Analysis of the beef value chain in Bangladesh

Towards a strategic action agenda for the Dhaka city corporations

M.G. (Melanie) Kok MSc, dr.ir J.M. (Han) Soethoudt, D.M. (Vera) Vernooij MSc and K.B. (Kulsum Begum) Chowdhury

WAGENINGEN
UNIVERSITY & RESEARCH

Analysis of the beef value chain in Bangladesh

Towards a strategic action agenda for the Dhaka city corporations

Authors: M.G. (Melanie) Kok MSc[1], dr.ir J.M. (Han) Soethoudt[1], D.M. (Vera) Vernooij MSc[1] and K.B. (Kulsum Begum) Chowdhury[2]

Institute: [1] Wageningen Food & Biobased Research
[2] Food and Agriculture Organization of the United Nations, FAO Representation in Bangladesh

This study was carried out by Wageningen Food & Biobased Research, funded by Embassy of the Kingdom of the Netherlands in Dhaka and commissioned by Food and Agriculture Organization of the United Nations.

Wageningen Food & Biobased Research
Wageningen, November 2021

Public

Report 2216

WAGENINGEN
UNIVERSITY & RESEARCH

WFBR Project number: 81419076-00
Version: Final
Photo front cover: FAO/Fahad Kaizer
Reviewer: S. (Seth) Tromp MSc BA
Approved by: Dr.ir. H. (Henk) Wensink
Funded by: Embassy of the Kingdom of the Netherlands in Dhaka
Commissioned by: Food and Agriculture Organization of the United Nations
This report is: public

PO box 17, 6700 AA Wageningen, The Netherlands, T + 31 (0)317 48 00 84, E info.wfbr@wur.nl, www.wur.eu/wfbr.

Abbreviations

AI	Artificial Insemination
BBS	Bureau of Statistics
BLRI	Bangladesh Livestock Research Institute
DAE	Department of Agriculture of Extension
DLS	Department of Livestock Services
DCC	Dhaka City Corporations
FAO	Food and Agriculture Organization of the United Nations
GCC	Gazipur City Corporation
GDP	Gross Domestic Product
GHG	Greenhouse gas
GoB	Government of Bangladesh
HSC	Higher Secondary Certificate
FLW	Food Loss and Waste
PS	Private Sector
SAU	Sher-e-Bangla Agricultural University
SSC	Secondary School Certificate
WUR	Wageningen University and Research

Contents

Acknowledgement

We would like to thank John Taylor and his team from the Food and Agriculture Organization of the United Nations (FAO) in Bangladesh for organizing the interviews in Bangladesh, facilitating the workshop, valuable feedback during the process of writing the report and validating the results. In addition, we would like to thank professor Md. Mufazzal Hossain and his team from Sher-e-Bangla Agricultural University (SAU) for conducting and translating all interviews with the actors in the beef supply chain. We would also like to thank all actors that contributed to the workshop and interviews.

The peer reviewers were John Taylor and Seyam Mohammed from the FAO in Bangladesh.

Summary

Livestock products are increasingly important in Bangladeshi diets. In developing countries including Bangladesh, the consumption of beef, mutton and chicken products grew with 5.8% per year over the last decade. In 2011 the amount of food loss and waste (FLW) for meat produced and consumed in South and Southeast Asia was estimated at 20% of the initial production. The FLW of beef in this region leads to 64,983,911 tons of greenhouse gas (GHG) emissions annually, which makes beef one of the hotspots for GHG emissions worldwide. In order to increase the amounts of food that reaches consumers, it is relevant to study where at various links of supply chains FLW takes place. FLW studies for beef in Bangladesh are scarce. An opportunity for the beef supply chain in Bangladesh is to work towards reducing food losses at various links of the chain. Understanding the flow of food to and within the metropolitan areas and the interaction between food producers, logistics service providers, wholesalers and retailers, and the various actors is necessary to facilitate the development of a secure, sustainable and resilient food system for the megacities. This beef value chain analysis in Bangladesh is performed as a first step with the aim to develop a strategic action agenda on the beef supply chain for the four city corporations in Dhaka. The ultimate goal is to decrease food loss and waste (FLW) with 5% and increase food availability. This value chain analysis focusses on the (post-) harvest supply chain till and including retail and processing.
The analysis of the beef value chain is drafted based upon data and information gathered in a literature study, workshop conducted with multiple actors in the supply chain and extensive interviews conducted with individual actors in the supply chain. The interviewees included agricultural producers, intermediaries and truck drivers in Dhaka, Narayanganj, Pabna, Sirajgonj and Faridpur districts, and wholesalers, retailers, mobile vendors, institutional users and abattoirs located in Dhaka North, Dhaka South, Narayanganj and Gazipur city corporation area.

Part of the live cattle and part of the beef cannot be sold and do not go to the intended market. The losses for agricultural producers are estimated at 8% for breeding cattle, 21% of the calves and 2% of the fattening cattle. The main reasons for losses of live cattle at producer level are high mortality rates due to stillborn, weak calves, illnesses and diseases. At intermediary level the losses are estimated at 15%, and mortality of the fattening cattle happen due to diseases or illnesses, or due to injuries during transportation. Wholesalers and retailers process live cattle into beef and the actors indicated that between 60-80% of the carcass can be used for human consumption. Losses that occurred due to the slaughtering and processing activity were overall less than 5% and often occurred due to bad work accuracy of the employees or a bad quality of the meat. However, often this part of the beef can still be sold on the urban food market or to the industry, used for home consumption, or given to employees or the poor. During slaughtering the food safety is not well taken care of and current slaughtering practices raise food safety concerns, since the mainstream slaughtering is carried out without any supervision or inspection. Many actors and butchers slaughter the cattle at the road- or market side. Another part of the losses occurred due to bad storage. This was less than 5%. This lost beef went to landfill, was used for own consumption, or given to the poor or employees. Unsold beef occurring at mobile vendors or institutional users was very small, <0.5% and 0.1% respectively. Besides this beef was still consumed at home. The cause of this unsold beef included the lack of customers. Other challenges related to the post-harvest supply chain originate in the enabling environment, as it contributes to inefficiencies. Transportation faces challenges such as extortion and bribery, which hamper smooth execution of the various value adding stages. Furthermore, extension service provisioning does not reach agricultural producers well. Uncontrolled imports of cattle and beef result in periods of undersupply and oversupply. Overall Bangladesh is self-sufficient with respect to cattle production and consumption. However at the festival of *Eid al-Adha* half of the annual cattle slaughtering and consumption takes place, which is leading to capacity problems.

Promising opportunities for optimizing the beef sector are through providing technical support on breeding, rearing, and caring for beef cattle, supporting cooperative structures to organize actors, promoting cultivation of (Napier) grass for cattle as a potential income generating activity, improving information, communication and transportation systems, and tapping in to the growing national demand for fresh and processed beef as well as the global demand for halal meat.

1 Introduction

As the population of the capital of Bangladesh, Dhaka, grew substantially in the last years, the pressure on the food supply increased. Dhaka is among the top 25 cities in Asia and is growing fast both demographically and economically (Zaman, 2019). The 8.9 million inhabitants of Dhaka need to eat food every day and primarily depend on food purchases. Due to this, Dhaka is dependent on food inflows from the rural areas. Large amounts of grain, fish, spices, vegetables, fruits and meat need to be delivered to Dhaka every day in order to meet the demand (Etzold, 2008).

Livestock products are increasingly important in Bangladeshi diets. In developing countries including Bangladesh, the consumption of beef, mutton and chicken products grew with 5.8% per year over the last decade (Wondmeneh et al., 2016). In 2017-2018, livestock contributed with 1.5% to the Gross Domestic Product (GDP), at a growth rate of 3.4% that has steadily been growing. The share of livestock in agricultural GDP in 2017-2018 was 13.6% (Department of Livestock Services (DLS) of the Government of Bangladesh (GoB), 2019). The livestock subsector provides 20% of the 165 million people with direct jobs, and 45% with part-time jobs (DLS in FAO-UNIDO, 2019).

Of all livestock products, particularly beef consumption is deeply linked to national, cultural and religious traditions, and it is a national development priority to further enhance the functioning of the sector (FAO-UNIDO 2019). The majority of rural households in the agriculture-based country adopt a mixed farming system by cultivating crops and rearing livestock at the same time. The sector is characterized by small-scale agricultural producers with less than three cattle per household (FAO-UNIDO, 2019). In 2019 there were 2,674,660 heads of cattle (FAOSTAT, 2019), supporting an estimated 8,700,000 rural small-scale agricultural producers and 1,858,590 medium and large-scale agricultural producers (FAO-UNIDO, 2019). The 2008 Agricultural Census data and 2011 Human Population Census showed that on average 38.6% of Bangladeshi households keep cattle, but this varies from 4.4% to 68.0% for four different zones. The average number of cattle per 1,000 people varied from 21 to 464 as shown in Figure 1 (Huque & Khan, 2017).

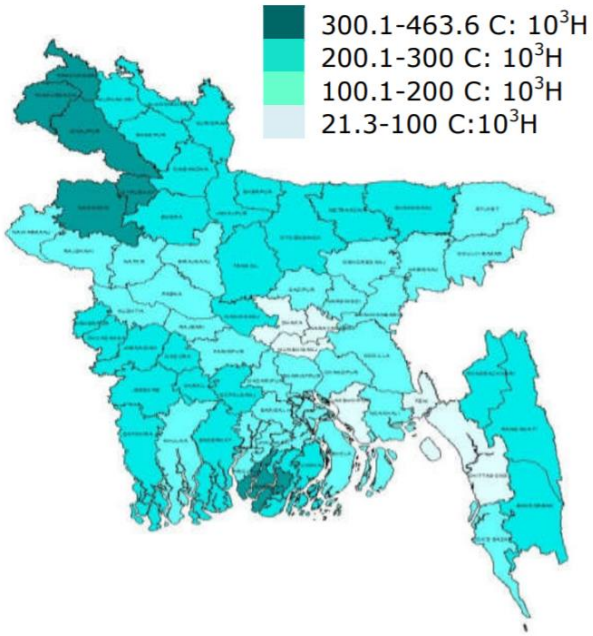


Figure 1 Four cattle production zones in Bangladesh, categorised according to average number of cattle per 1000 people (C:10³H) (Huque & Khan, 2017).

Meat production has steadily been growing from 10.4 metric tons in fiscal year 2007-2008, multiplying more than six times to 72.6 metric tons in fiscal year 2017-18 (Figure 2). Popular breeds for cattle production in Bangladesh are Red Chittagong, Pubna, Munshiganj, North Bengal grey, Red Sindhi, Sahiwal and Holstein Frysian cross cattle (DLS, 2019).

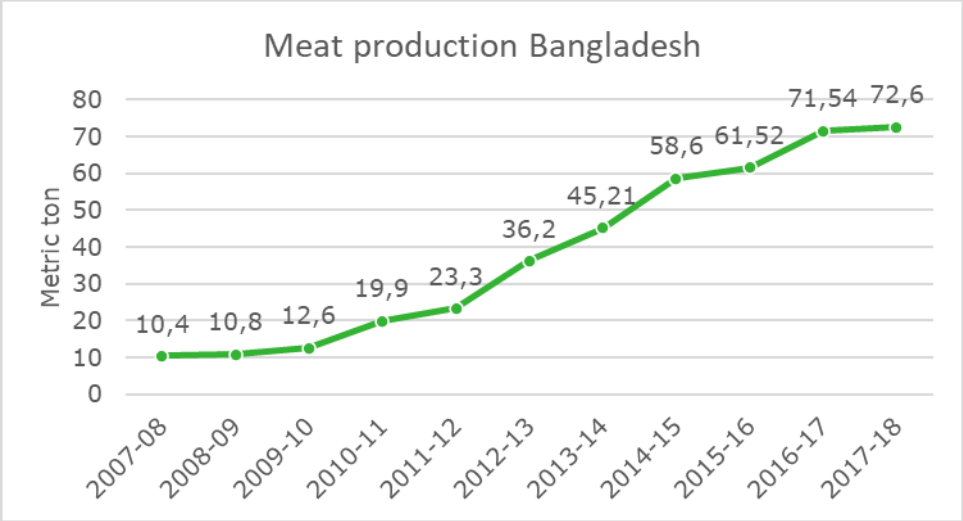


Figure 2 Meat production Bangladesh 2007 – 2018 (DLS, 2019).

The main consumer markets of cattle and beef fattening are located in Dhaka, Chittagong, Sylhet, Comilla, Barisal, Khulna, Pabna, Rajshai, Thakurgaon, Lamanirhat and Bogra districts (WorldVision, 2018; Awal & Bari, 2016). In 2016 daily per capita beef consumption was 7.5 gram, increasing from 6.8 in 2010 (Household Income and Expenditure Survey (HIES), 2016). Islam et al. (2018) indicated that beef consumption was found the highest in the middle social class, followed by the lower middle class. In general however, the lower the education qualification, the lower the mean beef consumption. 48% of consumers ate beef once a week and it was more frequently consumed by men than by women. Highest beef consumption areas were Chittagong and Sylhet (Islam et al., 2018).

Generally there are three types of markets: local, regional and national. The first two typically function twice a week and comprises of buyers and sellers from two or three villages within a locality. Regional markets include a larger number of buyers and sellers from one or two districts. Smallholders who are engaged in cattle fattening usually sell their cattle directly to local markets or rural brokers, who then also sell at local markets. Regional traders purchase from local markets and sell at regional markets. National traders purchase from few selected regional markets in mass and sell them at national markets (WorldVision, 2018). The main (national) chain constitutes four wholesale cattle markets located in the main consumer markets in Dhaka, Chittagong, Sylhet and in Comilla, and also extended to Barisal. To supply these markets, there are large assembly markets for cattle mainly in Khulna, Pabna, Rajshahi, Thakurgaon and Lalmanirhat districts (Hassanullah, 2013).

There is variety in the type of beef chains in Bangladesh. A typical beef marketing channel in Bangladesh consists of primary agricultural producers (farmers), cattle traders (*bepari*, local and larger scale), wholesale butchers, retail butchers, and consumers (Figure 3). The associated seven identified channels from Figure 3 are presented in Table 1 (Ahmed et al., 2010).

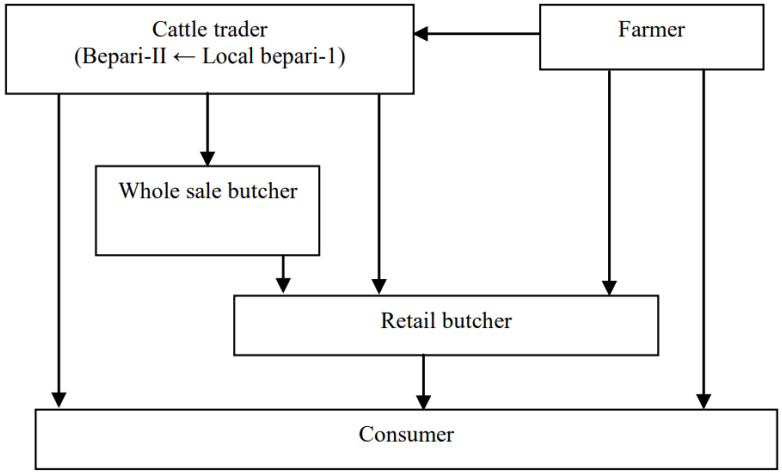


Figure 3 Marketing channel of beef cattle in Bangladesh (Ahmed et al., 2010).

Table 1 Seven marketing channels corresponding with figure 3 (Ahmed et al., 2010).

Channel	
1	Producer > *bepari* > butcher > consumer
2	Producer > butcher > consumer
3	Producer > *bepari* > producer (re-fattening) > *bepari* > butcher > consumer
4	Producer > *bepari* > producer (re-fattening) > butcher > consumer
5	Producer > producer (re-fattening) > *bepari* > consumer
6	Producer > producer (re-fattening) > *bepari* > butcher > consumer
7	Producer > consumer

Most literature distinguishes between traditional and modern marketing channels, of which traditional marketing channels being characterized by small-scale agricultural producers (FAO-UNIDA, 2019; Hassanullah, 2013; WorldVision, 2018). Traditional channels take up the majority (+90%) of beef compared to the modern channel (FAO-UNIDA, 2019). The major market players of industrial scale that process meat are Bengal Meat and Pabna Meat (WorldVision, 2018). In addition to the modern and traditional channels, there are also the seasonal and import channels. Agricultural producers in the seasonal channel target the *Eid al-Adha* festival where consumers buy live cattle to sacrifice for religious purposes. For processed meat, in the import channel, the initial stages of production, aggregation, and processing take place abroad with only wholesale and retail operations taking place in Bangladesh. Processed imported meat mainly originates from Australia and India, and +90% of imported live animals originate from India through cross border trade (Hassanullah, 2013).

There is however still a lot unclear about the functioning of the beef value chain in Bangladesh, and this study aims to contribute to already existing knowledge. Particularly, food loss and waste (FLW) for beef value chains in Bangladesh is unknown. In order to increase the amounts of food that reaches consumers, it is very relevant to study where at various links of supply chains FLW takes place. In 2011 the FLW worldwide was estimated to be one-third of what is produced for human consumption. For meat produced and consumed in South and Southeast Asia the amount lost and wasted is estimated at 20% of the initial production. In this area the losses are relatively high in agricultural production, due to the high animal mortality causes by frequent diseases in livestock breeding (Gustavsson et al., 2011). Guo et al (2020) also estimated that FLW and the FLW induced Greenhouse Gas (GHG) emissions are considerable for beef produced and distributed in South and South-East Asia. The FLW of beef in this region sums up to 1,697,888 tons and that FLW leads to 64,983,911 tons of GHG emissions annually. This makes beef one of the hotspots for GHG emissions worldwide (Guo et al. 2020).

Additionally, as the majority of food is produced in rural areas (predominantly by smallholder agricultural producers) understanding the flow of food to and within the metropolitan areas and the interaction between food producers, logistics service providers, wholesalers and retailers, and the various actors is necessary to facilitate the development of a secure, sustainable and resilient food system for the megacities.

This study was therefore conducted to gather information from various actors participating in the beef value chain to identify impediments and opportunities to improve its performance, in order to support policy makers in the four city corporations that comprise the Dhaka Metropolitan Area (North Dhaka, South Dhaka, Gazipur and Narayanganj).

1.1 Goal

This beef value chain analysis in Bangladesh is performed as a first step with the aim to develop a strategic action agenda on the beef supply chain for the four city corporations in Dhaka. The ultimate goal is to decrease food loss and waste (FLW) with 5% and increase food availability. A strategic action agenda intends to develop and determine the strategic position to reach its goal. It prioritizes the objectives and concrete steps needed to attain the goals set – usually covering the coming years. It is the common view on and basis for the process towards developing concrete plans to reach the required outcome. Here we identify the leverage points for reducing food losses for beef in order to improve the performance of the beef value chain and thereby to increase the amount of beef that reaches consumers and enhance food availability.
In order to achieve the goal we use the food systems approach of Van Berkum et al. (2018), zooming in on the food system activities and food availability in the top five beef producing districts and the four city corporations in the city of Dhaka.

1.2 The food system approach

This report is structured following the food systems approach (van Berkum et al. 2018). The food systems approach is aimed at sustainable solutions for sufficient supply of healthy food. System thinking with the help of this approach broadens the perspective when seeking solutions for the root causes of problems. Figure 4 presents an overview of the approach. This strategic action agenda focusses on the (post-)harvest supply chain up to and including food retail and processing. Food consumption is out of scope.

Figure 4 A way of mapping the relationships of the food system to its drivers (Van Berkum et al. 2018)

The scope of this report is circled in Figure 4, namely the food system activities and food security. The food system activities include the food supply system, which describes the different supply chain actors and their activities, challenges (including FLW) and mutual connection, and the enabling environment, business services, food environment and consumer characteristics.

For the food system activities, this report includes the first four aspects of the 'food supply system' namely agricultural production , food storage, transport & trade, food processing & transformation, and food retail & provisioning. Food consumption is out of scope. The value chain is at the heart of the food supply system where value is added in each step (van Berkum et al. 2018). Furthermore this strategic action agenda includes two of the four parts that interact directly with the food supply system: the enabling environment (transport, regulation, institutions and research infrastructure) in which the food supply system is embedded, and business services (training, agricultural inputs, technical support or financial services) that provide services and goods to the actors in the chain. Out of scope are the food environment and consumer characteristics, as these topics have a direct linkage with the consumer that is out of scope. The box 'food security' includes food utilization, food access and food availability. This food system analysis includes food availability only. Food utilization and food access are out of scope. Within food availability, this report includes all aspects namely production, distribution and exchange.

2 Methodology

The analysis of the beef value chain is drafted based upon data and information gathered in a literature study, a workshop conducted with multiple actors in the supply chain and extensive interviews conducted with individual actors in the supply chain.

2.1 Literature study

A literature study on the beef value chain in Bangladesh was conducted. It was conducted by Sher-e-Bangla Agricultural University (SAU) and included information from local statistics agencies and governments, and studies conducted in the English and the Bengali language. Topics included beef production details, used farming systems, information on available cattle breeds, wholesale locations and type of butchers, the beef supply chain with their actors, functions, relationships and challenges, food losses, other issues related to the food system like distribution network and food availability, extension services and input providers.

2.2 Workshop

On 9th December 2019, the Food and Agriculture Organization of the United Nations (FAO) in Bangladesh, in collaboration with Wageningen University & Research (WUR), organized a workshop with actors in the beef supply chain to better understand the supply chain actors, their roles and functions in the supply chain, as well as to identify the major challenges within the supply chain regarding inputs, quality of the cattle and beef available, food losses, distribution and relations. A participatory beef value chain mapping approach was selected to initiate a dialogue between the different actors involved and to validate the information provided by the different actors. The spatial map developed through this process identified the function and role of the different actors, their linkages and the various market channels, but also showed where products come from, the passage of the cattle from the farm to the city and specific locations that they flow through.
In total 25 participants contributed to the workshop which included cattle agricultural producers, aggregators, wholesalers, processors, retailers, consumers and legislators in the form of the responsible government authority which was the Department of Livestock Services (DLS). The participants were selected based on convenience. During the workshop the participants were divided into three groups to ensure the presence of all type of actors (and their roles) into each group. The workshop was facilitated by experts from the FAO in the Bengali language.

2.3 Extensive interviews

In total 334 face-to-face executive interviews were executed by SAU by field visiting study areas between 27 September 2020 and 3 October 2020. Actors included in the interviews were agricultural producers, intermediaries, truck drivers, wholesalers, retailers, mobile vendors, institutional users and abattoirs (Table 2).

In order to ensure the highest level of quality , the following measures were adopted by SAU:

a) Recruitment of appropriately qualified and experienced enumerators (Graduate completed and studying Master of Science in Sher-e-Bangla Agricultural University and expert in GPS machine and mobile apps system)
b) Training on use of the interview techniques and use of tools appropriately including field exercise
c) Pre-testing of questionnaire
d) Correction of questionnaire according to result found on field tests
e) Supervision by core team members
f) Sudden visit by core team member
g) Day to day checking of collected data in order to ensure proper filling and recording of data
h) Preserving telephone number of the respondents to recheck if necessary at the analytical stage.

Table 2 Definitions actors in the beef supply chain

Actor	Description
Producer	People (farmers) who rear or fatten cattle and sell live cattle to others.
Intermediary	Small traders purchase live cattle from agricultural producers and sell live cattle to large traders and in the local haat[1] or market. Large traders purchase live cattle from small traders, fatten the cattle and sell the fattened cattle at the big market in Dhaka or other big cities. Intermediaries included *faria*, *bepari* and *aratdar*. • *Faria* are intermediaries who collect cattle directly from farms or haats, or from agricultural producers in the village or in the local market and sell in local markets to the *bepari*, or directly to consumers. They have no permanent shop (Hasan and Naim 2018; Hasan et al. 2007). • *Bepari* are traders who assemble in local markets and buy from agricultural producers or *faria* and supply to urban centers. They sell to wholesalers or retailers through *aratdar*s or commission agents. They have no permanent shop (Hasan and Naim 2018; Hasan et al. 2007). • *Aratdar* are commission agents who have a fixed establishment and operate between urban *beparis* and wholesalers or retailers (Hasan and Naim 2018; Hasan et al. 2007).
Driver	People who drive vehicles to carry cattle from one place to another
Wholesaler	People who buy live cattle and sell beef in bulk amount and also sell live cattle occasionally to other actors or consumers.
Retailer	People who buy beef or live cattle and sell beef (somewhat sell live animal) to consumers or to some other actors in small amount.
Street vendor/mobile vendor	People who do not have any specific location/place to sell beef. They buy beef (meat) and sell beef on the street.
Institutional user	Institutes that use beef for various reasons.
Abattoir or slaughterhouse	A specific establishment designated for slaughtering the animal. It is either a public or private place
Abattoir's personnel	A veterinary surgeon, employee of an abattoir who are involved in the slaughtering process in an abattoir.
Butcher	A person who slaughter animals in a shop or outside, and sell the carcass to other actors

2.3.1 Sampling plan

Table 3 provides the survey area and sample size per type of actor. The actors were sampled from five different production districts, including Dhaka, Narayanganj, Pabna, Sirajgonj and Faridpur districts, and four city cooperation areas, including Dhaka North, Dhaka South, Narayanganj and Gazipur. This is visualized in Figure 5.

[1] An open-air market that serves as a trading venue for local people in rural areas and some towns

Table 3 Sample size and distribution

No.	Survey area/ sample distribution	Survey method	Respondents	Sample size
1.	Five selected production areas for beef commodity (District, which produced highest production of specific commodity). Production areas for beef are Dhaka, Narayanganj, Pabna, Sirajgonj, Faridpur districts.	FGDs/face to face executive interview	Agricultural producers	60 (12 for each production area)
2.	Five selected production areas for beef commodity (District, which produced highest production of specific commodity). Production areas for beef are Dhaka, Narayanganj, Pabna, Sirajgonj, Faridpur districts.	Face to face executive interview	Agreed market intermediaries	50 (10 for each production area)
3.	Five selected production areas for beef commodity (District, which produced highest production of specific commodity). Production areas for beef are Dhaka, Narayanganj, Pabna, Sirajgonj, Faridpur districts.	Face to face executive interview	Truck drivers	15 (3 for each production area)
4.	Four major wholesale markets in each of the 4 city corporations (Dhaka North, Dhaka South, Narayanganj and Gazipur city corporation area)	Face to face executive interview	Wholesalers	20 (5 for each markets)
5.	20 Traditional retail markets from the 4 city corporations (5 from each city corporation)	Face to face executive interview	Retailers	60 (3 for each markets)
6.	60 Informal roadside vendors from the 4 city corporations (15 from each city)	Face to face executive interview	Informal roadside vendors	60 (15 from each city)
7.	60 Institutional users from the 4 city corporations (15 from each corporation)	Face to face executive interview	Restaurants, food processors	60 (15 from each city)
8.	9 Abattoirs or which 7 government slaughterhouses (3 in Dhaka North, 2 in Dhaka South, 1 in Narayanganj and 1 in Gazipur) and 2 market slaughterhouses (both in Dhaka South).	Face to face executive interview	Operators of abattoirs/ abattoir's person	9 (1-4 from each city)
	Total sample size 334			

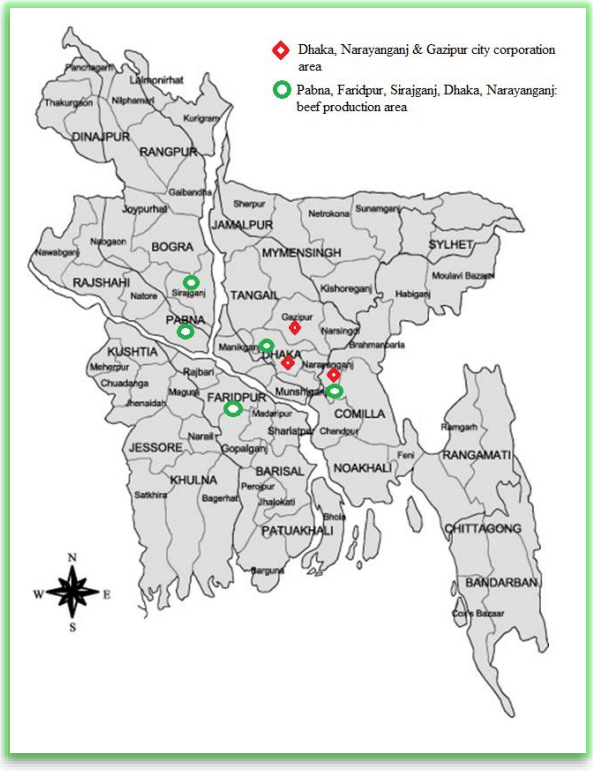


Figure 5 Map of beef value chain survey

2.3.2 Data collection

Eight different structured questionnaire surveys were developed, one questionnaire per type of actor. These were translated into the Bengali language and entered in the Kobo apps tool system - an online electronic data entry recording system. The survey app was developed by using Kobo collection software[2] for data collection and especially as downloadable by a user to an android mobile device. Kobo Collect is based on the open data kit and is used for primary data collection. The platform is very intuitive and offers comprehensive collection alongside basic mapping and analysis capabilities. Users can export data into more powerful analysis tools and it has a GPS tracking system.
Data processing work consisted of cross checking and matching of data. Statisticians oversaw the data processing activities. Data was stored automatically in electronic data entry record system and data storing system.

2.3.3 Data Analysis

Kobo apps was developed for data entry. Data analysis was done by Kobo tool apps. Different types of statistical calculations like number, mean, mode, median, percent and standard deviation were used. A simple tabular technique was presented in the study to classify the data into meaningful categories.

2.3.4 Validating findings

Findings from the interviews were shared for discussion, feedback and validation in two sessions. One session took place with the FAO team members and one session took place with four city corporations experts from FAO Bangladesh. Results were incorporated in the recommendations section of this report. All sessions took place online.

[2] https://www.kobotoolbox.org/

3 Results: Food system activities

This chapter describes the food system activities for beef cattle in Bangladesh, which includes the food supply system, enabling environment and business services.

In Table 4 a SWOT-analysis is provided regarding the beef food system activities. This analysis shows the strengths, weaknesses, opportunities and threats related to the food supply system, the enabling environment and business services. These results are further explained in chapter 3.1, chapter 3.2 and chapter 3.3.

Table 4 SWOT for beef supply chain activities

Strength	Opportunity
• Part of the beef that did not go to the intended market was still sold on the urban food market or used for human consumption (home consumption, charity) • Actors that store beef use a temperature controlled facility • Millions of small agricultural producers are engaged in beef fattening • Dominant systems characterized by low cost beef fattening • Developing the sector is a national development priority • Large number of domestic consumers	• Technical support on breeding, rearing, and caring for beef cattle, including diseases, to increase the production of cattle and beef • Cooperative structures to organize actors • Market demand of fresh and processed beef has been increasing fast • Global demand of halal meet is increasing
Weakness	**Threat**
• Problems with the supply of cattle and beef (not always available) • High cost of cattle feed • Lack of feed and fodder, especially in the rainy season • High cost and the lack of labor • High transportation cost • Loss of animals during transportation Lack of (timely) medicines and vaccines • Insufficient veterinary support • Poor growth rate of cattle • High mortality rate of cattle • High cost of storage or a lack of storage facilities • Quality decrease of beef over time (partly due to lack of (use of) cold chain facilities) • Bad quality of the beef • Lack of mechanical slaughtering instruments and modern cleaning and drainage systems • Lack of supply of clean water in the abattoirs • Indigenous varieties difficult to fatten • Low access to information channels	• Scarcity of land for fodder production • No slaughterhouse around the market and many slaughterhouses inactive • No specific place for slaughtering, therefore slaughtering is done at the roadside • Insects near processing locations • Cattle diseases causing illness • Extortion during transportation, due to traffic jams, poor roads and police disturbs, including paying bribes • Bad road communication • Market or selling point far away • Unavailable transport • Difficulties receiving financial support or loans • Reduced sell due to endemic like Covid-19 and price fluctuations • Uncontrolled import of cattle and beef • Natural calamities such as flash floods can kill cattle and/or destroy feed

3.1 Food supply system

In this chapter seven main beef food system actors are described: agricultural producers, intermediaries, wholesalers, retailers, mobile vendors, institutional users and abattoirs. Table 5 gives an overview of the amount of cattle and beef handled, and the amount of cattle and beef lost in the supply chain. The details at abattoirs are limited, since their core business is to slaughter animals for other actors, instead of purchasing cattle and selling beef. However, two respondents mentioned to purchase cows and/or bulls.

Table 5 Summary table beef supply chain actors, numbers and kgs handled, and lost/unsold

Purchased input	No. of cattle/year or kg beef/year purchased	Actor	Sold output	Food loss/unsold
Calves	0.6	Producer	Cow	Mortality on average (in %):
Cows	2.7		Fattened	8% breeding cattle,
Bulls	26.1		bull	21% calves and
				2% fattening cattle
				Total: 7% cattle and calves
Cows	91	intermediary	(fattened)	Mortality on average (in %):
			Cow	Max. 15% fattening cattle
Bulls	236		(fattened)	
			Bull	
Beef	Unknown		Beef	<5%
Cows	93	Wholesalers	Cattle	-
Bulls	1,153	and wholesale	Beef	<5%
		butchers		
Cows	28	Retailers and	Cattle	-
Bulls	331	retail butchers	Beef	<5%
Beef	8,525 kg			
Beef	13,764 kg	Mobile vendors	Processed beef	<5%
Beef	3,469 kg	Hotels	Processed beef	<5%
Cows	21	Abattoirs	Beef	Unknown
Bulls	241			

Wholesalers and wholesale butchers purchased the largest amount of live cattle. Live cattle were mainly slaughtered at this stage of the supply chain. Agricultural producers and intermediaries that breed or fatten the cattle had an average mortality rate of 7% and 15% respectively. Actors that only traded cattle quickly, so without fattening, were not taken into account, since they take care for the cattle only for a short period. Overall the amount of beef lost is less than 5%.
Every actor in the supply chain increases the value of the product. They perform different activities to differentiate themselves from their competitors, to maximize the margin on the products they sell and minimize their losses and costs. In Figure 6 the product flow of live cattle and beef is provided.

Hereafter the actors are described in more detail.

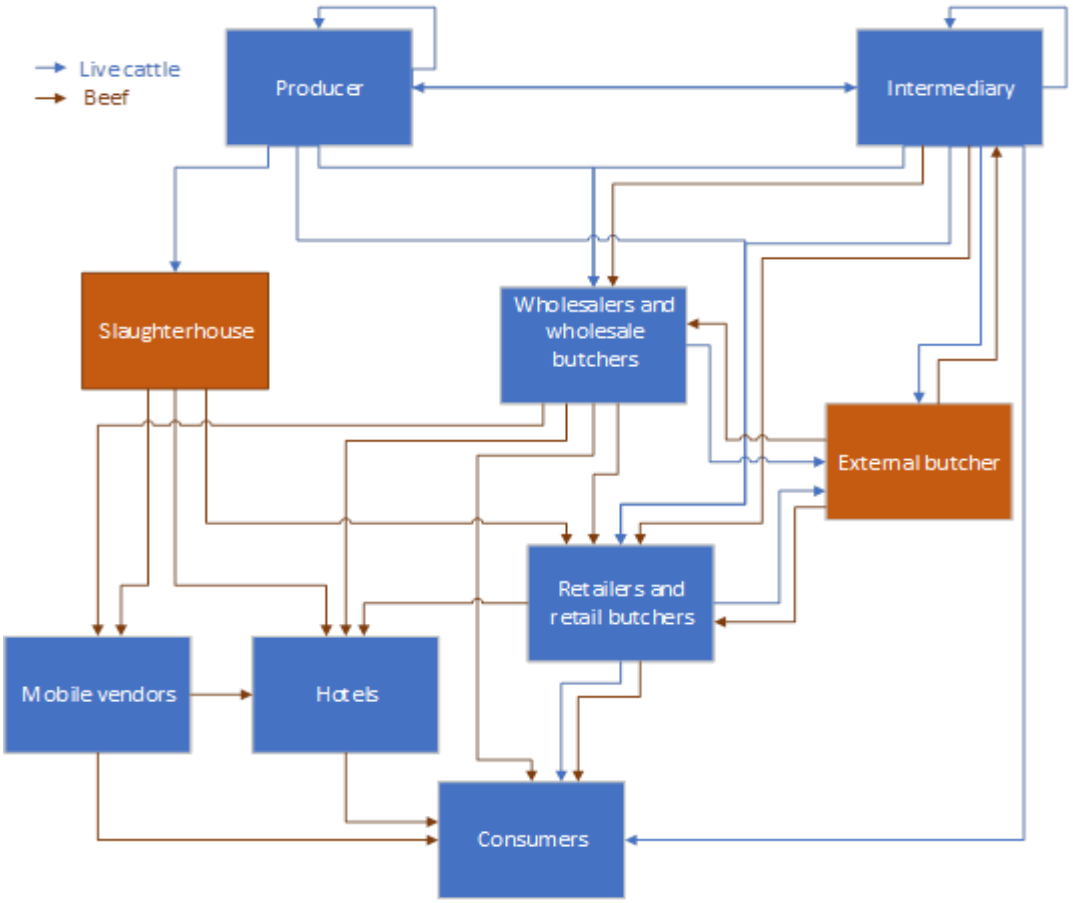


Figure 6 Flow chart of the beef supply chain with the actors included in this study.

3.1.1 Agricultural producers

The interviewed agricultural producers (N=60) had an average age of 41 years and had on average 14 years of experience in the beef supply chain. 93% of the interviewed agricultural producers were male and the other 7% was female. One-fifth of the respondents (20%) received high school education (up to class eight), 17% received a Secondary School Certificate (SSC), 13% received education up to Higher Secondary Certificate (HSC) and 8% were graduated. In contradiction, 3% of the respondents had a post-graduation degree in contrast to 25% illiteracy.

From the interviews, two types of agricultural producers could be distinguished; cattle breeders and cattle fatteners. Cattle breeders breed calves and rear them. Female calves are reared to produce calves at the own farm or sold to produce calves at someone else's farm or for beef production. Male calves are reared for a period of 6-8 months and thereafter sold to other actors for fattening. In general, cattle fatteners purchased female or male calves and fattened a calf for 1.5-2 years before they were sold. Both type of activities can also be combined by an agricultural producer (WorldVision, 2018).
Details about the type of agricultural producers interviewed and their amount of own and purchased cattle is shown in Table 6.

Table 6 Type of* agricultural producers *and their amount of own and purchased cattle

Type of agricultural producers	Total per actor	No. of actors that buy semen	No. cows owned for rearing:	No. calves owned (male/female) for rearing:	No. cattle owned for fattening	No. of agricultural producers that purchased cows	No. of agricultural producers that purchased calves	No. of agricultural producers that purchased bulls
Breeders	13 interviewed	13 actors	56 total 4 average	41 total 3 average	0 total	1	0	2
Fatteners	12 interviewed	0 actors	0 total	0 total	356 total 32 average	0	0	12
Breeders and fattener combi	35 interviewed	27 actors	458 total 13 average	327 total 9 average	835 total 24 average	14	5	29

Figure 7 shows the agricultural producers value chain overview. 67% of the cattle breeders and cattle fatteners purchased semen to breed calves, 8% purchased female calves under twelve months old, 25% purchased female cows over twelve months old and 72% purchased bulls. The calves, bulls and cows were purchased from other agricultural producers or from intermediaries. Agricultural producers purchased on average 9 female calves, 12 cows over twelve months old and 41 bulls per year, and sold on average 24 bulls, 4 fertile cows and 4 infertile cows (including female calves). Cows and bulls were sold directly in the market in their own districts, to intermediaries and butchers. The reasons for sale mentioned by the respondents were highest profit is reached, need for cash at that moment, high demand for cattle at a specific date and high demand for cattle for a certain weight.

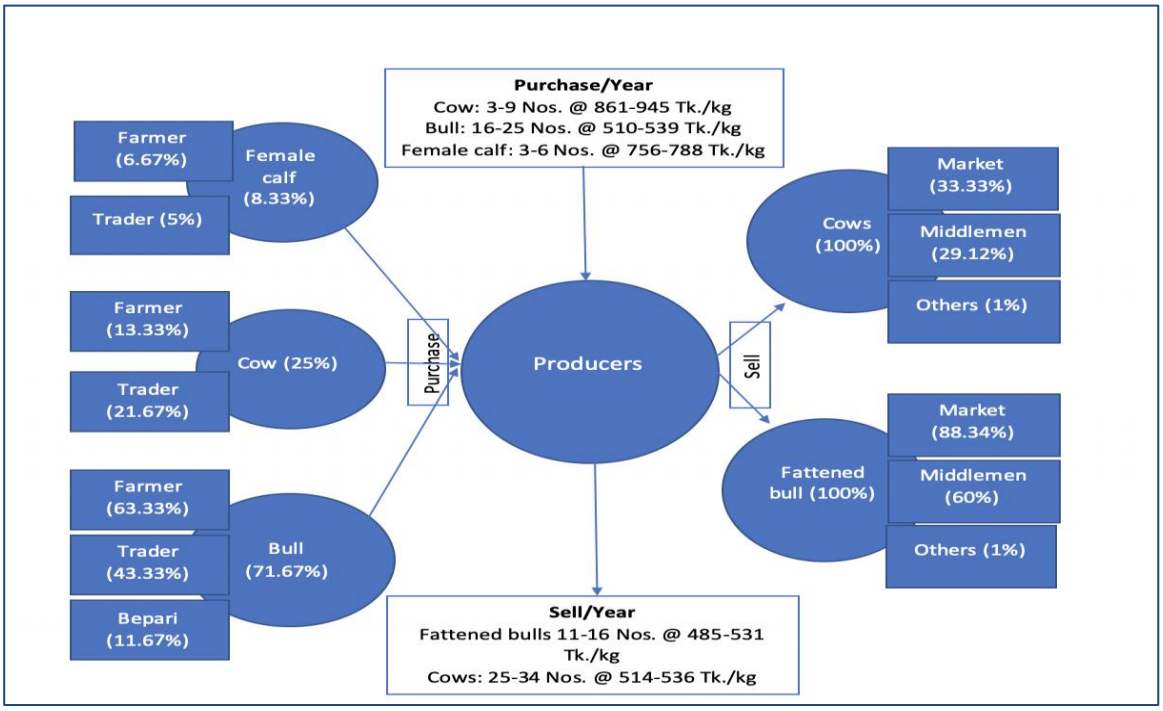


***Figure 7 Flow chart of* agricultural producers**

82% of the agricultural producers reared cattle. These cattle breeders owned on average 12 cows and 8 calves (both male and female), and eight of them took care of a few extra cows or calves to receive an extra income and because of family duty. 40 respondents purchased semen to breed calves themselves, while the others only reared calves. The mortality rate of breeding cattle was on average 8% and for calves 21%.[3] Mortality can occur when cows got a stillborn, when the calve is too weak to survive or when the calve become ill. Mortality of adult cattle can occur due to illness.

[3] Percentage based on calculation: No. of cattle died / (no. of cattle owned + no. of cattle died). In this calculation the amount of sold cattle was not taken into account and therefore the percentage can be lower in reality.

The mortality rate of calves at a national level is rated at 25%. It is indicated in the literature as a problem experienced by many small-scale agricultural producers (FAO-UNIDO, 2019; Hassanullah, 2013). Mortality rates as a result of diseases are even higher, such as 51% for Foot and Mouth Disease (FMD), and 80-100% for Black Water (FAO-UNIDO, 2019).

Most of the cattle breeders mentioned they use Holstein Friesian Local Cross (26 respondents), non-descriptive Deshi (14 respondents), other like Australian, Jersey, Mundi, Desi cross or Pakistani (all 11 respondents), Sahiwal (10 respondents) or Pabna cattle (2 respondents), and these were selected based on their good growing breed, health, low amount of feed needed, purchase price and business purpose. A strength of local breeds is that fattening happens at relatively low costs due to low amount of feed needed, but a challenge is that they are relatively difficult to fatten so it takes time (Hassanullah, 2013).
After cows become fertile, on average every 1.3 years a new calf will be born, which is 0.8 calves per year per cow. They inseminate a cow on average 1.7 times before she becomes pregnant. The moment of insemination is based on the behaviour of the cow, the month of the year and external advise. The birth weight, rearing time and selling weight per breed is shown in Table 7.

Table 7 Birth weight, rearing time and selling weight per breed

Breed of cattle	Birth weight (kg)	Rearing time (months)	Selling weight (kg)
	Mean ± SD	Mean ± SD	Mean ± SD
Pabna cattle	27.83 ± 4.71	22.33 ± 4.63	203.33 ± 77.37
Red Chittagong cattle	25.00	24.00	350.00
Sahiwal	28.08 ± 3.07	31.17 ± 18.65	320.83 ± 150.30
Sindhi	27.50 ± 6.36	22.00 ± 2.83	360.00 ± 197.99
Holstein Friesian local cross	28.88 ± 4.97	30.59 ± 21.29	245.16 ± 126.78
Non-descriptive Deshi	21.50 ± 4.85	37.25 ± 31.73	194.58 ± 79.41
Other	27.00 ± 5.24	30.92 ± 21.88	260.42 ± 187.16

78% of the respondents mentioned they fatten the cattle. The 47 cattle fatteners own on average 26 cattle or which 9 cattle fatteners took also care of the cattle of others to receive an extra income and because of family duty. Cattle fatteners mention to use Holstein Friesian Local Cross breeds (21 respondents), Sahiwal (20 respondents) and non-descriptive Deshi (18 respondents) most often. Furthermore, Australian and Pakistani, Pabna cattle, Sindhi and Reg Chittagong cattle were used. The breeds are selected because of their good growth, health, purchase price and low amount of feed needed. The average mortality rate of the cattle was on average 2%.[3]
The different cattle breeds were purchased at a weight between 113-150 kg on average and fattened within 4-12 months to a selling weight between 256-333 kg on average per breed (see Table 8).

Table 8 Weight on arrival, fattening time and selling weight per cattle breed

Breed of cattle	Birth weight (kg)	Rearing time (months)	Selling weight (kg)
	Mean±SD	Mean±SD	Mean±SD
Pabna cattle	136.00 ± 37.82	9.40 ± 6.62	256.00 ± 62.29
Red Chittagong cattle	150.00 ± 0.00	4.00 ± 0.00	320.00 ± 0.00
Sahiwal	117.73 ± 67.25	11.95 ± 11.52	275.00 ± 77.20
Sindhi	130.00 ± 26.46	4.33 ± 0.58	333.33 ± 115.47
Holstein Friesian local cross	126.43 ± 52.79	7.71 ± 4.67	279.29 ± 104.81
Other	113.06 ± 41.27	10.00 ± 6.01	275.56 ± 134.39

The cattle producers (both breeders and fatteners) used a stable-fed system (60%), a mixed system (37%) or a grazing system (2%) and the cattle were fed with straw, fresh cut grass and/or concentrate. The feed was provided two times by most agricultural producers (88%) or ad libitum (22%)[4]. Agricultural producers mentioned problems with the availability of feed and fodder. Due to the lack of feed available, e.g. during the rainy season, the feed becomes scarce and the costs increased. The cattle had access to water two times a day (52%), ad libitum (42%) or one time a day (7%). Recently grass cultivation has become profitable, and combined with a strong interest of many smallholder agricultural producers to improve their rearing practices, the cultivation of for example Napier grass can be promoted as a potential income generating activity (WorldVision, 2018; Hassanullah, 2013). Another problem that agricultural producers mentioned included diseases, of which Food and Mouth Disease (FMD) was mentioned specifically.

3.1.2 Intermediaries

All interviewed intermediaries (N=50) were male. They were selected from the same districts as the agricultural producers. They were one average 45 years old and their average work experience in the beef supply chain was 21 years. Almost half (44%) of the intermediaries were illiterate followed by educated up to class 8 (18%), up to SSC (17%) and HSC (13%). Education level up to graduation and post-graduation were recorded in 8% and 3%, respectively.

Figure 8 shows the intermediaries value chain overview for live cattle. All interviewed intermediaries (100%) were involved in the trade of live cattle. The intermediaries purchased on average 91 cows and 236 bulls per year from agricultural producers, producer markets and other intermediaries. The number of cows purchased varied between 0 (26% of the respondents) and 1,200 cows per year and the number of bulls purchased varied between 0 (8% of the respondents) and 3,000 bulls per year. The average weight was 204 kg per cow and 222 kg per bull at the moment of purchasing. All intermediaries that purchased cows did also sell cows. Also the same amount of intermediaries that purchased bulls also sold bulls. Overall intermediaries sold on average 115 cows and 239 bulls per year. Cows were sold to intermediaries, butchers and agricultural producers, while bulls were sold to traders, butchers and consumers. The average selling weight was 202 kg per cow and 228 kg per bull, which was (almost) equal to the purchase weight, which is possible since only 22% of the intermediaries mentioned they fattened the cattle.

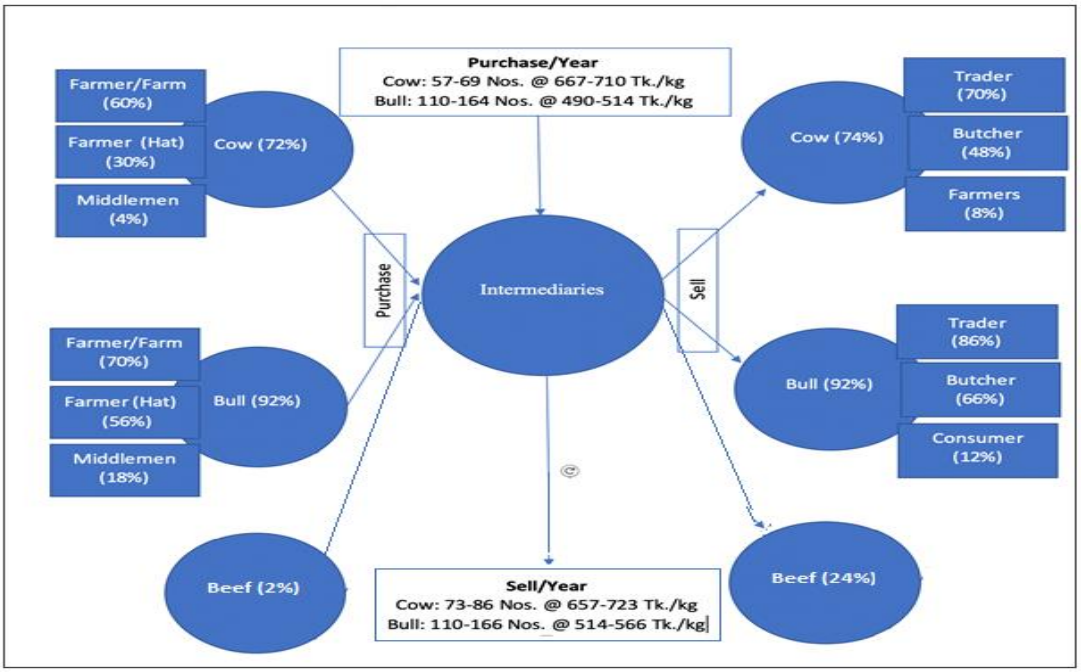


Figure 8 Intermediaries value chain overview

[4] Feed is available at all times.

22% of the intermediaries who fatten their purchased cattle owned on average 11 cattle and took care for 5 cattle themselves. They used a stable fed system (82%) or a mixed system (18%) and fed the cattle fresh cut grass, straw, dried grass and concentrate (all 100%). All intermediaries provided their cattle with feed and water two times a day. Also intermediaries faced problems with the availability of feed, especially in the rainy season due to the low production of grass. They estimated the weight on arrival, fattening time and selling weight per type of cattle breed (see Table 8). The moment of sale is determined based on highest profit reached or need for cash at that moment. The mortality rate for the intermediaries that fatten the cattle was estimated at 15%.[3] However this number is probably lower in reality, since the fattening time is on average three months (See Table 9). Therefore the total amount of cattle fattened in one year is probably way higher compared to the current amount of cattle owned and fattened at this moment. Mortality during fattening can occur due to illness or injury during transportation.

24% mentioned that they sold beef. Overall they all purchased live cattle and let them slaughter by someone else, or purchased live cattle and slaughtered the cattle themselves (four respondents). 3 out of 4 respondents mentioned that 60-70% of the animal can be used for human consumption, while 1 respondent mentioned that less than 60% can be used. Overall, 1 respondent mentioned a loss of beef of less than 5% and the other 3 respondents mentioned a loss of beef between 5-10%. The reason provided for this extra loss is a bad work accuracy by the employees. However this part is still sold on the urban food market or used for home consumption. After slaughtering, the beef is not packed.
2 intermediaries, that also slaughtered the animals, stored the beef. They both used a temperature controlled storage facility and stored the beef for less than one week. They both mentioned that less than 5% of this stored beef was lost. The lost beef went to landfill.

Table 9 Weight on arrival, fattening time and selling weight per cattle breed

Breed of cattle	Weight on arrival (kg)	Fattening time (months)	Selling weight (kg)
Pabna cattle	97.14	3.29	147.86
Sahiwal	139.17	3.17	199.17
Sindhi	142.50	1.25	174.38
Holstein Friesian local cross	144.44	3.89	208.89
other	110.00	8.00	210.00

3.1.3 Wholesalers

The wholesalers in the four Dhaka districts that were interviewed (N= 20) were all male and had an average age of 39 years. Their average years of experience in the beef value chain was 19 years. Their education varied from illiteracy (35%) to graduation (5%). However, educational qualification up to class 5 (35%), up to class 8 (20%), up to HSC (5%), etc. were also recorded.

Figure 9 shows the wholesalers value chain overview for the wholesalers that buy live cattle and sell beef or live cattle. In total 95% of the wholesalers were involved in buying live cattle and selling beef, 25% of the wholesalers were involved in buying and selling live cattle and 5% was involved in buying and selling beef.

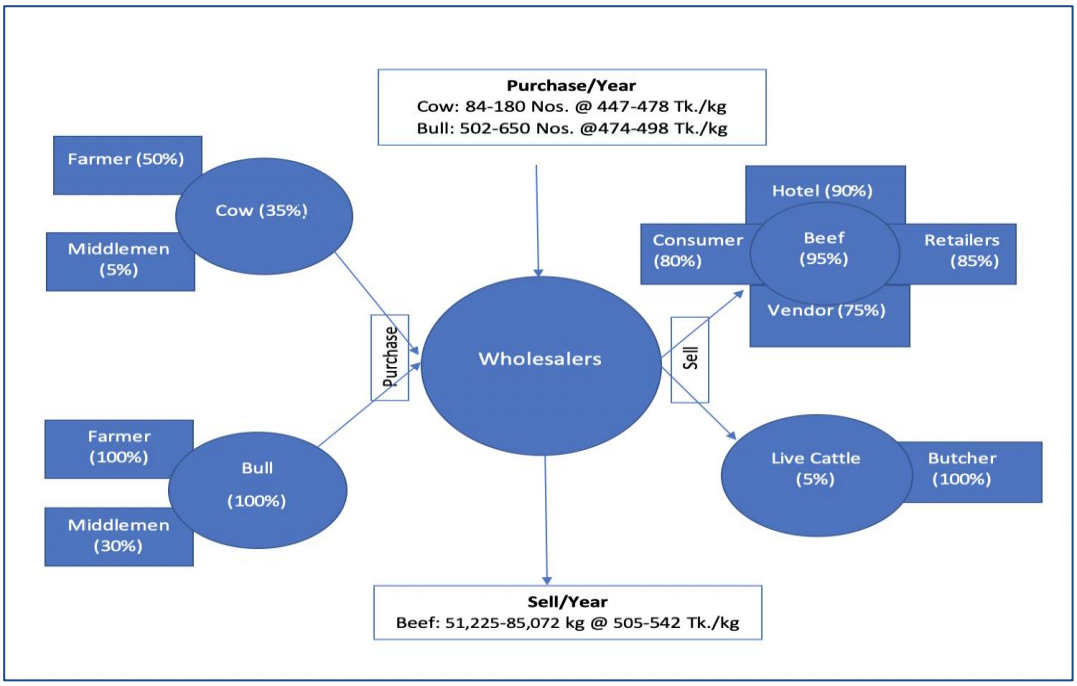


Figure 9 Wholesalers value chain overview

All wholesalers (100%) purchased bulls of which 35% of the wholesalers also purchased cows. Both cows and bulls were purchased from agricultural producers and intermediaries. In total, wholesalers purchased on average 93 cows and 1,153 bulls per year. The number of cows purchased varied between 0 (65% of the respondents) and 460 cows per year, and the number of bulls purchased varied between 140 and 6.188 bulls per year. The average weight was 149 kg per cow and 152 kg per bull at the moment of purchasing. Overall the weight of the cows and bulls was ±25 kg less in high season[5] compared to low season[6].

Wholesalers did not fatten their cattle, but 75% did slaughter the animals themselves or let someone do it for them (slaughterhouse at the market). Of these wholesalers that do slaughtering, 10 respondents mentioned that 60-70% of the animal can be used for human consumption and 5 respondents mentioned that 70-80% of the animal can be used for human consumption. Overall the 87% of the wholesalers mentioned that less than 5% of the animal, that can be used for human consumption, goes to another destination than the intended food chain. The other 13% of the wholesalers that slaughter their animals mentioned a loss between 5-10%. Losses occurred due to bad quality of the meat and bad work accuracy. However three respondents mentioned there was no unsold beef. The rest of the respondents used this part (partly) for different purposes, including own consumption or given to the poor, or sold on the urban food market or industry. Only 1 actor mentioned that a part of the meat is used as landfill.
After the slaughtering process, the beef is not packed by wholesalers. However, 40% of the wholesalers stored the beef. They use dry, ventilated, temperature controlled storing facilities and store the beef in small or large boxes, or in a small or large pack/sac. Overall the beef is stored for less than one week. 25% of respondents that store the beef mentioned they have a small amount of unsold beef (<5%) which was used for own consumption or given to charity/employees.

3.1.4 Retailers

All the retailer respondents (N=60) were male. Their average age was forty years and they worked for seventeen years in the beef value chain on average. Most retailers (42%) received education up to class 5, followed by illiterate (25%), up to class 8 (23%), and up to SSC (3%). Graduate (3%) and post-graduate (2%) were also found among the respondents.

[5] Period of a year when the flow of beef is high, from 2 month before the start of *Eid al-Adha* occasion till the occasion itself in Bangladesh
[6] Period of a year when the flow of beef is low (other than *Eid al-Adha*)

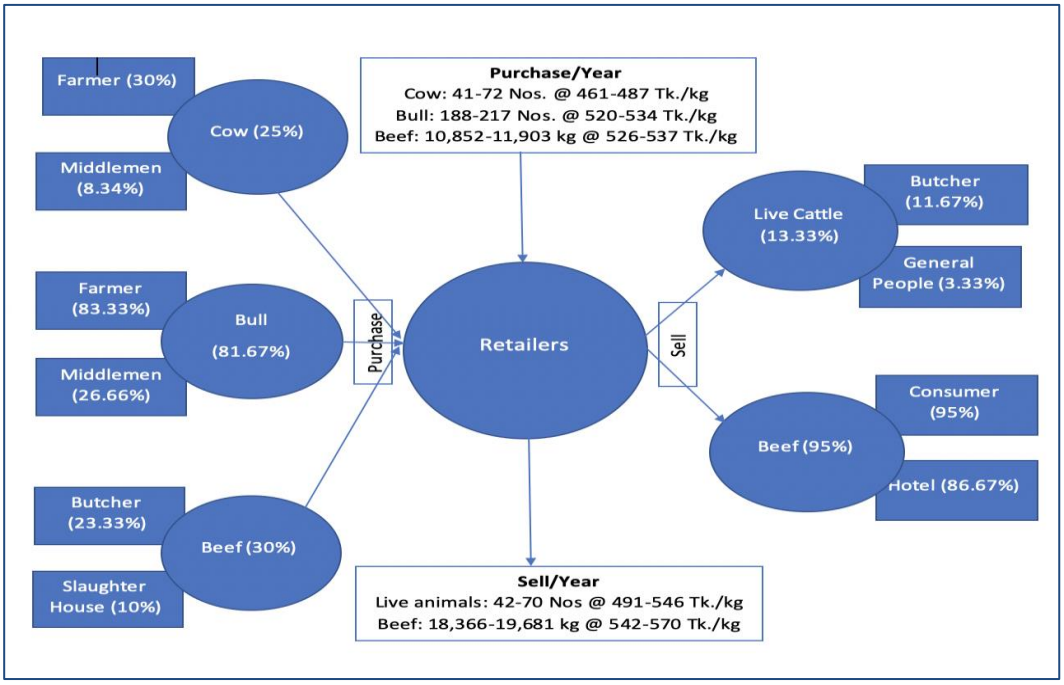


Figure 10 Retailers value chain overview

Figure 10 shows the retailers value chain overview. 83% of the retailers purchased live cattle of which all (100%) purchased bulls. 32% of the respondents that purchase live cattle purchased also cows. Live cattle was purchased from agricultural producers and intermediaries. Retailers purchased on average 28 cows, 331 bulls and 8,525 kg of beef. The average purchase weight per cow was 145 kg and per bull 156 kg. Overall the weight of the cows and bulls was ±25 kg less in high season compared to low season.

One retailer mentioned to fatten the cattle. Furthermore, 63% of the retailers (38 respondents) slaughtered their animal themselves or let someone do it for them (slaughterhouse at the market). In total 3 respondents mentioned that less than 60% of the animal can be used for human consumption, 23 respondents mentioned between 60-70% of the animal and 11 respondents mentioned between 70-80% of the animal. Overall 29 retailers mentioned that less than 5% of the animal, that can be used for human consumption, went to another destination than the intended food chain. Of this group 8 respondents mentioned that there was no unsold beef. 7 respondents mentioned that between 5-10% of the animal did not go to the intended food chain. Reasons for this were bad work accuracy or bad quality of the meat. The beef that did not go to the intended food chain was sold on the urban food market or to the food industry, used for own consumption, given to the poor, or it went to landfill.
After the slaughtering process, the beef was packed by one retailer, which is an insignificant amount. 40% of the interviewed retailers stored the beef in a dry, ventilated, temperature controlled storage facility. Overall, they stored it in small or large boxes, or in small or large packs/sacs, for less than a week. 3 retailers stored the beef between 1-4 weeks. In total, 7 respondents mentioned that all beef was sold after storage, while the other retailers mentioned destinations like own consumption, given to employees or to the poor, sold on the urban food market or to the food industry/restaurants, or used as landfill.

3.1.5 Mobile vendors

The interviewed mobile vendors (N=60) were on average 38 years old and worked on average for eighteen years in the beef supply chain. All interviewed mobile vendors were male. Among the vendors 37% were illiterate, 32% were educated up to class 5, 28% were educated up to class 8 and 3% were educated up to SSC. All mobile vendors purchased and sold beef.

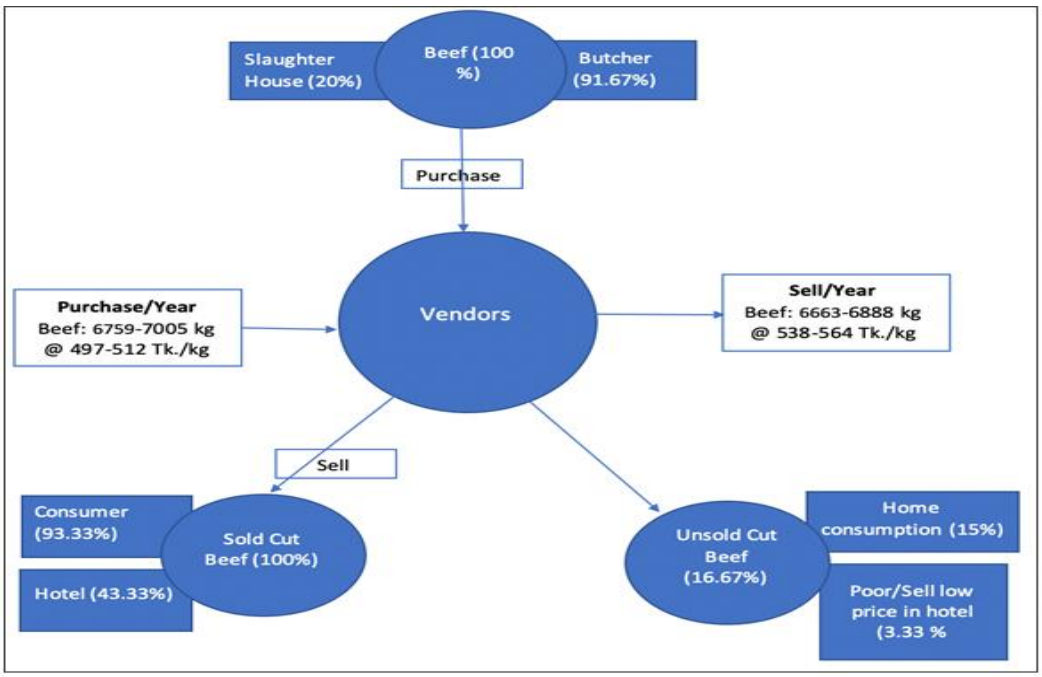


Figure 11 Mobile vendors value chain overview

Figure 11 shows the mobile vendors value chain overview. Mobile vendors each purchased 13,764 kg beef, of which 6,759 kg in low season and 7,005 kg in high season. They purchased the beef from slaughterhouses (20%) and butchers (91.67%). Of this purchased beef, 34 kg of beef was not sold and was used for home consumption (15%) and given to the poor, or sold for a low price to hotels (3.33%). This was less than 0.5% of the total input. The good quality beef was prepared and sold to consumers (93%) and institutional users (hotels) (43%).

All mobile vendors were involved in cutting (100%). Some of them were also involved in seasoning (10%) and/or baking. The cut beef was sold as raw beef or as ready-to-eat beef pieces. After handling, a part of the beef went to another destination than the intended food chain. 83% of the mobile vendors mentioned this amount as less than 5%, and 7% mentioned this amount between 5-10%. The other 10% did not respond to this question. This beef was used for home consumption, sold on the urban food market, used as landfill or animal feed.
Packaging was conducted by only 3% of the respondents, which is an insignificant amount. Storage was conducted by 37% of the mobile vendors. They all used at least a dry, ventilated temperature controlled storage facility. Besides, some of them (6 respondents) also us a dry, ventilated room with fan, a dry, ventilated room without fan, or they cover the meat with wet clothes. They stored the beef in small or large boxes or in small or large packs/sacs for less than a week. 7 respondents mentioned they did not have unsold beef. 7 other mobile vendors mentioned that they had less than 5% unsold beef, which went to home consumption, given to employees or to the poor, sold to the food industry/restaurants or used as landfill. The cause of this unsold beef included the lack of customers.

3.1.6 Institutional users

The interviewed institutional users (N=60) included hotels (59 respondents) and a beef processor (1 respondent). 95% of the respondents were male. They were on average 40 years old and 12 years involved in the beef supply chain. The respondents reached the educational level up to class 5 (32%), up to class 8 (25%), up to SSC (17%), up to HSC (5%), and graduate (8%). As high as 13% of the respondents were illiterate. All institutional users (100%) purchased and sold beef.

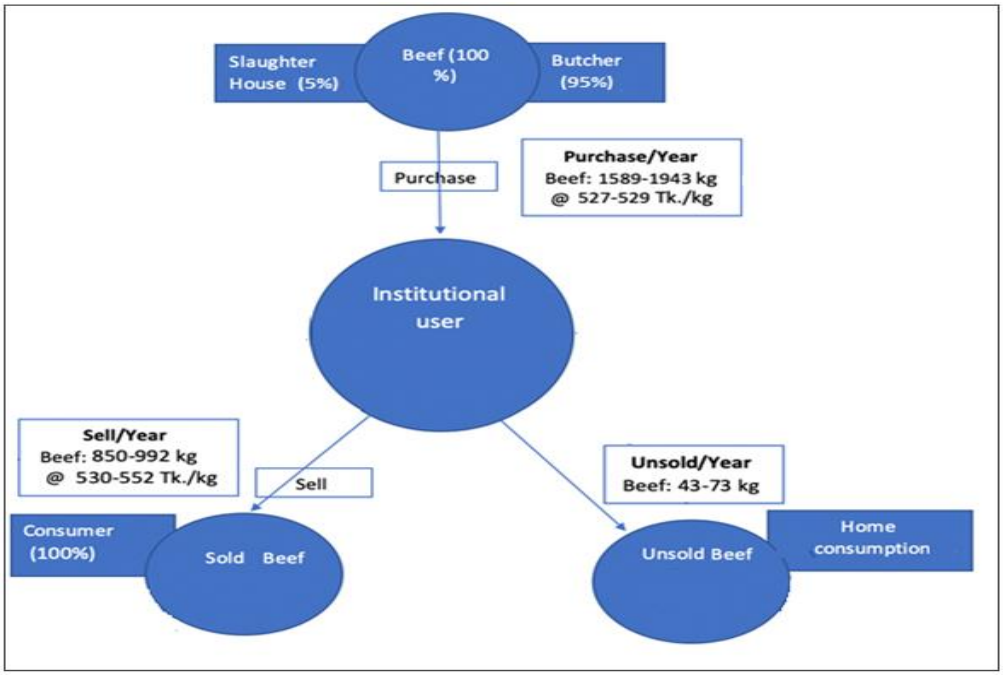


Figure 12 Institutional user value chain overview

Figure 12 provides the overview of the value chain for institutional users. The institutional users each purchased 3,469 kg beef per year on average, of which 1,589 kg in low season and 1,943 kg beef in high season. They purchased the beef from butchers (95%) and slaughterhouses (5%). Only 3 interviewees mentioned they had unsold beef, with an average 115 kg of beef. For all institutional users together the total beef that was unsold was on average 4 kg per year, which is 0.1%. The unsold beef was used for home consumption.

The institutional users performed cutting (72%), cooking (12%) or nothing (8%). The beef is sold as raw beef (2%), used in meals (77%) or sold as cut beef pieces ready-to-eat (22%). After handling, less than 5% of the beef went to another destination than the intended food chain, and was used for own consumption, sold to the urban food market or went to landfill.
Packaging was conducted by only one respondent. Storage was conducted by 35% of the respondents. They all used a dry, ventilated, temperature controlled storage facility and stored the products in small packs or small boxes. Overall they stored the beef for less than a week. Due to storage, overall less than 5% of the beef could not be sold. That beef was used for own consumption, given to employees or the poor, or used as landfill. 7 respondents mentioned there was no unsold beef.

3.1.7 Abattoir personnel

The employees of the slaughterhouses/abattoirs (N=9) interviewed were all male. Their average age was 43 years old and they worked on average for 17 years in the beef supply chain. Among the abattoir personnel, 11% were illiterate, 56% received education up to class 5, 11% were graduates and 22% received post-graduation.

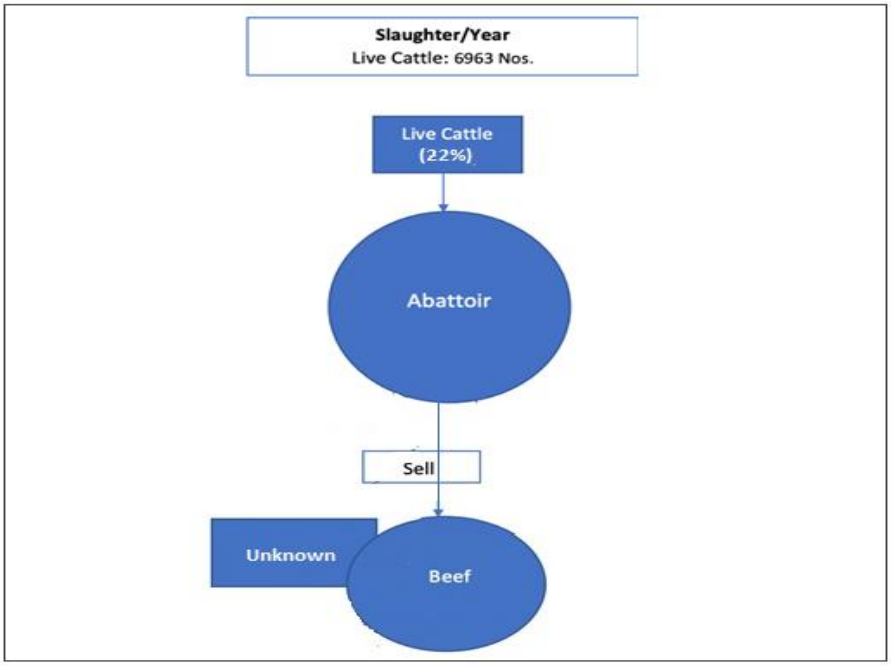


Figure 13 Overview abattoirs value chain

Figure 13 shows the overview of the abattoirs value chain. On average each abattoir slaughtered 6,963 live cattle per year, varying from 1,600 till 17,000 cattle/year per abattoir. 2 respondents mentioned to purchase live cattle and sell beef, of which 1 abattoir purchased both cows and bulls, and 1 abattoir purchased only bulls. They both purchased the cattle from the producer (directly at the farm or at the market). The abattoir that purchased both cows and bulls purchased 185 cows and 370 bulls per year on average (slaughtered 1,750 cattle in total per year), of which 355 cattle in high season and 200 in low season. The average weight was 150-200 kg per cow (low season vs high season respectively), and 220-320 kg per bull (low season vs high season respectively). The abattoir that only purchased bulls purchased 1,800 bulls per year (slaughtered 1,620 per year) of which 1,620 in low season. The average weight was 120 kg per bull in high season and 200 kg in low season. The other abattoirs did not purchase live cattle, but slaughtered live cattle for their customers directly.

A study to slaughterhouses and meat selling centers in Dhaka City among 130 meat shops and 10 meat selling centers showed that a total of 182 live cattle were slaughtered per day (66,430/year) in the 10 meat selling centers. The average weight of the slaughtered cattle was 137,5 kg (data collection from June 2018 to February 2019), going for a price of 482 Tk./kg (Jafor, 2019). This average weight is comparable to the live animal weight in high season of the abattoir that only purchased bulls.

8 out of 9 abattoirs answered the questions related to slaughtering. They all used the Halal method to slaughter the cattle and they used a manual knife for it. 7 respondents mentioned that between 60-70% of the animal can be used for human consumption and 1 respondent mentioned between 70-80%. 2 respondents mentioned there is no unsold beef after slaughtering, 4 respondents mentioned a loss of less than 5% and 1 respondent a loss between 5-10%. The unsold beef went to the urban food market, the food industry, own consumption or landfill.
1 respondent mentioned to pack the beef and 1 respondent stored the beef.

3.2 Enabling environment

3.2.1 Transport networks

Short distance transportation in the rural areas or city of Dhaka, and long distance transportation are conducted by own modes of transport or by an external transporter. From the interviews with the external drivers (N=15) it was concluded that agricultural producers, intermediaries, wholesalers and retailers used hired transport.
All external drivers involved in this study were male. The average work experience of the respondents was 13 years and they were on average 36 years old. Almost half (47%) of the respondents were found educated up to class 8, 33% of them were educated up to class 5, 11% were illiterate and 7% received up to SSC. The included drivers transported beef from the South- and West side of Dhaka towards the city regions. They transported live cattle for agricultural producers (87%), intermediaries (27%), wholesalers (40%) and retailers (33%). They transported the cattle to another type of actor, e.g. from intermediary to wholesaler or retailer, or to the same type of actor, e.g. producer to another producer or to a producer market. Per time, the external drivers transported on average 11 cattle per transporter. The drivers transported the cattle by a truck (60%) or pick-up (mini truck) (47%). Distances of paid transport include 5-10 km (40%), 10-20 km (40%) and >20 km (73%). The most frequent mentioned problems faced included extortion during transportation, high transportation cost and injured/lost animals.

Transportation, conducted by the other actors in the production areas and the city of Dhaka, was done over distances of less than 5 km up to distances of more than 20 km. Overall agricultural producers and intermediaries used a truck, mini-truck (or pickup) or troller-boat as modes of transportation. Wholesalers mainly used a mini-truck (pickup), truck or human labour when responsible for transportation. Also vans and rikshaws were used.
Overall, retailers and mobile vendors used smaller vehicles to transport the purchased product to their own location, since they only transported beef. They used a van, rickshaw, minitruck, compressed natural gas auto-rickshaw, or truck. The institutional users used mainly the rickshaw, followed by van, own/company car, minitruck and compressed natural gas auto-rickshaw.
The main problem of all actors was related to high transportation costs. In addition, retailers suffered from extortion and loss of animals during transportation. Wholesalers experienced bad road communication, market or selling point far away, unavailable transport, traffic jams and poor roads, police disturbs and paying bribe to the police. The problems of retailers, mobile vendors and institutional users were likewise. Widespread practices of bribery and extortion during transportation affecting all actors was confirmed during the workshop (20 March 2020).

3.2.2 Regulations

Agricultural producers and other actors in the beef supply chain were not very familiar with regulations in the beef sector. Between 78-95% of all actors did not know any regulation. A smaller percentage of the agricultural producers, intermediaries, wholesalers, retailers, mobile vendors and institutional users mentioned the imposing of a fixed price to sell beef as a disturbing regulation while operating a business. Other mentioned regulations were to sell a certain amount and bound to sell in a specific day.

3.2.3 Institutional arrangements

All type of actors shared information on market price and market demand. Only intermediaries also shared information on quality standards. All type of actors shared information mainly in person or by phone calls. Around 20% of the agricultural producers, intermediaries, wholesalers and retailers used television, newspaper or social media daily to receive information. Related to this information access, all type of actors faced the same constraints which included a weak mobile phone network and insufficient internet access. Besides, wholesaler, retailers, institutional users and mobile vendors also mentioned the irregularity of newspapers as a constraint to get information access when operating a business.

The client can have demands related to the product. Cattle appearance was found to be the most desirable quality standards for beef, followed by health and safety. Cattle appearance included the colour, size and muscles of the cattle or beef, while safety included the use of hormones or the type of feed received.

Payment terms is mainly by cash directly by all type of actors. However intermediaries, retailers and wholesalers also received delayed cash payment without interest or payments by instalment. Major constrains in transaction with different actors included demand for specific breeds, delay in cash payments and transactions on credit.

3.2.4 Research infrastructure

The Bangladesh Livestock Research Institute (BLRI) aims to implement research and development activities towards achieving the GoB goal to ensure food – and nutritional security. Specifically, the GoB has projected to ensure intake of animal protein sources, among others 110 gram of meat per day, by 2021. Further major functions of BLRI include to solve bottlenecks associated with livestock and poultry farming, such as through developing new technologies for increasing productivity of the current industry (Nahar & Sarker, 2017).

The International Livestock Research Institute (ILRI) also operates in Bangladesh in projects for example about livestock and forage genetic resources. Other projects in the region that are relevant for Bangladesh include reducing agriculture-associated antimicrobial resistance and participatory value chain modelling of livestock sectors (ILRI, 2021).

3.3 Business services

3.3.1 Extension services

Extension services for beef producing activities in Bangladesh were not well structured. 20% of the agricultural producers got support from extension services. Services provided included receiving knowledge in rearing, fattening or cattle farming practices. 1 agricultural producer mentioned to receive training on youth development and 1 agricultural producer mentioned a milk-vita training[7]. 4 of these agricultural producers mentioned that the training was provided by a government programme. In total 5 agricultural producers were involved in governmental programmes.
The Department of Livestock Services (DLS) is largely responsible for providing a range of services in order to increase livestock production and productivity, maintain ecological balance, conserve biodiversity and improve public health. Services they offer include prevention and control of diseases, analyse animal feed, increase calf production, increase breeding, and extension of artificial insemination (WorldVision, 2018).

Only 6% of the intermediaries received training from extension services. The trainings included the prevention of anthrax disease or a beef fattening program. Only 2% took part in a government program that supported their business.
Wholesalers, institutional users and drivers did not get any support or training from extension services and did not join any government program. From the mobile vendors 1 respondent mentioned to receive support from extension services and 1 respondent mentioned to receive support from government program. However, as high as 22% of abattoir's personnel received support from extension services and received training on hygienic slaughtering of animals.

[7] Long term field-based technical assistance was provided to the Milk Vita dairy co-operative for a total period of about 15 years from the mid-1970's to the late 1980's. The objective was to help the government in its longer-term objective of raising the subsidiary agricultural income of small scale agricultural producers in relatively remote rural areas through the organisation of a sustainable co-operative dairy programme. From: http://www.fao.org/ag/againfo/themes/documents/LPS/DAIRY/DAP/milkvita/milkvita3.htm, viewed 26-2-2021.

In the workshop (20 March 2020) wholesalers and retailers further indicated to lack knowledge about how to identify healthy animals, and how to establish/estimate the weight of animals visually. As a result they may make low profits because of underestimating animal weight or overlooking diseased animals.

Cooperative structures, associations or micro-credit groups were not prominent in the current value chain. 77% of the agricultural producers and 86% of the intermediaries mentioned that there were no cooperative structures, even though 83% of the agricultural producers and 72% of the intermediaries stated that cooperative structures are a good idea as they can solve the cattle rearing problem together, receive training and loans, and receive a higher price for the cattle. Downsides of a cooperative like structure mentioned were time and money loss, and fraud. The other actors mentioned the same type of profits and downsides compared to the agricultural producers and intermediaries.

3.3.2 Input providers

Resource constraints and input constraints related to production, fattening and the care of cattle were related to the availability of feed and medicines for all actors. Furthermore all actors in the supply chain faced problems with the availability of labour and the lack of live cattle or beef, especially during high season, of which agricultural producers also experienced a lack of calves. Of the actors in the beef supply chain, mobile vendors and institutional users also mentioned the lack of specific beef from a certain breed.
Latest, slaughterhouses around the market are lacking and slaughterhouses lack availability of space. Although temperature controlled storage facilities are present in the beef supply chain, wholesalers mentioned the lack storage facilities as resource constraint.

From the workshop (20 March 2020), other challenges mentioned were the high price of inputs at production stage, eventually leading to high consumer prices. As a result of the high and increasing input prices, most cattle fattening producers only target the *Eid al-Adha* festival, and the supply to beef to the markets remains insufficient throughout the rest of the year. In addition, agricultural producers have limited knowledge and receive limited training about farming practices, which increases risks of unhealthy cattle and production losses.

3.3.3 Technological support

Different types of equipment were used during the breeding and fattening stage. In the cattle housing systems agricultural producers and intermediaries who breed or fatten the cattle used electric fans, water pumps or waterers, manger and/or cameras.
The actors that slaughter the animals did this based on the Halal method. None of these actors used a mechanical instrument, but they all used a manual knife only. Some of the abattoirs also used a manual hanging system and mentioned that the drainage system is not good anymore. So overall it can be concluded that no modern facilities were used.
The actors that stored the beef all had a temperature controlled storage facility available.
Furthermore institutional users used stoves, cutting machines, manual knifes and cookers, while mobile vendors used stoves, cutting machines, manual knifes, and digital balances.

3.3.4 Financial services

Financial services like loans and credits are used by all type of actors. 20-30% of the agricultural producers, intermediaries, mobile vendors and institutional users used loans or credits, 5% of the wholesalers and 87% of the retailers used it. They all used it to cover business expenses including the purchase of cattle or beef or for long- and short term family needs. Loans were taken from NGO's, associations, relatives or neighbours, or banks. Some loans had to be paid back without interest, while other loans had to be paid back by instalment with high interest or reasonable interest based on the interpretation of the actor. Agricultural producers, intermediaries and mobile vendors mentioned to pay the loan back with high interest, while institutional users and retailers mentioned to pay it back with reasonable interest. Receiving financing and credit or loans was mentioned as a resource constraint by intermediaries.

4 Results: Food availability

4.1 Food production

Many years Bangladesh was not self-sufficient with respect to beef production. A large part of deficit of animal and animal product was met by import of live animals from India (mainly). Meat consumption is increasing, but in the last few years the meat production (beef is not specified) is exceeding the demand according to DLS. The meat demand in 2019-2020 was about 7.4 million tons, whereas production yielded 7.7 million tons (DLS 2021). Experts think India's ban on cattle export[8] has encouraged many agricultural producers, traders and unemployed educated youths to take up cattle farming to steadily turn the crisis into an opportunity to attain cattle autarky. Nevertheless, there is import from frozen meat, which is increasing over the last few years. Bangladesh is preparing a ban on these imports to meet the internal resistance in the country of cattle-rearing groups[9]. They claimed 80-90% of the country's cattle production comes from rural agricultural producers, small and medium farms. If imported meat is easily available, this big number of people will plunge into poverty.
Cattle and buffalo are raised all over the country as shown in Figure 14.

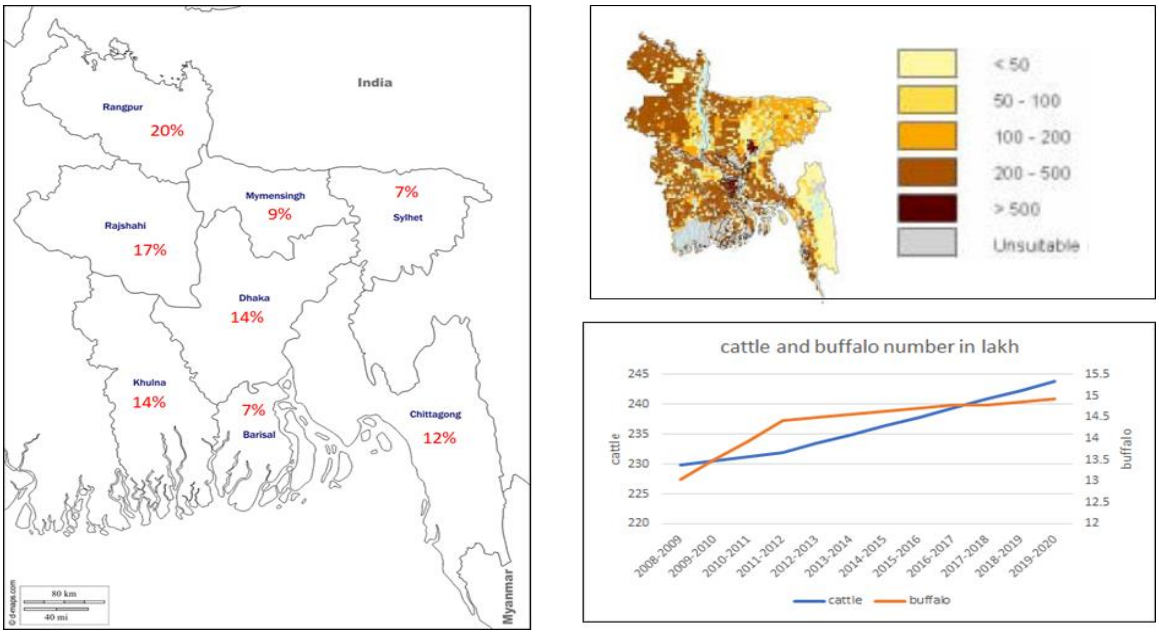


Figure 14 Overview of areas with and amount of cattle and buffalo (left: share of number of cattle and buffalos in Bangladesh per region in 2008 (BBS 2008); upper-right: cattle density per square km (FAO and AGAL 2005); lower-right: development of cattle and buffalo between 2008-2020) (DLS 2021)

Although the location-related data are not from recent years, they are assumed to be indicative for the distribution over the country. The number of buffalos is about 6% of the cattle; in 2019-2020 there were 1.5 million buffalos and 24.4 million cattle in Bangladesh.
The breeds of livestock available in Bangladesh are (i) local breed of cattle: non-descript indigenous type, Red Chittagong Goyal, Pabna Cow; (ii) Exotic: Hariana, Sindhi, Shahiwal, Jersey, and Holstien-Friesian; (iii) Hybrid: Bos indicus'Bos taurus. The most preferred breed are the Holstein Friesian local cross, followed by Sahiwal and then the Non-descriptive deshi breed.[10]

[8] https://www.dhakatribune.com/bangladesh/2019/08/10/india-s-ban-on-cattle-export-a-blessing-for-bangladesh, viewed 24-2-2021
[9] https://www.euromeatnews.com/Article-Bangladesh-prepares-ban-on-meat-imports-due-to-self-sufficiency/3587, viewed 24-2-2021
[10] http://en.banglapedia.org/index.php/Livestock, viewed 23-2-2021

Another important element in animal production is feed. The small agricultural producers generally feed their cows with home-made feed such as rice straw which is often mixed with broken rice, rice husk, maize and molasses to feed the cow. Often the cows are malnourished as they are not fed proper nutritious feed. Some agricultural producers do not have space to grow their own feed and they have to buy it. Hay, Napier grass, rice bran and husk are usually sold in the local market. However, in the interviews it was mentioned that the high price of feed was a major problem. In a cost analysis of fattening a cow for 6 months the purchase price and feed costs were 70% and the feed 24% of the total costs respectively (WorldVision 2018). There are low cost alternatives such as Urea Molasses Block which can be used but are not practiced by the agricultural producers. Including a diversified diet with more protein can improve the development of bulls and thereby increase the profitability of agricultural producers.

Next to feed, healthcare is crucial for animal husbandry. DLS provides healthcare (vaccination monitoring of diseases and artificial insemination (AI)) to domestic livestock through upazila[11] livestock extension offices and district veterinary hospitals. AI services are provided via upazila sub-sector and Union points. The cows are generally vaccinated and dewormed regularly. Unfortunately, the awareness of these extension services is decreasing with the distance of the farm to these service locations.

In many regions, cattle smallholders need help to solve their problems related to nutrition, disease, meat quality improvement and cattle marketing. Agricultural producers watch that their cattle are not growing in spite of feeding all day long, health is not improving in spite of available treatment, cows are not conceiving in spite of repeated AIs. They have no access to analytical and diagnostic facilities to ascertain the reasons and their remedial measures. Support is required from DLS on the organizational part as well as the Bangladesh Livestock Research Institute (BLRI) on the technology part. In Hassanullah (2013) it says that currently this support is limited due to inadequate field personnel, logistics and funding.

Remark: note that a cow or buffalo provides various marketable products like hide, skin and leather. Although they contribute significantly to the feasibility of cattle farming, these are not considered in this study.

To put the local cattle and beef production in perspective a SWOT analysis is applied based on the results found in the literature study, workshop and interviews (Table 10).

[11] Upazila is an administrative region in Bangladesh. It functions as sub-unit of districts.

Table 10 Sampling districts production contribution

Strength	Opportunity
• Almost all households have dairy cows, who can give birth to male calves suitable for beef fattening via AI • Cattle production is increasing and has a surplus in the last few years	• Breed selection • With the increasing population, the demand for beef is ever increasing • Significant scope for women and youth involvement • Support from BLRI and DLS to improve cattle farming • Local breed more healthy • Promotion of commercial cultivation of Napier/Pakchong to be sold in the market
Weakness	**Threat**
• Disease prevalence • No knowledge about feed preservation • Do not follow proper rearing practices • Less farm mechanization • High cost of feed • High labour costs • Lack of medicine and vaccine • Scarcity of land for fodder production • High buying cost of cattle • Poor growth rate. Lack of knowledge (identifying appropriate inputs) • No access to high value markets • No linkage to meat processors • Very limited support from extension services • Manual farm operation • Insufficient veterinary support • Less Cooperative approach • Lack of modern communication channel • Less training	• High input cost • Interrupted supply of inputs • reduced fodder land for population growth • High transport costs • Extortion during transport • Natural calamities such as flash floods often kill the bulls and destroys sources of cattle feed

Combining elements from Table 10 the following main issues come forward.

Market price: the price for beef is stable. However, the price becomes high during *Eid al-Adha* festival.

Farm activities: from inputs to sales the average Bangladesh cattle producer lacks technology, knowledge and support. In the rural areas extension services are hardly present, and the need for support is there on many levels. It starts with lack of and high input costs of feed, medicines and vaccines. Although few mechanization is used in the farm, grass cutter is not available. Due to high labour costs and a shortage of labour capacity, it is difficult for an agricultural producer to manage the farming.

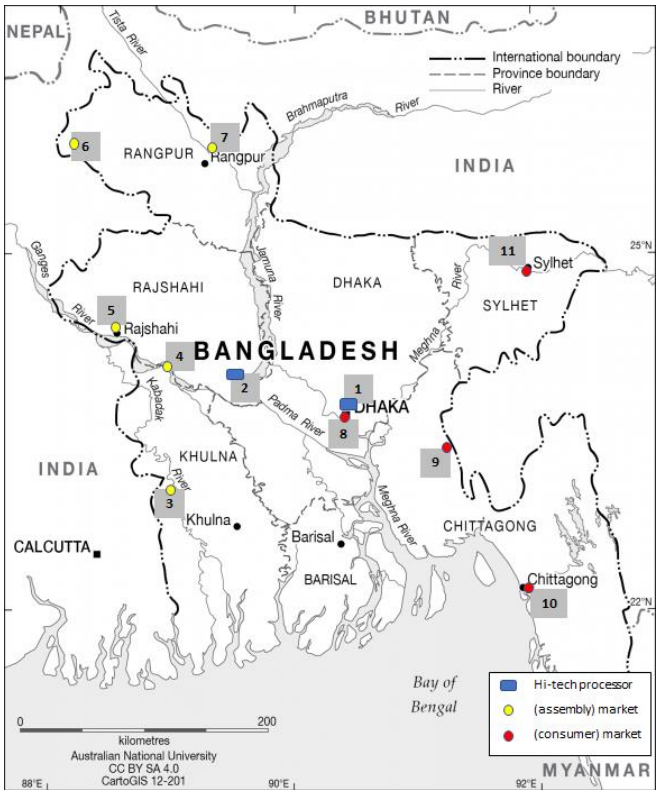
4.2 Food distribution

The distribution of cattle starts at farm level. Agricultural producers either sell their produce in a haat[1] locally, inter districts or from farm gate to intermediary. The agricultural producers sell when they feel need of cash or to get highest profit. To get high profit they sell when the cattle reached to highest growth which is an average 240-350 kg depending on the breed and age of the cattle. The *faria* are very much connected with the agricultural producers and they go from household to household and buy cattle from the agricultural producer. Wholesalers in local market meet the *faria* in local market and buy cattle from them. Drivers go from agricultural producers to agricultural producers, agricultural producer to wholesaler and retailer or from wholesaler to retailer, and drive between 26 and 400 km (see Table 11).

Table 11 Distances (in km) travelled by the drivers in the project sample[12]

To / From	Dhaka	Faridpur	Pabna	Sirajgonj	Chittagong	Narayanganj	Cumilla	Norshingdhi	Kushtia	Chuadanga	Khulna
Dhaka							100	50			
Faridpur	117								92	116	158
Shirajgonj			64								
Pabna	153				389	169					
Chuadanga	231	116									
Khulna											
Munshigonj						26					
Cumilla						92					

The main flow (about 40%) of the cattle is along the so-called hard-core grid and constitutes of four wholesale cattle markets located in the large consumer markets namely Gabtoli in Dhaka, CDA market in Chittagong, Kazir haat in Sylhet and Chakbazer in Comilla (see Figure 15). This grid is also extended to Barisal. From supply side there are a few large assembly markets such as Satmail in Khulna, Arankhola in Pabna, City market in Rajshahi, Haripur in Thakurgaon, and Patgram in Lalmanirhat districts, which are linked with the grid. They used to connect imported animals from India to the core grid, but currently are significant cattle markets themselves (Hassanullah 2013). Figure 16 shows the Satmail market.



Processing
1. Deshi meat
2. Bengal meat

Cattle markets
3. Satmail
4. Arankhola
5. City market
6. Haripur
7. Patgram
8. Gabtoli
9. Kazir hat
10. CDA market
11. Chakbazer

Figure 15 The main grid for cattle distribution in Bangladesh

[12] https://www.google.com/maps Accessed 23 February 2021

Figure 16 Satmail cattle market in Jessore (July 2020)[13]

Transport: Logistics is an issue in many ways. The logistic costs are high, due to bribing and huge traveling times. Truck owners feel compelled to make facilitation payments to traffic police and labour unions to ensure smooth passage through different districts. Especially for long distance deliveries the impact is immense. Congestion impedes normal driving speed, even on highways. The average speed of a truck is between 25-30 km/h on the highway from Dhaka to Chittagong (see Table 12) (Herrera Dappe et al. 2019). A detailed analysis on logistics by the World Bank shows that the average truck speed in the country is 19 km/h.

Table 12 Speed statistics for trucks in Bangladesh (Herrera Dappe et al. 2019)

	MEAN		MINIMUM		MAXIMUM	
VARIABLE	UNCONGESTED	ACTUAL	UNCONGESTED	ACTUAL	UNCONGESTED	ACTUAL
Distance (kilometers)	113	114	20	20	318	306
Duration (hours)	2.8	18.0	0.7	2.5	7.4	96.2
Speed (kilometers/hour)	40	19	20	0.4	60	36

Source: World Bank analysis.

Slaughtering: Just under half of the animals slaughtered for beef are old cows, which are no longer productive in milk production. Bulls are mostly slaughtered for the Muslim holiday *Eid al-Adha*, when about half of the cattle consumed (6 million animals out of 10-11 million animals slaughtered in 2017-2018) are slaughtered on one day, when religious rites require families to sacrifice a bull. Slaughtering six million bulls, as well as other animals, on a single day, far exceeds the capacity of all of the slaughter facilities in the country. On this day, slaughtering occurs in homesteads and on roadsides, by untrained individuals. As a result, the open disposal of animal waste in the streets poses challenges for public health and safety, as well as creating environmental hazards. Further, since the hides are removed by untrained hands, the resulting products prepared by the tannery industry are of lower quality. The meat sellers and butchers said they were compelled to slaughter animals in such conditions, as the abattoirs were very few in number and located far away from the kitchen markets. "The existing practice of slaughtering and processing the animals in the city can severely infects meat with germs and other hazardous elements."

Only about 30% of the cattle that are slaughtered in Dhaka are slaughtered in official slaughter facilities, and only about 20% in the other major cities, with few to none being slaughtered in official facilities in the peri-urban and rural areas. The other slaughtering occurs in unofficial and unregulated sites, without veterinarian supervision. Even in the official slaughter facilities, the conditions of slaughter prevent the preparation of uncontaminated, safe meat according to basic food safety standards. Most of the slaughterhouses are lacking basic amenities such as light, ventilation and water. Due to the scarcity of water, butchers cannot wash carcasses and clean slaughterhouses properly (see Figure 17). They often clean carcasses manually carrying water in a bucket. They clean the stomach in the pond resulting in huge water contamination.

[13] https://www.dhakatribune.com/bangladesh/2020/07/27/sales-of-sacrificial-animals-for-eid-ul-azha-to-drop-by-30-to-40, viewed 25-2-2021

The slaughtering and carcass-dressing processes are performed in open areas in highly unhygienic conditions and the meat is sold with little or no veterinary inspection. Carcasses are prepared in unhygienic conditions in local slaughterhouses. In rural and urban areas, towns and even in cities, the slaughtering of animals is still done by unauthorized butchers in fields, bushes, backyards or roads, where killed animals are eviscerated and dressed.

Figure 17 Abattoir in Firingi Bazar in Chittagong[14]

The modern slaughterhouses are fully mechanized and furnished according to the latest standards of efficiency and food safety. They also perform well on by-products like the leather industry by keeping the hides undamaged. No leftover of sacrificed cattle such as blood, dung and bone would be wasted, as these could be used as important raw materials for different industries.

On the supply side beef is the main contributor to the meat availability in Bangladesh, noting that half of its volume is consumed at the *Eid al-Adha* festival. The meat supply in Bangladesh in 2017-2018 is shown in Table 13.

Table 13 Meat supply in Bangladesh in 2017-2018 (DLS 2019)

Livestock	National livestock population	% slaughtered annually	Number slaughtered	Smuggled into the country	Total number slaughtered	Carcass weight (Kg)	Meat supply (MT)	% of meat supply
Cattle	24,086,000	40.00%	9,634,400	300,000	9,934,400	146.25	1,452,906	65.45%
Buffalo	1,485,000	40.00%	594,000	0	594,000	211.25	125,483	5.65%
Sheep	3,468,000	35.00%	1,213,800	0	1,213,800	19.50	23,669	1.07%
Goats	26,100,000	55.00%	14,355,000	0	14,355,000	19.50	279,923	12.61%
Poultry	337,998,000	100.00%	337,998,000	0	337,998,000	1.00	337,998	15.23%
TOTAL			**363,795,200**		**364,095,200**		**2,219,978**	

[14] https://www.dhakatribune.com/bangladesh/2016/11/02/public-health-risk-lack-abattoirs, viewed 25 February 2021

The SWOT analysis for cattle and beef distribution in Bangladesh is shown in Table 14.

Table 14 SWOT for Bangladesh cattle and beef distribution

Strength	Opportunity
• Distance to market is relatively small on average, since cattle is nationwide available • Urbanization will put more focus on food safety • Supply of beef is high and the country is self-sufficient	• Export, since surplus in cattle is increasing
Weakness	**Threat**
• Unhygienic condition of market place • Lack of place in the market • No authorized supervision in most cases of slaughtering • No permanent business relations	• Trend of convenience food is too slow to boost improved supply chains and export • Decrease in price if oversupply grows without market development

4.3 Exchange

Beef fattening has become an important business for smallholder agricultural producers in Bangladesh, due to increasing demand for meat. Total meat intake in Bangladesh has been increasing significantly over the years and equals 120 gram/day/head in 2019-2020 (DLS 2021). Beef is not eaten as many times as other main animal products as shown in Table 15, but still the vast majority eats beef at least once a week.

Table 15 Consumption frequencies of various animal products (Islam et al. 2018)

Frequency	Fish(%)	Chicken(%)	Beef(%)	Mutton(%)	Egg(%)
Once daily	59	62	7	30	77
2-5 times a week	39	24	26	23	13
Once a week	1	8	48	18	6
Once every two weeks	1	6	6	5	4
No consumption	0	0	13	24	0
Total	100	100	100	100	100

The FAO-UNIDO (2019) notes that the DLS estimation of meat supply is more likely representative of the total body weight of the herds available for slaughter, but not on the actual meat available to consumers. The actual per capita consumption of meat in Bangladesh is 36.9 gr/day. A small sample of consumers (30) in Hassanullah (2013) estimated the beef consumption to be 60 gram/day/head. Many consumers, particularly in rural and peri-urban areas, report consuming no beef except during the festival. Beef consumption is higher and more consistent in urban areas.

The traditional channel accounts for nearly 93% of the beef supply in Bangladesh, which has remained dominant. In this traditional channel there are generally three types of markets of cattle in Bangladesh, which are local market (haat), regional market and national markets. These markets are functioning with three major types of buyers, namely: Regional intermediaries, national intermediaries and butchers. Majority of these cattle are sold through the informal market and this represents an upgradation scope to link the smallholder agricultural producers with large institutional meat processors.

The workshop and interviews provided a lot of information on the exchange of cattle and issues related to buying and selling. About 72% of the agricultural producers did not use loans, and about 28% did use it for farming and family need. Loans were taken from NGOs, banks, sometimes or relatives, most of them with high interest, some with none. High prices for inputs and labour are the main drivers for loans. Cattle agricultural producers sold to market directly in most cases, but they hardly sell on contract basis (5%). The payment is directly by cash in almost all cases except very few delay payments without interest. For all buyers, cattle weight was the main driver for price, followed by gender, health and breed consecutively.

It is known that some actors may have several roles, and for instance if an intermediary or their employees are transporting themselves, they are a 'driver' as well. Especially for short distances intermediaries arrange the transport themselves, since volumes are much smaller and the time effort is restricted. The payment for hired transport is done after (93.3%) or before transport (46.7%). Problems the hired drivers encountered were payment in instalment and transaction in credit. In case of transaction in credit the payment does not involve exchange of cash (by cash, debit- or credit card) at the time of occurrence of the transaction, but is settled in cash at a subsequent date.[15]

Wholesalers were buying directly from agricultural producers in the local haat in most cases to obtain significant volume to sell. Like intermediaries they work seven days a week, however, some were involved specific day wise purchase and sale 95% purchase live cattle and sell beef. The price (buying and selling) is determined by colour, size, muscle and healthy appearance of cattle. About 70% of the wholesalers were paying for transport from origin to their location. They sell to retailers, vendors, consumers, out of home institutions (hotels/restaurants) and live animal to butchers who again sell to wholesalers. For 55% of the wholesalers delayed payment was an issue, and 40% suffered from instalment type payment and 15% transaction in credit. Demand for a specific breed is an important issue affecting wholesalers.
Many wholesalers did not like to take loans or credit facilities. From the interviews 95% of the respondents did not take loan for trading and 5% of the respondents said they used loans, mainly from neighbour or relatives, to purchase input like live cattle or beef.

Retailers purchased their live cattle mostly from agricultural producers, intermediaries and wholesalers. Among them 95% of the retailers sold beef to their clients who were mostly household consumers, hotels and restaurants. A small amount was sold to mobile vendors and to consumers directly. Likewise to other actors, retailers work seven days a week in general. Most retailers did not take loans, but when they did mostly it was used for buying products and family need. Relatives were the main service provider in this context.

Institutional users, like hotels and restaurants, purchased beef from wholesalers and retailers. The payment depends on quality, portion size, weight and safety. Mobile vendors purchased mainly from wholesalers. Most of these entities did not use loans. Both in rural or urban areas, consumers prefer to buy freshly slaughtered beef directly from butchers in the wet markets.

In overview, all actors, but agricultural producers, deal with the same issues and operate in a similar way with respect to quality, pricing and payments.

Price fluctuation is minimal when reviewing the prices of kg beef in 2020 compared with 2019. The average prices for both years per actor and type of cattle are provided in Table 16.
Within the interviews the fluctuation of the price in the beef chain and sudden drops in prices were mentioned as bottlenecks.

Table 16 Price (Tk) of beef/kg for 2020 and 2019

Breed of cattle	Agricultural producers	Intermediaries	Wholesalers	Retailers	Vendors	Institutional users
Pabna cattle	469-463	565-544	510-507	549-547	470-519	577-573
Red Chittagong	550-475	478-548	495-485	566-564	545-533	-
Sahiwal	497-501	527-528	550-520	560-550	513-493	-
Sindhi	500-460	566-572	520-500	550-525	-	-
Holstein Friesian local cross	502-484	577-576	516-519	548-536	559-549	554-539
Non-descriptive Deshi	506-482	501-504	522-524	553-544	547-546	549-535

[15] https://www.termscompared.com/difference-between-cash-transaction-and-credit-transaction/, viewed 26-2-2021

The modern channel is existing in Bangladesh also but it is not the mainstream. There are only two companies, Bengal Meat and Deshi Meat[16], leading the industrial processing sector. The fresh and processed products are sold through retail stores, supermarkets, restaurants and hotels. Meanwhile, since the price is not competitive internationally, the company also has difficulties in exporting, but progress is made. Cattle meat is exported to Middle East countries and the Maldives on a very small-scale, largely due to the inability of the company (working in partnership with the government) to guarantee that the meat confirms with international food safety standards, given the uncontrolled situation of cattle disease in Bangladesh.
As claimed, both are processing Halal way and safe or organic meat. Their processing capacity is 200 and 25 respectively. At present they claim to operate at 25% and 20% capacity respectively. Smallholders are not likely to meet their standards of bull as well as supply conditionality. They depend on suppliers (Hassanullah 2013). In general, this channel is still marginal.

The SWOT analysis for cattle and beef exchange in Bangladesh in shown in Table 17.

Table 17 SWOT for Bangladesh cattle and beef exchange

Strength	Opportunity
• Most actors do not require loans (except a share of smallholders) • Cattle is profitable for all actors • Agricultural producers are paid in cash	• Export development
Weakness	**Threat**
• No market rules and regulation • High share of transport costs in cattle price • Price fluctuation • No grading system of cattle	• Consumption decreasing because of high price

[16]http://www.theindependentbd.com/post/212545#:~:text=Once%20highly%20dependent%20on%20Indian,quiet%20revolution'%20in%20animal%20husbandry, viewed 24-2-2021

5 Conclusions

This report presents the results of a value chain analysis for beef in Bangladesh. This study offers relevant indications for FLW hotspots in the chain. Reducing FLW enhances the amounts of food that reaches consumers, and therefore contributes to improving food availability.

FLW takes place at various links of the value chain. Part of the beef cannot be sold and cannot go to the intended market. The main reasons for losses at producer level are high mortality rates due to stillborn, weak calves, illnesses and diseases. At intermediary level mortality also happens due to diseases or illnesses, or due to injuries during transportation (Table 18).

Table 18 Reasons for losses in the beef value chain in Bangladesh.

Purchased input	No. of cattle/year or kg beef/year purchased	Actor	Sold output	Food loss/unsold	Reason loss/unsold
Calves	0.6	Producer	Cow	Mortality on average (in %): 8% breeding cattle, 21% calves and 2% fattening cattle	Mortality due to stillborn, weak calve, illness, disease
Cows	91	intermediary	(fattened) Cow	Mortality on average (in %): Max. 15% fattening cattle	Mortality due to illness, disease, injury during transportation
Cows	93	Wholesalers and wholesale butchers	Cattle	-	Bad work accuracy, bad quality meat, but often still sold/consumed
Bulls	1,153		Beef	<5%	
Cows	28	Retailers and retail butchers	Cattle	-	Bad work accuracy, bad quality meat, but often still sold/consumed
Bulls	331		Beef	<5%	
Beef	8,525 kg				
Beef	13,764 kg	Mobile vendors	Processed beef	<5%	Lack of customers, but often still consumed
Beef	3,469 kg	Hotels	Processed beef	<5%	Lack of customers, but often still consumed
Cows	21	Abattoirs	Beef	Unknown	Unknown
Bulls	241				

Mobile vendors handle the largest amounts of beef, followed by retailers and retail butchers, and hotels. Wholesalers and wholesale butchers handle the largest number of bulls, followed by retailers and retail butchers, and abattoirs. Estimated losses are generally below 5%. At the wholesale, retail, mobile vendor and hotel levels, products that do not have the right quality for the intended market are often still sold below market price or consumed. This is therefore not regarded as FLW.

The high mortality rates of cattle at producer and subsequently at intermediary level are the greatest source of FLW for the beef value chain in Bangladesh. Reasons for high mortality are primarily diseases, often associated with bad animal husbandry practices, but also with seasonal climatic conditions. Agricultural producers further suffer from unavailability or high prices of inputs such as feed, labor, and veterinary services such as AI and/or medicines. Additionally, poor knowledge on recognizing diseased animals among agricultural producers and intermediaries is common.

The enabling environment also contributes to inefficiencies, particularly extortion and bribery hampers smooth execution of the various value adding stages and transportation. Further, extension service provisioning does not reach agricultural producers well.

Uncontrolled imports of cattle and beef result in periods of undersupply and oversupply. Beef is most popular with 65% of the total meat consumption in Bangladesh. Overall Bangladesh is self-sufficient with respect to cattle production and consumption. However at the festival of *Eid al-Adha* half of the annual cattle slaughtering and consumption takes place, which is leading to capacity problems.

During slaughtering the food safety is not well taken care of and current slaughtering practices raise food safety concerns. Currently the mainstream slaughtering is carried out without any supervision or inspection. Besides, there are not enough well-equipped and supervised slaughterhouses in Bangladesh and the location is often unfavourable. For this reason many actors and butchers slaughter the cattle at the road- or market side, which makes supervision even more difficult.

The main strengths of the current beef sector are that currently beef that did not go to the intended market still reaches consumers, albeit at a lower price. Further, the sector shows potential through its great numbers of agricultural producers whose farming systems are dominated by low cost beef fattening in combination with the large number of domestic consumers.

Promising opportunities for optimizing the beef sector are 1) through technical support on breeding, rearing, and caring for beef cattle, including diseases, to increase the production of cattle and beef and reduce mortality at production and intermediary stages, 2) support cooperative structures to organize actors, 3) promote cultivation of (Napier) grass for cattle as a potential income generating activity, and 4) tap in to the growing national demand for fresh and processed beef as well as the global demand for halal meat.

6 Recommendations

The four Dhaka city corporations are responsible for interventions that can be applied within the borders of their districts and have a regulatory starting point. They have impact on the local (market) regulations, including monitoring, prices, syndicates and food adulteration. However the city corporations can also facilitate and stimulate the private sector to invest in new proven interventions or in the implementation phase, or set the agenda for long term goals that have to be implemented in collaboration with the government of Bangladesh (GoB). For this reason the recommendations for a strategic action agenda are provided below and can have different potential implementors including the government of Bangladesh (GoB), city corporation (CC), specifically Gazipur city corporation (GCC), since it is a peri-urban area with some cattle production, the private sector (PS), or a combination of these actors, dependent on their responsibilities.

In general we recommend that improving the beef supply chain should go beyond decreasing FLW and improving food availability. Moreover, the strategy should consider as well the FLW induced trade-offs like the GHG emissions and be linked to climate mitigation strategies for the long term.

Short-term recommendations:

- Timely provision of high-quality inputs to agricultural producers—particularly feed, medicine and vaccine (PS, GCC & GoB)
- Cooperative like structure can help agricultural producers for better access to farm inputs and for better information sharing (PS, GCC & GoB).
- Utilization of by-products and cow dung (PS, GCC & GoB).
- Provide technical support on breeding, rearing, and caring for beef cattle, including the recognition and prevention of diseases, to increase the production of cattle and beef and reduce mortality at production and intermediary stages (GCC & GoB).
- Awareness creation for buying safe and quality meat. This will improve the supply chain on these issues (GoB & CC).
- Cold storage facilities installation for meat prepared and unsold (PS & CC).
- Slaughterhouses should have supervision of Veterinary Doctor and Huzur[17] for slaughtering. Slaughtering, disease control and feed acts should be strictly implemented (CC).
- Lowering the feed cost, increase production and preservation of cattle feeds & fodder (PS & GoB).
- Improvement of market facilities. Support making review of their business operations and accordingly design intervention package and encouraging new entrepreneurs to invest through loan and technical support package (CC & GoB).

Medium-term policy recommendations:

- Increase the number of slaughterhouses, to start in urban areas, where the consumption is year-round, and educate enough personnel for supervision (PS & CC).
- Set up feed support programs to help agricultural producers to be more self-sufficient (GoB).
- Timely, adequate, and accurate information is the basis for policy formulation and decision making, but there are often major discrepancies in the information and data on agricultural production reported by the two government agencies responsible for collecting it—the

[17] Huzur is commonly addressed to Islamic educated persons who performs group or mass prayers and also slaughter animals in Islamic way called halal meat without which it is not edible to Muslim

Bangladesh Bureau of Statistics (BBS) and the Department of Agricultural Extension (DAE). Measures should be taken to reconcile the data reported by these agencies, improve their quality, and minimize their delivery time (GoB).

- Develop an information and communication system among the agricultural producers (GoB & PS).
- Support with credit and technical assistance identification of export market and creation of safe and hygienic facilities (PS & GoB).
- Encourage and support arranging circular flows (e.g. fruits and vegetables from several actors) to tackle part of the feed shortage (CC & PS).
- Anticipate on two major trends: cattle surplus will stimulate both export and urbanization. Both trends require high-level supply chains with respect to food safety, traceability but also with respect to added value like packaging, frozen end assorted meat (GoB, PS & CC).

Long-term policy recommendations:

- Make use of the existing Special Economic Zones to facilitate beef export competitiveness (GoB).
- Transportation system and facilities should be developed and the government should take necessary steps to avoid additional cost during transportation. The Padma Bridge is a good example as the first fixed river crossing for road traffic. It will connect the south-west of the country, to northern and eastern regions (GoB & CC).

Literature

Ahmed, T., Hashem, M.A., Khan, M., Rahman, M.F. & Hossain, M.M. (2010). Factors related to small scale cattle fattening in rural areas of Bangladesh. Bangladesh Journal of Animal Science, Vol. 39 No 1&2, pp. 116-124.

Awal, M.A. & Bari, E. (2016). Report on product feasibility for two cooperatives in Bhairab, Kishoregonj, Bangladesh. http://www.heiferbangladesh.org/images/resources/study_report/Study-on-Product-Feasibility.pdf Accessed 23 February 2021.

BBS (Bangladesh Bureau of Statistics) (2010). Census of agriculture 2008: Structure of agricultural holdings and livestock population. National series. Volume 1.

DLS (Department of Livestock Services) (2019). Livestock Economy at a Glance. http://dls.portal.gov.bd/sites/default/files/files/dls.portal.gov.bd/page/ee5f4621_fa3a_40ac_8bd9_898fb8ee4700/Livestock%20Economy%20at%20a%20glance%20%20%282017-2018%29.pdf Accessed 23 February 2021.

DLS (Department of Livestock Services) (2021). Livestock Economy at a Glance. http://dls.portal.gov.bd/sites/default/files/files/dls.portal.gov.bd/page/ee5f4621_fa3a_40ac_8bd9_898fb8ee4700/2020-07-22-19-34-e4cd5ed65f45419ee038e00b8939c1a0.pdf Accessed 23 February 2021

Etzold, B. (2008). Street Food in the Megacity Dhaka: How can we conceptualize its role within the megaurban food system. *Resilience and Social Vulnerability*, *30*.

FAOSTAT. (2019). Livestock Primary for Bangladesh. http://www.fao.org/faostat/en/#data/QL Accessed 23 February 2021.

FAO-AGAL (2005). Livestock sector brief - Bangladesh. http://www.fao.org/ag/againfo/resources/en/publications/sector_briefs/lsb_BGD.pdf Accessed 25 Februari 2021.

FAO-UNIDO. (2019). The dairy and beef value chain in Bangladesh: Diagnostics, investment models and action plan for development and innovation. https://www.unido.org/sites/default/files/files/2019-05/Bangladesh%20dairy%20and%20beef%20vc%20report%20%28Wei%27s%20final%20version%29%20.pdf Accessed 23 February 2021.

Guo, X., Broeze, J., Groot, J.J., Axmann, H. and Vollebregt. M, (2020). A Worldwide Hotspot Analysis on Food Loss and Waste, Associated Greenhouse Gas Emissions, and Protein Losses.

Gustavsson, J., Cederberg, C., Sonesson, U., Van Otterdijk, R., & Meybeck, A. (2011). Global food losses and food waste.

Hasan, M. R., Haque, S., Islam, M. A., & Hoque, M. N. (2007). Marketing System of Some Selected Vegetables in Bangladesh. International Journal of BioResearch, 46-51. https://www.researchgate.net/publication/335000855_Marketing_system_of_some_selected_vegetables_in_Bangladesh

Hasan, A.H.R. and Naim, S.J. (2018). The Vegetable Supply Chain of Bangladesh: Is it Capable to Meet the Requirements of International Trade? https://www.researchgate.net/publication/328555471_The_Vegetable_Supply_Chain_of_Bangladesh_Is_it_Capable_to_Meet_the_Requirements_of_International_Trade

Hassanullah, M. (2013). Report on Beef Value Chain Study in Bangladesh. Heifer International Bangladesh. http://www.heiferbangladesh.org/images/resources/study_report/beef_value_chain_study_in_bangladesh.pdf 1 Accessed 23 February 2021.

Herrera Dappe, M., Kunaka, C., Lebrand, M., & Weisskopf, N. (2019). Moving Forward: Connectivity and Logistics to Sustain Bangladesh's Success. The World Bank.

Huque, K. S., & Khan, M. Y. A. (2017). Socio-geographic distribution of livestock and poultry in Bangladesh-A review. Bangladesh Journal of Animal Science, 46(1), 65-81.

ILRI International Livestock Research Institute. (2021). ILRI Projects in Bangladesh. https://www.ilri.org/where-we-work/south-asia/bangladesh Accessed 23 February 2021.

Islam, M.J., Sayeed, M.A. & Akhtar, S. (2018). Consumers profile analysis towards chicken, beef, mutton, fish and egg consumption in Bangladesh. British Food Journal, Vol. 120 No. 12, pp. 2818-2831.

Jafor, M.A. (2019). Scenario of slaughterhouses and meat selling centers in Dhaka City. MSc thesis submitted to the Faculty of Animal Science & Veterinary Medicine, Sher-e-Bangla Agricultural University, Dhaka. http://www.saulibrary.edu.bd/daatj/public/index.php/getDownload/Done-SCENARIO%20OF%20SLAUGHTERHOUSES%20AND%20MEAT%20SELLING%20CENTERS%20IN%20DHAKA%20CITY_11.pdf Accessed 23 February 2021.

Kabir, F.H.M.H. (2017). Bangladesh's per capita protein consumption soars: Intake of eggs, chicken jumped in last six years, BBS survey shows. https://thefinancialexpress.com.bd/trade/bangladeshs-per-capita-protein-consumption-soars-1509251853 Accessed 23 February 2021.

Nahar, T.N. & Sarker, N.R. (2017). BLRI Bangladesh Livestock Research Institute: A Brief Acquaintance. http://www.blri.gov.bd/sites/default/files/files/blri.portal.gov.bd/page/1dade392_bf86_4efa_a8d0_58ba5a490e64/BLRI%20Acquantance-16%20PDF%20(1).pdf Accessed 23 February 2021.

Van Berkum, S., Dengerink, J., & Ruben, R. (2018). The food systems approach: sustainable solutions for a sufficient supply of healthy food (No. 2018-064). Wageningen Economic Research.

Wondmeneh, E., Van der Waaij, E.H., Udo, H.M.J., Tadelle, D. and Van Arendonk, J.A.M. (2016). Village poultry production system: perception of agricultural producers and simulation of impacts of interventions. African Journal of Agricultural Research, Academic Journals, Vol. 11 No. 24, pp. 2075-2081.

WorldVision. (2018). Value Chain Assessment at National Level for World Vision Bangladesh. https://reliefweb.int/report/bangladesh/final-report-value-chain-assessment-national-level Accessed 23 February 2021.

Zaman, M. (2019). Future of Dhaka as a mega city: Lessons from Shanghai-Pudong experience. https://thefinancialexpress.com.bd/views/views/future-of-dhaka-as-a-mega-city-lessons-from-shanghai-pudong-experience-1557328522 , accessed 24 February 2021.

To explore the potential of nature to improve the quality of life

Wageningen Food & Biobased Research
Bornse Weilanden 9
6708 WG Wageningen
The Netherlands
www.wur.eu/wfbr
E info.wfbr@wur.nl

Report 2216

The mission of Wageningen University & Research is "To explore the potential of nature to improve the quality of life". Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 6,800 employees (6,000 fte) and 12,900 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.