock Disease awareness, identification and management

Farming training in disease awareness and identification is critical, especially for globally significant endemic diseases such as Mastitis in dairy cows, which even in the subclinical form can be seriously damaging to milk yields and industry profitability, as well as to milk quality. Sharma et al, (2012)²¹ reported the prevalence of mastitis in Bangladesh herds as being

²⁰ Sharma, N., Rho, G.Y., Hong, Y.H., Lee, T.Y., Hur, T.Y. & Jeong, D.K. 2012. Bovine mastitis: an Asian perspective. Asian Journal of Animal and Veterinary Advances, 7: 454–476.

²¹ Sharma, N., Rho, G.Y., Hong, Y.H., Lee, T.Y., Hur, T.Y. & Jeong, D.K. 2012. Bovine mastitis: an Asian perspective. Asian Journal of Animal and Veterinary Advances, 7: 454–476.

approximately 17% in 1996 and 52% in 2010. However, many smallholder farmers are currently unaware of the disease's presence and how to best prevent and manage it.

13. Overall Recommendations and Next Steps

This section puts forward options for strengthening business structure in Bangladesh that can accelerate commercialization of the livestock sector. There are four major structures with distinct features and strengths that operate within the country's livestock sub-sector. Each of these structures could be strengthened to deliver desired results. There is a growing realization within the development community that government, private businesses, producer-owned organizations and multi-party partnerships have unique strengths that call for optimal harnessing.

13.1 Government-led Business Structure

Infrastructure and policy investments are the core areas where government intervention is effective and helpful. This amplifies the role of the private sector and producer organizations in driving livestock productivity, opening up markets, introducing new technologies and facilitating increased private investment in the subsector. Public investment in all-weather roads helps to connect producers to input and output markets. More and improved wholesale markets in secondary cities and rural towns helps connect producers to where the demand is. The Government can invite private collaboration in animal vaccine production and distribution and import of semen for propagation. With proper incentives and control, the State and private universities can set up food safety and Quality testing labs for processed foods. Slaughterhouses are now under Corporations. A program for privatizing them and encouraging establishment of integrated meat processing plants by the private sector will have strong positive ripple effects. As the processing sector grows, it will create value addition and markets, but it will need and seek more raw material supply— something the right policy and regulatory framework can help with.

13.2 Private Sector-led Business Structure

Meat and milk value chains are becoming more urbanized, and consumer driven, with a greater emphasis on quality and food safety. The SME sector is increasingly playing a crucial role in livestock trade, farm services, agro-processing, urban retailing, and food services. The midstream of the food value chain is particularly important, as it is closest to the market connecting to farmers. This midstream consists of traders, transporters, and processors who play an important role in linking the farmer with the downstream retailers. This is the “Hidden Middle” often hidden in the ongoing policy debates on supporting the livestock sector value chains who majorly contribute to the gross value addition to the movement of livestock products from farm to plate in Bangladesh. There is good potential to help the government replicate the services provided by the Hidden Middle at scale across the country, with improved support from public infrastructure and sound policies. The Government of Bangladesh (GOB) does not need to “reinvent the wheel” and step in directly to provide warehouses or transport or aggregation facilities, for example. The private sector is already providing these services and the role of government is, in consultation with business associations, to address the constraints faced by them and this may incentivize them to grow their businesses.

13.3 Producer Organization-led Business Structure

LDDP acknowledges the potential of producer organizations to reduce transaction costs, improve efficiency and develop collaboration in processing and marketing livestock products. So far, more than 5,500 producer organizations (POs) have been formed under the LDDP. The POs are producer owned and controlled and engaged in collective activities of production to marketing which are however needed to build their capacities to sustain the complexities of market structure in the country. LDDP is currently promoting cooperatives as the legal form of POs. These organizations strengthen the collective bargaining power of producers by:

- Collective purchase of inputs,
- Improving marketing of produce,
- Access to veterinary and financial assistance from the government,
- Providing technical and logistical assistance to their members,
- Bringing about quality management in each step of supply chain,
- Transferring knowledge through training, exposure tours and learning exchanges.

13.4 Public-Private-Producer Partnership (4P) Business Structure

The 4P approach is used as a “pull market” mechanism to finance business plans jointly proposed by the private companies and producer organizations in which they propose to enter in a partnership agreement where both parties take risks, invest and share the benefits. For these 4P projects, often donor contributions bridge the financing gap of viable business plans. Higher milk, and meat production have beneficial impact on health and nutrition of vulnerable groups and add to the income of small producers. Typically, milk and meat markets feature a high degree of inefficiencies in distribution. In a perfectly competitive market, the forces of supply and demand balance each other out, with a change in one side of the equation leading to a change in price that maintains the market's equilibrium. Market failure refers to a situation defined by an inefficient distribution of goods and services at a price which is higher or lower than what it would have been in a perfectly competitive market. In Bangladesh, smallholder farmers often receive prices which are often lower than that regarded a ‘fair price’. Use of government and donor grants and concessionary finance is justified to address a “market failure” where the perceived high risks and transaction costs of working with large numbers of small producers are inhibiting private business from starting to forge commercial relationships. Shown below are suggested pathways for business structures which can potentially support the way forward in commercialization of the livestock sectors of Bangladesh.

Table 17. Suggested Pathways for Business Structure Reform

	Business structure led by	Functional areas	Proposed activities
1	Government	• Regulations • Extension services. • Concessionary financing • Sustainability planning	• Enforce food safety standards. • Train and certify all butchers • Register and license all meat handling establishments • Strengthen extension services, particularly mass vaccination • Ensure smooth availability of critical medicines • Incentivize private investors in milk collection and processing units
2	Private business	• Value addition • Innovations • Digital technology • Investment & finance	• Contract farming with producers with the dairy hubs • Management and financing of integrated meat processing plants • Create products and services for banks and financial institutions for financing small producers and rural SMEs
3	Producer organizations	• Input and output aggregation • Market scanning • Gender mainstreaming	• Establishment of PO federations • Technical Assistance (TA) package for VMCCs (until they are matured enough to manage their own affairs) • Organize Long Term financing for infrastructure development • Capacity building of the committees and members
4	Public-Private-Producer Partnerships (4Ps)	• Value addition through processing • Skill development • Branding & marketing of niche products (e.g., sweetmeats)	• Identification of strength and weakness of partners • Establishing Standard Operating Procedures (SOPs) • Provisioning of Technical Assistance • Special incentives for women-led VMCCs, cooperatives, and enterprises • Explore new markets for livestock and livestock products • Establish small scale abattoirs.

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ANNEXES

APPENDIX – 1

SWOT ANALYSES

SWOT Analysis of Dairy Cattle Production, Meat Production from Beef Cattle, Goats & Sheep, Meat Production from Poultry and Ducks and Service Delivery

Strengths	Weaknesses
- Large numbers of dairy farmers in all parts of the country - Farmers are on the path of commercialization - Market for milk is expanding in the country - Breed improvement program is available from government and private sector - Government has a network of structure for service delivery throughout the country - Government has physical structures for service delivery - Government and private sector has large numbers of trained man power.	- Dairy cattle are predominantly of Deshi breed which are not productive. - Farmers are not organized in groups or cooperatives - Farmers are scattered and difficult to reach to each household for service. - Human resources for service delivery is not adequate - Animal health services are not adequate - Farmers' knowledge about modern livestock keeping is poor - Extension service is not adequate and officers are not well trained.
Opportunities	Threats
- Livestock related industries like dairy processing plants are increasing - Large numbers of unemployed youths are interested in livestock farming - Young people returning from foreign employment are attracted to livestock. - Bangladesh has a huge domestic market for livestock products.	- Imported milk powder is a key threat. - Livestock keeping is not profitable at the moment. So, farmers may quit. - Natural disasters like flood, cyclone and drought will increase in the future. - Risk of outbreak of diseases is high. - Government support for the sector for the sector is not fully adequate.

SWOT Analysis of Meat Production from Beef Cattle, Goats & Sheep

Strengths	Weaknesses
- Large sections of population are engaged in raising meat animals. - Large populations of beef cattle, goat, sheep are available in the country. - Beef fattening is becoming very popular - There is a large domestic market for meat. - There is an export potential for meat.	- Commercialization of goat and sheep meat production is yet to be done. - Many of the animals are genetically better suited to milk production. - Shortage of good quality feeds and fodder. - Support services are not adequate. - Farmers do not have modern skills in animal productivity improvement.

Strengths	Weaknesses
- Government has a network of structure for service delivery throughout the country. - Government and private sector have large numbers of trained man power in the sector.	- Mainly subsistence level production systems. - Human resources for service delivery are not adequate. - Animal health services are not adequate. - Feed costs are currently high, so industries are not strongly competitive.
Opportunities	Threats
- Bangladesh has a huge domestic market for livestock products. - Export potential is there. - Large number of livestock farmers are there - Large numbers of unemployed youths are interested in livestock farming - Young people returning from foreign employment are attracted to livestock. - Farmers are on the path of commercialization.	- Natural disasters like flood, cyclone and drought will increase in the future. - Livestock keeping is not profitable at the moment. So, farmers may quit. - Risk of outbreak of diseases is high. - Government support for the sector for the sector is not fully adequate.

SWOT Analysis for Meat Production from Poultry and Ducks

Strengths	Weaknesses
- Large populations of poultry and ducks are available in the country. - There is a large domestic demand for Deshi poultry and duck meat. - There is export potential for poultry and duck meat. - Commercial poultry production is highly developed. - Farmers have good experience in poultry and duck production. - Rural poultry and duck is a regular source of income for women farmers. - Government has a network of structure for service delivery throughout the country. - Government and private sector have large numbers of trained man power in the sector.	- Feed cost is high. So cost of production is high. - Growth rate of native/Deshi chicken is slow. - Support services like veterinary services are not adequate. - Farmers do not have modern skills in animal productivity improvement. - Subsistence level of production in rural areas. - Human resources for service delivery are not adequate. - Veterinary services are not adequate. - There are high mortality rates of chicken and duck.
Opportunities	Threats
- Large numbers of poultry and duck farmers, particularly women, in rural areas. - Meat related infrastructure like meat processing/slaughterhouses are present.	- Natural disasters like flood, cyclone and drought will increase in the future. - Livestock keeping is not profitable at the moment. So, farmers may quit. - Risk of outbreak of diseases is high.

• Large numbers of unemployed youths are interested in livestock farming • Young people returning from foreign employment are attracted to livestock. • Poultry and duck production is possible in all parts of the country.	• Government support for the sector for the sector is not fully adequate.
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SWOT Analysis of Service Delivery

Strengths	Weaknesses
• Government has a network of structure for service delivery throughout the country. • Government has physical facilities for service delivery. • Government and private sector has trained man power available. • Several services like breed development, animal health, capacity building, fodder production and marketing are available.	• Livestock farming is yet to be commercialized. • Difficult to reach some farm households. • Most farmers not organized in groups. • Technicians are not well trained. • Human resources for service delivery are not adequate. • Extension services are weak. • Existing human resources are mostly technically orientated and they do not have skills for social mobilization. • Animal health services are not adequate.
Opportunities	Threats
• Bangladesh has a huge domestic market for livestock products.	• Risk of outbreak of diseases is high. • Government support for the sector for the sector is not fully adequate.

APPENDIX - 2

Managing The Increasing Impact of Climate Change on The Dairy & Livestock Sectors of Bangladesh

1. Climate change – Bangladesh context

Bangladesh being a low-elevation country with a very high population density, is highly prone to the risks of climate change. The low flatland is formed by the major rivers through a complex network of tributaries and irrigation canals. Flooding²² is reported to be the major risk with an index of 9.9 against a global average of 4.5 as presented in the table below. This extreme vulnerability to flood places the country among nations with high flood exposure. The next highest risk is from tropical cyclones. Drought is also on the rise marked by more frequent heat waves, especially in the Northwest regions of the country.

Table 18. Global and Bangladesh INFORM Climate Risk Indices²³

Climate Risk/Indices	Flood (0-10)	Tropical cyclone (0-10)	Drought (0-10)	Vulnerability (0-10)	Lack of coping capacity (0-10)	Overall INFORM risk level (0-10)	Rank (1-191)
Global average INFORM Risk Index	4.5	1.7	3.2	3.6	4.5	3.8	NA
Bangladesh INFORM Risk Index	9.9	6.9	3.9	5.5	4.9	5.5	29

The estimated annual economic losses from climate disasters are around 1-2% of the country's GDP or USD 3 billion and the majority of the losses are from the agricultural sector²⁴. If the climate risks are not addressed, then, the forecasted annual losses are estimated to be around USD 6-7 billion by 2030²⁵. The future trend is predicted to be marked by a slight increase in average precipitation through frequent and extreme climatic events. Hot and highly humid conditions are expected to rise where the heat index will cross 35°C. It is forecasted that South Asia will experience a major drought event every 50 years from the current occurrence of once every 100 years²⁶. The frequency of tropical cyclones is predicted to reduce but it is to be noted that the intensity of the events and damages will be high. Food and fodder production are predicted to face decreased yield due to climate events in the near future. The extreme river

²² <https://climateknowledgeportal.worldbank.org/country-profiles>

²³ <https://drmkc.jrc.ec.europa.eu/inform-index/INFORM-Risk/Country-Risk-Profile>

²⁴ https://www.unisdr.org/2016/iddr/IDDR2018_Economic%20Losses.pdf

²⁵ https://mujibplan.com/wp-content/uploads/2021/12/Mujib-Climate-Prosperity-Plan_ao-21Dec2021_small.pdf

²⁶ <https://drmkc.jrc.ec.europa.eu/inform-index/INFORM-Risk/Country-Risk-Profile>

flood events will affect an estimated 6-12 million people by 2040 if climate change adaptive measures were not properly enforced.

The tools and technology interventions for weather/climate services are missing linkages with the community level in the current scenario. Currently the Department of Disaster Management under the Ministry of Disaster Management and Relief has required disaster management and adaptation/vulnerability tools to be kept available till the sub-district level. Detailed climate related data and analysis with respect to climate risks are strongly required to formulate better action plans for the country. As per the Environmental Justice Foundation (EJF), one among seven will be displaced due to climate change leading to poor living conditions for the migrants²⁷. Therefore, both the adaptation and mitigation measures are required at the community, provincial and national levels of Bangladesh.

2. Climate change impacts on livestock/dairy value chain

2.1 Animal health

Local breeds of cattle, buffalo, goats, sheep or poultry and ducks, are all becoming somewhat less tolerant to higher temperatures and humidity. During summer, the temperature rise is significant, and higher temperatures generally favour the faster spread of animal diseases, as well as internal and external parasites, plus higher mortality rates. This all leads to reduced productivity in food value chains, which include milk, meat and eggs.

Insurance policies are not sufficiently utilised by small and medium livestock farmers in Bangladesh to protect against climate hazards. Training farmers in insurance matters will help them cope with climate risks. Selective breeding of drought-resistant livestock species and innovations such as climate adaptive rearing practices will also help address the problem. The promotion of vaccination and deworming activities will certainly improve overall animal health status, while the redesign of lairage facilities and a greater emphasis on inspection can help in ensuring the health of animals just prior to slaughter.

2.2 Animal feed

The quality and quantity of feed and fodder production are also affected by flooding and drought which affects animal nutrition and health. Sea level rise and associated salinity intrusion at coastal zones of Bangladesh directly affects the green fodder production. The loss of grazing land during flooding events and non-availability of land for fodder production greatly impacts the nutritional intake and productivity of the livestock.

2.3 Socio-economic impacts

Major financial losses occur to livestock farmers in case of climatic events. Most of them have no insurance for their livestock and thereby are at high risk. Lack of communication services causes a delay in forecasting and warning about disaster events in remote communities. Supply chain disruptions in meat/milk supply or feed for livestock in the event of floods and cyclones lead to damage to products, loss of income and isolation from essential supplies for livelihood and farming, thereby worsening the sustainable socio-economic growth of vulnerable communities. These aggravate the socio-economic issues including loss of employment, poverty and migration.

²⁷ <https://ejfoundation.org/reports/the-urgent-need-for-legal-protections-for-climate-refugees>

3. Policy interventions in climate action

The climate change risks are recognized by the Government of Bangladesh (GOB) few decades ago due to the evident loss & damage the country faces. Bangladesh is one of the key nations in the Vulnerable 20 (V20) climate forum at the global level²⁸. The rising demand by this forum for loss and damages is also felt in the COP 27 proceedings. Various mitigation interventions are already implemented at various levels of the livestock and dairy sector but adaptation measures are gathering momentum only in recent years. The key government policies, national adaptation policies and strategies that are focused on mitigating/adapting climate change are presented in the table below.

Table 19. Government Policies and Strategies

No.	Policy/Strategy	Year
1	National Adaptation Program of Action	2009
2	Bangladesh Climate Change Strategy and Action Plan	2009
3	Climate Change Trust Fund	2010
4	Technology Needs Assessment and Technology Action Plans for Climate Change Adaptation	2012
5	National Action Plan for Clean Cooking, 2020-2030	2013
6	Nationally Determined Contribution to Paris Climate Agreement	2016
7	National Plan for Disaster Management 2016–2020	2017
8	Country Investment Plan for Environment, Forestry and Climate Change	2017
9	Bangladesh Delta Plan 2100	2018
10	National Communications to the UNFCCC	2018
11	National Integrated Livestock Manure Management Policy	2018
12	Updated Nationally Determined Contributions	2021
13	Mujib Climate Prosperity Plan	2021

The National Adaptation Action Plan and the Bangladesh Climate Change Strategy & Action Plan have focused on climate disaster management along with other agendas such as food security, social/health protection, mitigation and capacity building. It is to be noted that Bangladesh's Climate Change Trust Fund is the first climate-related fund operational since 2010. This paves way for specific programs for vulnerable communities via the national budget to counter climate change impacts.

²⁸ <https://www.v-20.org/>

Development plans for implementing climate resilient measures at the national level require detailed technology needs assessment. The Technology Needs Assessment (TNA) and technology action plans for climate change adaptation for Bangladesh were submitted to United Nations Framework Convention on Climate Change (UNFCCC) in 2012. The TNA covers all major sectors that need climate action plans including livestock and dairy sector. The cow dung from cattle rearing at smallholder farms is at present dried and utilised for cooking in most of the rural areas. The National Action Plan for Clean Cooking, 2020-2030 highlights the pollution and health effects of this practice and encourages a shift to clean fuels.

Under the Business as Usual (BAU) scenario, the total greenhouse gas (GHG) emissions estimate was around 169.05 million tCO₂e²⁹. The agriculture sector alone contributes around 27.35% or 45.87 million tCO₂e. This sub-sector includes methane emissions from rice cultivation, enteric fermentation & manure management from livestock and nitrous oxide emissions from fertiliser use. The Nationally Determined Contributions (NDC) commitment as communicated in the updated documents targets an emission reduction of up to 61.9 million tCO₂e by 2030. Plans and strategies for forest management, disaster management, land use, and safeguarding environment/ecosystems are proposed extensively. The delta region which is highly vulnerable to climate disasters was considered exclusively in the Bangladesh Delta Plan (2018).

National Integrated Livestock Manure Management (ILMM) policy specifically highlights the manure management-related goals of the country. The manure generated in the country from large ruminants is estimated to be 151.3 million tons and out of which only 3.08 million tons of manure is collected by co-operatives and large farms. Apart from abatement of health issues through the reduction of manure use as household cooking fuel, use of livestock manure will reduce fertiliser imports by 40-45%. It is estimated that around 657,585 and 197,327 tons of urea and triple super phosphate fertiliser respectively could be reduced through bio-fertiliser from the manure generated. Rural employment is an added advantage in these interventions. The control of methane emission from livestock through anaerobic digestion of manure from cattle and poultry is one of 16 key abatement measures identified in the National Action Plans (NAP, 2013). Mujib Climate Prosperity Plan is another important initiative by the GOB that focuses on climate resilience and natural/indigenous agricultural practices.

4. Potential mitigation measures

Various mitigation actions have been communicated through NDC and are extensively implemented with varying success rates. The relevant mitigation measures formulated by the GOB for the livestock and dairy sector are discussed below:

4.1 Methane emission from 'Enteric Fermentation'

Methane emissions from 'enteric fermentation' result from the methane gas (CH₄) which is burped from the mouth of ruminant livestock following the natural process of anaerobic microbial breakdown and fermentation of carbohydrates within the four chambered stomach and intestines of ruminants such as cattle, buffaloes, sheep and goats. These emissions are increasingly causing a degree of concern amongst global climate scientists. However, certainly not scientists all are equally concerned, as there are multiple large planetary sources of global

²⁹ <http://nda.erd.gov.bd/en/c/publication/nationally-determined-contributions-ndcs-2021-bangladesh-updated> nd

CH₄ emissions, even such the world's huge rice padi fields, and the melting of massive expanses of Arctic permafrost (which is becoming increasingly significant).

In Bangladesh, livestock scientists are attempting to keep up-to-date with developments world-wide, such as those described in the box below.

Box A: Climate Science Update - 'The Alarming Rise of Global Methane Levels'

Reference:

CSIRO, 2022: *Methane Levels and the Role of Science in Mitigation*. ECOS Magazine, Issue 296 - Agriculture: Facing the future, November 11th, 2022. Commonwealth Scientific & Industrial Research Organisation.

Research scientists at Australia's [University of New South Wales School of Biological, Earth and Environmental Sciences](#) have discovered that many different planetary sources release methane into the atmosphere. Dr Lexie Lu reports that "For example, methane is naturally produced from wetlands and freshwater by microbes in anaerobic conditions." Approximately 40% of methane emitted into the atmosphere is from these natural sources, which also include rivers, termites and natural geological sources, such as gas-oil seeps. "However, since the industrial revolution, human activities have contributed a significant amount of methane emissions via numerous anthropogenic sources including agriculture, waste and fossil fuels." These human sources also include biomass burning, wastewater treatment, the decomposition of organic matter in landfills and emissions from agriculture.

Rising methane levels in our atmosphere have been making headlines around the globe over the last 15 years at least. Overall, the increase in atmospheric methane has now reached 262% of pre-industrial revolution levels. Ahead of COP27, the [World Meteorological Organization \(WMO\)](#) released in October 2022 its *Greenhouse Gas Bulletin*, which reported on levels of carbon dioxide, methane and nitrous oxide in the atmosphere. This Bulletin has underlined again the enormous challenge – and the vital necessity – of urgent action to cut greenhouse gas emissions and prevent global temperatures rising even further in the future. The Bulletin reported the biggest year-on-year increase in methane concentrations in 2021, since systematic atmospheric measurements began nearly 40 years ago. According to WMO, analysis indicates that increased emissions are coming from sources such as rice farms and tropical wetlands, especially in Africa. But exact reasons for the accelerated increase are still not fully clear.

Interestingly, as cities make up 3% of the world's land surface, they are responsible for about 20% of man-made methane emissions. Leakage from natural gas infrastructure has been found to be a significant – and remediable – source of methane in many cities worldwide. Methane is also being emitted from landfill and waste-water treatment plants.

In Australia, the contribution of methane emissions from ruminant livestock is nearly 10% of total greenhouse gas emissions. That is why scientists at Australia's Commonwealth Scientific & Industrial Research Organisation (CSIRO) and many global animal nutrition companies and organisations are researching methane-reducing feed additives.

(According to the LDDP team's nutritional advisor Mr Greg Willis, methane-reducing additives are based on an increasing array of natural products (such as the *Asparagopsis* variety red seaweed) and various biochemical enzymic formulations which alter methane liberating pathways within ruminant digestive systems and can significantly reduce enteric CH₄ levels. Methane reductions are being reported from sources around the world as being from approx. 20-70%, depending on various animal and environmental specific factors. Mr Willis adds that, fortunately, such nutritional physiological interventions also commonly enhance feed conversion efficiency, so therefore improve animal growth performance. However, whether such approaches provide an economic return on investment for livestock producers is a rather complex question at this point in time.)

Most interestingly, amongst an increasing number of climate scientists, the lead of [CSIRO's Greenhouse Gas Observations](#) team, Dr Zoë Loh, says methane has a relatively short atmospheric lifetime. "While carbon dioxide (CO₂) stays in the atmosphere for hundreds of years, methane (CH₄) has an atmospheric lifetime of less than 10 years. And the good news here is that because CH₄ has a short atmospheric lifetime, effective action at reducing emissions will provide a near-term brake on 'climate forcing', while we wind down CO₂ emissions."

(Another highly prominent advocate of the very short atmospheric lifespan of CH₄ in comparison with CO₂ and the far less harmful effects of livestock emissions on the planet, in comparison to the global **burning of fossil fuels** and many other sources of emissions, is Professor Frank Mitloehner. Prof Mitloehner heads a prominent team of climate scientists at the [Clarity & Leadership for Environmental Awareness & Research \(CLEAR\) Centre](#), within the University of California, Davis in the USA.)

4.2 Land use changes related to fodder production

Land use is an important issue in Bangladesh owing to high population density and growing food production needs. The livestock sector is one of the affected segments where fodder shortages are already reported. Various interventions in this sector include climate-smart food and fodder production where food security is the ultimate objective. Emission reduction potential/targets are not presented in NDC targets owing to their complexity in estimations.

4.3 Renewable energy (RE) use and energy efficiency

Adoption of RE at various levels from solar home systems (SHS) to large-scale RE projects is executed by the Sustainable & Renewable Energy Development Authority (SREDA) and along with other government and development agencies. The potential emission reduction through RE generation from different sectors is reported to be around 43.75 million tCO₂eq.

4.4 Waste management

Policies such as the ILMM as discussed earlier are notable interventions in the livestock sector. Improper manure management alone contributes to a reduction of around 130,000 tons of CH₄ annually.

5. Potential adaptation measures

As the country is densely populated with a low geographical elevation, the peoples are under direct threat of climate change. Though the mitigation targets are fixed in the NDC, adaptation measures require immediate interventions aligning with national adaptation action plans and

other relevant policy measures. Some prominent natural/indigenous practices in the livestock and dairy sector are highlighted in this section.

5.1 Climate adaptive fodder production

With a rising population, industrialization and increased demand for food crop production, Bangladesh lacks land availability for fodder production. The floating agricultural production system is not new to the country and it is recognised to be a globally important agricultural heritage system by the Food and Agriculture Organization (FAO)³⁰. In the floodplains of the southern parts of Bangladesh, mainly in the districts of Goplaganj, Barisal and Pirojpur such systems are practiced. The hydroponic system is referred to as Dhap³¹ by the local communities who traditionally practice it indigenously.

Similar interventions in fodder production implemented under the International Fund for Agricultural Development's (IFAD) *Promoting Agricultural Commercialization and Enterprises (PACE) project* along with the Department of Livestock Services (DLS) is a notable adaptive solution that can be replicated in other regions³². This intervention is applied to the regions affected by salinity intrusion problems like Satkhira district. Under climate adaptation action, the Rural Development Academy (RDA), Bogra has suggested a hydroponic fodder manufacturing system for the dairy sector which will reduce the pressure on land requirements and can cope with the seasonal flooding of grazing land.

5.2 Climate adaptive livestock rearing

As the country is highly prone to seasonal floods and cyclones, the rearing of water buffalo and ducks is more climate adaptive compared to other livestock rearing. Char islands are the most vulnerable ecosystems that are prone to major climate events. Bhasan Char is an island in Hatiya Upazila of Bangladesh and is considered for resettling Rohingya refugees. This Island has cattle rearing, especially water buffaloes, as economic activity and livelihood. Water buffaloes being more adaptive to the water results in a lower risk of loss during seasonal flooding and cyclones³³. Similarly, the people on the island are also included in other livestock activities in which duck farming is considered as a viable option for the adverse climatic effect.

6. Key climate-smart interventions

6.1 Interventions in farming practices

Drought-resistant crops for feed and fodder production are an initiative to adapt to climate change. The droughts are characterised by severe demand for feed/fodder sources and can be mitigated by promoting drought-resistant crops and animal breeds. Planned feed and fodder value chain enhancement can contribute to high yield with good quality products even during climate hazards. Smart feed and fodder value chain monitoring tools will help in identifying problems and addressing them. Capacity development of the farmers mainly on seed selection, climate-smart farm activities and effective management at the farm level, will enhance feed and fodder production.

³⁰ <https://fao.org/3/bp777e/bp777e.pdf>

³¹ <https://www.fao.org/giahs/giahsaroundtheworld/en/>

³² <https://ruralsolutionsportal.org/en/-/39585602-40>

³³ <https://link.springer.com/article/10.1007/s43545-021-00281-9>

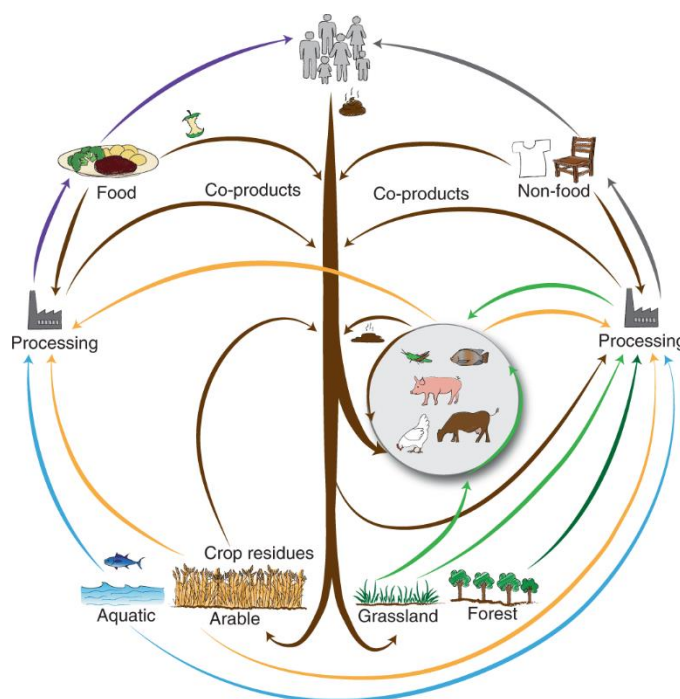
Intervention in animal health through a selection of specific breeds for the Bangladesh scenario helps the animals to cope with disaster events. Climate-smart sheds can improve animal health and productivity along with efficient water and energy use. Management of farm waste is necessary for the proposed climate smart sheds. Monitoring animal feed and balanced nutrition for livestock will improve the quality of livestock. Insurance schemes will help reduce financial losses in case of climatic events.

6.2 Integrated Farming and the 'Circular Economy'

With global warming and a growing population to feed, the development of a sustainable form of food production is vital. This is where the concepts of the 'Circular Economy' and 'Circular Agriculture' come to play a role. The use of by- and waste products as animal feed not only helps reduce carbon emissions from burning and from waste 'landfill', but such waste products also represent key nutritional opportunities for global livestock populations.

Integrated farming systems that utilize/manage all the products, by-products and wastes generated through integral linkages are an ideal example of the Circular Economy. Mixed farming is at present the predominant farming technique recognized even at smallholder farms. Integration and linkages among them are currently lagging in the farms practicing mixed farming. Individual livestock farmers or a group of livestock farmers can improve their livelihood through artisanal products like cheese, butter, ghee, etc. The agricultural produces can also be used along with dairy, meat and other products adding value and creating a unique identity for the farmers in a region. This intervention can be useful for farmers in remote locations where potential is there and penetration of commercial processors is low.

Figure 21. The Circular Economy in integrated farms³⁴



³⁴ <https://www.nature.com/articles/s43016-021-00340-7>

Five types of integrated farming that are being observed in Bangladesh are:

1. Crop-Livestock-Poultry-Fish (C-L-P-F)
2. Crop-Livestock-Poultry (C-L-P)
3. Crop-Livestock-Fish (C-L-F)
4. Crop-Poultry-Fish (C-P-F)
5. Crop-Livestock (C-L)

The C-L-P-F integrated farming system has the highest potential and is reported to increase the socio-economic status in rural regions³⁵. The lack of energy security in these systems is a major drawback that can be mitigated through integrated livestock manure management (energy from biogas systems and value-added manure products) as highlighted in the monitoring report on Bangladesh Second Country Investment Plan Nutrition-Sensitive Food Systems³⁶.

Utilization of renewable energy sources (solar PV, solar thermal, etc.) can also offer a cheap and reliable power supply for businesses/farms operating in remote locations. The current challenges faced in the integrated farming systems can be mitigated through:

- Coordinated extension services focusing on integrated farming,
- Marketing support,
- Agro-ecological research activities.

Energy security, water quality/conservation, energy efficiency measures, technology upgradation and waste management are some of the key aspects that need to be taken into consideration for the upgrading to integrated farming from the business-as-usual scenario.

6.3 Interventions for pollution/GHG mitigation

Manure management through domestic and community-scale interventions addresses GHG emissions. Domestic scale manure management through anaerobic digesters is widespread in the country. Implementation of such efforts at domestic levels is extensively carried out by the government entities like Infrastructure Development Company Limited (IDCOL) and the Local Government Engineering Department (LGED).

Community-scale manure management is another viable solution that will help in addressing the socio-economics and energy demands. Proper implementation through the best available technologies with smart monitoring tools integrates value chain players. The development of suitable business models considering sustained operations meeting fertiliser and energy needs locally is one aspect where the need for more technical assistance is identified.

Dairy wastewater treatment is another important process in meeting the environmental norms. A large quantity of dairy wastewater is handled through an effluent treatment plant at dairies. Circulation-based anaerobic digester such as Upflow Anaerobic Sludge Blanket (UASB) has

³⁵https://www.researchgate.net/publication/342347722_Integrated_farming_and_its_impact_on_farmers%27_livelihood_in_Bangladesh

³⁶ <http://fpmu.gov.bd/agridrupal/sites/default/files/file/MR-2021/MonitoringReport2021.pdf>

been identified as the best available technology³⁷. Water conservation activity will also be realised using such systems since the treated water can be utilised for gardening, crate washing, floor cleaning, etc.

To address issues of tannery waste and to satisfactorily meet the requirements/ environmental regulations of the international market, the GOB proposes to build advanced effluent treatment plants in each of the tannery zones. Around 220 tanneries are shifted from the old tannery cluster to Savar where a sufficient wastewater treatment facility exists³⁸.

6.4 Interventions at the socio-economic level

Socio-economics of the local community need to be addressed through capacity development and modern tools exposure. Youth and women's involvement in livestock value chains as entrepreneurs through self-governed cooperatives offer mutual benefits. Access to micro-credits and other climate finance services can help communities invest and be equipped in fighting climate change. The involvement of private players is reported to enhance the business operations. Incorporating energy efficiency measures and renewable energy installation in the design and construction of community infrastructure yields financial benefits in long term. Community awareness programs should be implemented with a special focus on adaptation, food security, diseases and water conservation/management.

7. Technology upgradation addressing climate change impacts

The competitiveness of the dairy and livestock sector in Bangladesh can be improved by incorporating the best suitable technologies at all levels. Technology upgradation measures in the livestock and dairy sector can include:

- Nutrition control
- Health monitoring and tracking
- Improving resource efficiency (feed, energy, water, etc.)
- Cold chain

Cold chain interventions are important not only to increase the shelf life but also to ensure quality and thereby health/food safety. Some of the technological suggestions are highlighted below.

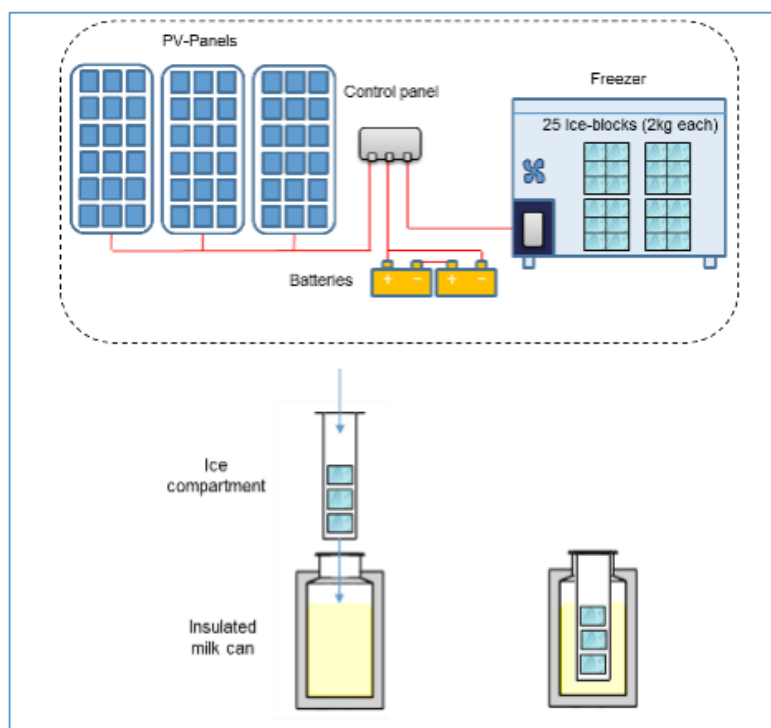
7.1 Solar PV based freezers

At the grass root level chillers are required for the livestock farmers to ensure the quality of milk at the producer level in the dairy sector. In the case of the meat sector, though refrigeration is not required for the farmers but is required at the subsequent levels of the supply chain. Solar PV-based freezer is a solution that can aid farmers at distant locations by preserving the quality of products thus bringing higher returns.

Ice produced using the Solar PV-based freezer can be used in insulated cans to transport milk or meat products. A simple schematic of solar PV-based freezer system and its use is presented in figure below.

³⁷https://www.researchgate.net/publication/264841746_Biomethanation_of_Dairy_Waste_Water_Through_UASB_at_Mesophilic_Temperature_Range

³⁸ <https://www.unido.org/sites/default/files/files/2019-05/Bangladesh%20dairy%20and%20beef%20vc%20report%20%28Wei%27s%20final%20version%29%20.pdf>

Figure 22. Schematic of milk chiller for small dairy farmers³⁹

Box A: Case study of solar milk chillers in Sidi Bouzid, Tunisia⁴⁰



The technology was implemented in the Sidi-Bouzid region of Tunisia through funding from BMZ, Germany in collaboration with INRAT and the University of Hohenheim under grant agreement with ICARDA. The focused region contributes around 293,000 litres of milk per day mainly through smallholder farmers with less than 5 cows. It is estimated that 20-30% of the collected milk is lost due to poor hygiene at the source. The milk cooling system consists of 40 litre cans with insulation that can be removed. The ice is produced by solar powered freezers. The system can cool 60 litres of milk to temperature below 15°C which will preserve the milk for up to 6 hours until reaching VMCC. Through this project 10 milk cooling systems were implemented at 7 locations. The cost of each system is around USD 2,800 and the payback period varies from 3-4 years. This system can be shared by a cluster of smallholder farmers and enterprises for cost-effectiveness.

³⁹ https://energypedia.info/images/0/00/User_Guide_-_On-farm_Solar_Milk_Cooling_System.pdf

⁴⁰ <https://www.fao.org/climate-smart-agriculture-sourcebook/production-resources/module-b2-livestock/b2-case-studies/case-study-b2-4/ar/>

7.2 Cold chain powered by renewable energy

The use of renewable energy for cold chain networks is not new to Bangladesh. PRAN had already experimented with solar powered VMCC's (Nadosayedpur, Goihata, etc.). The amount of milk cooled at such centre is around 2,000 litres. The solar powered VMCC⁴¹ sites by PRAN are shown in Figure 9.4 where 10-20 kWp solar systems are installed. The current cost of such systems is around BDT 50,000 per kWp. Biogas-powered cold chains also have enormous potential which was not explored so far in Bangladesh.

Figure 23 – Solar powered VMCC by PRAN⁴²



Box B: Micro-grid powering bulk milk chillers in India⁴³

A micro-grid based bulk milk chillers had been installed by NGO Named Tara Urja in India. The milk chilling capacity is around 1,200 litres per day. The facility at Shivapura village in Uttar Pradesh sources milk from 80 smallholder farmers. The enterprise focuses on milk processing mainly ghee. This project also provides power to other agro-processing and other commercial enterprises nearby.

7.3 Energy efficiency measures

The National Agricultural Mechanization Policy⁴⁴ (2020) promotes scientific measures in agricultural techniques to promote productivity in modern agriculture. The government has joined hands with the World Bank, Asian Development Bank and several other development agencies to promote and implement conservative energy measures in the agriculture sector including livestock and dairy. The farmers receive grid electricity at only 50% of the consumer price and it is challenging to expect them to adopt energy efficiency measures, even among the few technology-driven farmers. However, energy efficiency can be an important aspect of medium & large scale industries in the sector. It can help reduce the energy cost in the production process and thus achieve higher profit margins, especially in large dairy processing units and modern slaughterhouses.

⁴¹ https://www.reeep.org/sites/default/files/REEEP%20-%20Enerplus%20Bangladesh%20Brochure_0.pdf

⁴² https://www.reeep.org/sites/default/files/REEEP%20-%20Enerplus%20Bangladesh%20Brochure_0.pdf

⁴³ <https://www.taraurja.com/program/details/MED-program/Bulk-MilkChiller/56465a53536c42525054303d/>

⁴⁴ http://dae.portal.gov.bd/sites/default/files/files/dae.portal.gov.bd/policies/c940594d_3ca5_4665_b390_ace578255853/2021-08-25-06-05-7b2382934f7fa3773586d4084061cd04.pdf

8. Key Recommendations for addressing the Increasing Impacts of Climate Change on the Dairy & Livestock Sectors of Bangladesh

Below are recommendations for addressing the climate change impacts in the livestock and dairy sector, if possible and as applicable, under the LDDP project:

- ✓ Sustainable fodder production and supply can be targeted through more advanced climate-adapted varieties, together with the possible implementation of hydroponic systems in certain drought prone regions.
- ✓ Efficient waste collection from agro-processing (food product wastes), livestock (waste by-products from slaughterhouses) and dairy wastes (whey) and utilization as the inputs to feed production can reduce requirements of fresh raw materials and also ensure feed volumes available in the market even at times of adverse climate conditions.
- ✓ Focus can be given to effectively manage grazing lands for the livestock through community cooperation and agro-forestry to overcome risks of floods, droughts and permanent loss of pasture due to overgrazing
- ✓ Crop-Buffalo-Duck-Fish type integrated farms at flood-prone zones can be scaled up based on the lessons learned from previous endeavours by the GOB and other development agencies.
- ✓ Climate-smart infrastructure resilience to floods and heat waves such as sufficient storm drains near village milk collection centres (VMCC), storage warehouses, elevated livestock sheds above ground level and good ventilation, etc., can be promoted through awareness and skill development.
- ✓ Micro-grids or off-grid-based RE generation (biogas, Solar PV, wind) can be encouraged at farms in remote locations such as the char islands for reliable electricity access during floods and other climate events.
- ✓ At the VMCC level where downstream cooperative networks are already available, biogas initiatives could not only contribute to energy independency but also aid farmer networks with value-added bio-fertiliser products.
- ✓ Biogas use for transport sector can be promoted to aid in attaining the NDC targets. Manure management which is sub-sector under livestock and dairy segment could enable a circular economy by using this biofuel for its logistic needs.
- ✓ Communication systems for weather and climate event warnings can be established across the livestock and dairy value chain for the timely dissemination of information and safeguarding of livestock and products.
- ✓ Access to formal financial services can be encouraged offer micro-credits, soft-loans, micro-insurance to mitigation risks in investment by the farmers and entrepreneurs.