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VALUE CHAINS FOR NUTRITION IN SOUTH ASIA: WHO DELIVERS, HOW, AND TO WHOM?

Editors Mar Maestre and
Nigel Poole



Notes on Contributors	iii
Introduction: Value Chains for Nutrition in South Asia: Who Delivers, How, and to Whom?	
Mar Maestre and Nigel Poole	1
Private Business-Driven Value Chains and Nutrition: Insights from India	
Rohit Parasar and Bhavani RV	21
Business-Based Strategies for Improved Nutrition: The Case of Grameen Danone Foods	
Jessica Agnew and Spencer Henson	39
Going Against the Grain of Optimism: Flour Fortification in Pakistan	
Natasha Ansari, Rashid Mehmood and Haris Gazdar	57
Food Distribution Value Chains under the Integrated Child Development Services	
Bhavani RV and Rohit Parasar	73
'Milk for Milk, Water for Water': Analysing Pakistan's Dairy Innovation	
Natasha Ansari, Rashid Mehmood and Haris Gazdar	91
Building Dairy Value Chains in Badakhshan, Afghanistan	
Nigel Poole	107
<u>A Study on Milk Value Chains for Poor People in Bangladesh</u>	
Md. Abid Ul Kabir, Md. Sirajul Islam and Md. Hasib Reza	129
Focus on Gender, Context, and Evidence: CARE's Lessons Learned	
Emily Janoch, Elly Kaganzi and Thomas Schaetzel	147
Glossary	163

A Study on Milk Value Chains for Poor People in Bangladesh

Md. Abid Ul Kabir, Md. Sirajul Islam and Md. Hasib Reza

Abstract Child and maternal undernutrition is still prevalent in Bangladesh and poor dietary diversity is one of the major causes. While milk can contribute to nutritional requirements, currently availability in Bangladesh is 126ml/person/day, whereas recommended consumption is 250ml/person/day. This case study was conducted to identify existing milk value chains and the milk consumption behaviour of poor people. Priority was given to women and children as they are the most vulnerable in both rural and urban areas. It was observed that both formal and informal value chains coexist where milk collectors and chilling centres have a lead role. At the household level, milk purchase decisions are usually taken by men in rural areas, whereas in urban areas women take part equally in the process. Government and private sector initiatives can play a role in increasing milk production and consumption through greater investment. Behavioural change communication is also vital to build awareness of milk consumption.

Keywords: dairy value chain, nutrition, milk consumption, milk preference, women and children, milk price.

1 Introduction

1.1 Nutrition insecurity

According to the latest *State of Food Security and Nutrition* report, the number of chronically undernourished people in the world is estimated to have increased from 777 million in 2015 to 815 million in 2016 (FAO *et al.* 2017). Estimates are that 155 million children worldwide still suffer from stunting, and climate-related shocks are contributing to increasing food and nutrition insecurity. It is evident that there is uncertain progress towards meeting the Sustainable Development Goals, specifically SDG 2, to 'End hunger, achieve food security and improved nutrition, and promote sustainable agriculture'.¹

The links between agriculture and better nutrition of vulnerable groups have been the focus of considerable recent research, and there has been a surge of interest in understanding agriculture–nutrition linkages to achieve nutrition outcomes globally (Dangour *et al.* 2012). Reviews by Berti, Krusevec and Fitzgerald (2004), Leroy and Frongillo (2007),

Girard *et al.* (2012) and Masset *et al.* (2012) show limited but growing evidence for a positive relationship between agricultural strategies, and nutrition and health. Regarding the potential for livestock interventions, recent reviews have improved the evidence base (Rawlins *et al.* 2014; Hoddinott, Heady and Dereje 2015).

The UK Aid-funded research consortium programme Leveraging Agriculture for Nutrition in South Asia (LANSA) has addressed the question: why do high levels of undernutrition persist in South Asian countries with predominantly agrarian economies? It has sought to understand the policy and stakeholder environment, the nature and impact of agricultural and other interventions, and the functions of agri-food value chains, in order to improve the efficacy of agriculture–nutrition linkages and raise the health status of nutritionally vulnerable groups, specifically children, adolescent girls, and women. A growing body of evidence can be understood in terms of the four food security ‘pillars’ (FAO 2009). Overall, the literature shows that the *availability* of nutrient-rich foods does not automatically provide *access*, *affordability*, and *stability* of consumption by vulnerable population groups: there is no assurance that nutritious home produce will be consumed by vulnerable women and children, in sufficient quantities and over time, to affect permanent improvements in population nutrition and health. More studies point beyond agricultural production to the role of markets as a source of safe and nutritious foodstuffs (Sibhatu, Krishna and Qaim 2015; Flores-Martinez *et al.* 2016; Zanello, Shankar and Poole 2017). This suggests potential for value chain analysis to evaluate and improve food system health, safety, and efficiency even among rural peoples (Maestre, Poole and Henson 2017). This article reports on work in Bangladesh that explores the role of markets and value chain development for nutrient-rich foods – specifically dairy produce – in contributing to improved diets, nutrition, and health in Bangladesh.

1.2 Agriculture, dairy, and nutrition in Bangladesh

Despite nationwide improvements in nutritional status, undernutrition in Bangladesh persists, especially in the form of childhood undernutrition, maternal undernutrition, and different forms of micronutrient deficiencies. The reduction in stunting among under-five children nationally has remained relatively stagnant, declining from 43 per cent in 2007 to 41 per cent in 2011. Wasting rates have seen a similar lack of movement, declining by only 1 per cent between 2007 and 2011. Micronutrient deficiencies are similarly widespread. Bangladesh’s 2013 national micronutrient survey reported that the prevalence of anaemia in pre-school-aged children was 33 per cent, with much higher rates in rural areas (37 per cent). Night blindness has sharply reduced due to the large-scale implementation of a vitamin A supplementation programme, but pregnant women still have inadequate vitamin A intakes. The national prevalence of zinc deficiency is approximately 45 per cent among pre-school-aged children. Twenty-four per cent of married women nationwide are undernourished [body mass index (BMI) < 18.5], while 17 per cent of this same cohort are overweight or obese

(BMI > 25.0). Despite the progress that still remains to be realised in improving many nutrition outcomes, the country has seen a reduction in the prevalence of chronic energy deficiency among women from 52 per cent in 1997 to 25 per cent in 2012 (Yosef *et al.* 2015).

To address the persistence of undernutrition in Bangladesh, multiple evidence-based, nutrition-specific interventions have been in place for a couple of decades. Cereals, largely rice, are the main food in Bangladesh with nearly two-thirds of the daily diet consisting of rice, some vegetables, a small amount of pulses and minimal quantities of protein. Animal-sourced foods such as meat, milk, eggs, and cheese still make up a relatively small proportion of an average Bangladeshi family diet, compared with grains and cereals. Milk, milk products, and meat are consumed only occasionally and in very small amounts. As a result, traditional eating habits often do not translate into a balanced nutritious diet (Copenhagen Consensus Center 2016). Nevertheless, milk production in Bangladesh is increasing. During 2006–07, the production was 2.28 million tonnes, and during 2011–12 it rose to 3.46 million tonnes and in 2015–16 to 7.27 million tonnes (DLS 2016).

The livestock sector currently accounts for about 3 per cent of gross domestic product (GDP) and 15 per cent of employment. During 1996–2006, livestock output grew at the rate of 4.1 per cent compared to 3.4 per cent for crop and horticulture, and 4.6 per cent for fisheries. The share of milk in the total value of livestock sector output increased from 26 per cent in 1990–91 to 29 per cent in 1995–96. The share was 30 per cent in 2000–01 then decreased to 24 per cent in 2005–06 – primarily because the share of meat, especially poultry meat and eggs, increased. These changes have been prompted by a rapid growth in demand for livestock products due to income and population growth, and urbanisation. The income elasticity of demand for milk was estimated to be 1.62 compared to 1.19 for meat and eggs in 1995–96, and these were projected to be 0.65 and 0.63 respectively in 2020. Expenditure elasticity of demand for milk and meat only in the urban areas in 2007 was estimated at 0.95 and 1.36 respectively. National statistics on production and consumption of milk in the country is poor and inconsistent, so the growth rates shown above should be interpreted with caution (Jabbar 2010).

The dairy sector offers a major opportunity to improve nutrition: milk and dairy products are concentrated dietary sources of macro and micronutrients and milk is particularly important for children (Grillenberger *et al.* 2003; Lien do *et al.* 2009; Neumann, Harris and Rogers 2002). In particular, milk can make a significant contribution to meeting the body's needs for calcium, magnesium, vitamin B12, and energy (Muehlhoff, Bennett and McMahan 2013). Pre-school children, and pregnant and lactating women are at highest risk for malnutrition and have highest potential benefit from dairy consumption, due to the nutrition in the milk as well as the potential for income production (CARE 2016). For example, a smallholder dairy initiative by Grameen Bank between

2000 and 2006 improved the nutritional status of 6,000 households. Beneficiaries consumed 0.2–1.0 litre of milk daily. Community-based pro-poor dairy initiatives provided an effective entry point for improving family household nutrition. Dairy industry development aimed at smallholders enhances broader development opportunities for women and young rural people. Empowerment of women has a significant effect on household nutrition outcomes, particularly children's health, wellbeing, and development (Muehlhoff *et al.* 2013).

A number of milk supply chains, mostly around the processing companies, are currently operating in the country. Major milk supply chains are related to Bangladesh Milk Producers' Cooperative Union Ltd. (Milk Vita), BRAC Dairy and Food Project (Aarong), Pran Dairy Ltd, Akij Dairy, Rangpur Dairy, etc. Milk Vita has the largest market share followed by Aarong and Pran (Mandate, Mandal and Rahman 2009).

In Milk Vita cooperatives there are around 65,000 smallholder dairy farmers from 925 villages in 15 areas of Tangail, Manikganj, Tekerhat, Baghabarighat, Sree Nagar, and Rangpur, supplying over 538,000 litres of milk per day. Historically, Shahjadpur and Pabna are the highest milk-producing areas. More than 100 BRAC chilling centres are in the Shahjadpur, Pabna, and Manikganj districts (Halder and Barua 2003).

Moreover, dairy production in Bangladesh offers good employment opportunities for both farm and non-farm rural and urban families. Development of the dairy sector positively impacts the life of poor people through stabilisation and generation of income, employment opportunities, nutrition, providing draft animals and manure for agricultural productivity, intra-household allocation of resources, and division of labour. It has been found that, in terms of employment, most workers are employed in small-scale milk production, with a declining number of workers employed by the larger-scale milk producers. The potential for the dairy sector to contribute not just to better nutrition but to poverty reduction, enterprise, and economic development objectives seems clear.

1.3 Dairy demand

Milk demand, measured by per capita consumption, is increasing by 4 per cent per year, which is higher than the growth in milk production (3.6 per cent). This has led to a continuous widening of the gap between milk supply and demand (Uddin *et al.* 2011).

In Bangladesh, the daily recommended requirement for milk is 250ml/person/day but the availability is very low, at 126ml/person/day. Total annual demand for milk is 16.49 million tonnes, whereas the production, as noted above, is 7.27 million tonnes (DLS 2016).

Milk consumption behaviour by the poor is very important while studying the dairy value chain. Consumption behaviour of dairy consumers depends upon income, price, and availability of milk and dairy products. A large number of factors directly affect the consumption

expenditure such as income, prices of individual commodities, size and composition of household, etc. (Roy *et al.* 2002).

There is hardly any evidence that the recent increase in production has increased milk consumption by the poor, particularly by women and children. And, as noted, the increase is relatively small in relation to potential demand. The study reported on in this article is an exploration of the characteristics of dairy demand in terms of availability, access, and affordability by nutritionally vulnerable population groups in Bangladesh. The study adopts the agri-food value chain approach of Maestre *et al.* (2017) as a conceptual framework. The study will be helpful for identifying policies to be effective in promoting milk products as nutrient-rich foods to take into account not only how dairy products are produced, but also how they are processed, distributed, and marketed along the value chain.

Maestre *et al.* (2017) identified different potential pathways where post-farmgate value chain interventions can contribute to enhanced nutrition among poor people. Direct interventions such as investment in physical and institutional infrastructure can improve food chain performance; foods with increased nutritional value can be developed and distributed; and finally, by enhancing access to, and consumption of, foods that are naturally rich in micronutrients, overall dietary diversity will increase (*ibid.*: 34). From those pathways the study followed the last one; that is, by enhancing access to, and consumption of, foods that are naturally rich in micronutrients. The framework implies three outcomes to bring about improvements in the micronutrient intake of vulnerable populations. The study acknowledges that a particular nutrient-rich food ‘must be safe to eat’; it must be ‘nutrient-dense at the point of consumption’; and finally, ‘Food must be consumed in adequate amounts on a sustained basis to bring about the desired nutritional outcomes (*ibid.*: 34–35). Having recognised the limitations in effective demand for dairy produce, and hypothesising that consumption by vulnerable groups is limited, this study focused on the final expected outcome by measuring the consumption of dairy products by poor people. The study also tried to test some of the requirements shown in the conceptual framework. Concentration was on nutritional awareness, availability, acceptability, and value chain coordination with governance. It was not possible to address all the requirements through a single study with a short time frame. While working with the milk value chain, these five requirements were found to be essential.

Food safety is also an important characteristic: it is well documented that milk and milk products provide a wealth of nutritional benefits, but that raw milk can harbour dangerous microorganisms that can pose serious health risks. According to an analysis by the Centers for Disease Control and Prevention (CDC) between 1993 and 2006, unpasteurised milk is 150 times more likely to cause food-borne illness and results in 13 times more hospitalisations than illnesses involving pasteurised dairy products. Raw unpasteurised milk can carry dangerous bacteria

that causes numerous food-borne illnesses (US Food and Drug Administration 2012). In the pasteurisation process, milk is heated to 72–75 degrees Celsius for 15–20 seconds. With appropriate cooling and chilled distribution, it has a shelf life of 5–15 days. Pasteurised milk in Bangladesh is marketed as 'Pasteurised full-cream liquid milk' and the companies provide a seven-day expiry date on this product. On the other hand, ultra-high temperature (UHT) milk lasts up to six months without refrigeration and preservatives. UHT milk is rapidly gaining popularity among urban consumers in Bangladesh due to its longer shelf life (BIDA 2016).

The objectives of this current study were to:

- Map the existing dairy value chain in urban and rural areas;
- Identify the quality and quantity of milk that households consume, particularly by women and children, and determine if there are differences between milk-producing and non-milk-producing households;
- Identify the engagement of women in decision-making for milk consumption and in the different steps of the dairy value chain; and
- Identify the household preference for milk consumption.

2 Methodology

2.1 Study sites

Survey data were collected through questionnaires using both quantitative and qualitative methods. Data collection was conducted in three different types of areas within the research framework of the BRAC-led Agriculture and Food Security Programme (AFSP).² The AFSP involves both international donors and local organisations, working in 52 *upazilas*³ of 18 districts in Bangladesh through agricultural research, development, and extension activities. In every *upazila*, ten blocks are selected, and the programme works with around 1,000 farmers of each *upazila* with the aim of changing their livelihood through dissemination of climate-smart agricultural technologies. The LANSAs activities focusing on agriculture and human nutrition is one component of the programme.

A classification of rural people by land size was considered here using the Household Income and Expenditure Survey 2010 (BBS 2011). In this study, we used the presence and approach of the AFSP to select the rural *upazilas*. According to ownership of land, poor people are considered to be those that are landless through to people who have up to 1.5 acres of land.

The first of the three types of area was a milk-producing rural area where households rear one or two cows. The Sonatala *upazila* of Bogra District is such an area and was selected purposively as it has good infrastructure facilities (including a chilling centre) for dairy industry development.

Figure 1 Survey areas, Bangladesh



Source Authors' own, adapted from BRAC communications.

There are many areas of the country where people are not engaged in the dairy business. The second area was a non-milk-producing rural area where people do not rear cows and are not commonly engaged in milk production. The Pirgachha *upazila* of Rangpur District is such an area and was purposively selected as a non-milk-producing area using the AFSP survey framework. Household selection criteria for this area were: (a) households are not engaged in milk production, and (b) landholdings of rural households are less than 1.5 acres.

The third area selected was an urban slum. Generally, it was assumed that the most poor and vulnerable people in the city live in slum areas. There are a number of slums in Dhaka, and Korail area in Gulshan 1, where a large number of poor people live, was selected.

2.2 Sample size

One hundred households from every site were selected randomly as being representative of the area. Household-level data were collected and the special target groups were women and children. Five collectors were involved in data collection. Training was conducted for the data collectors before the survey. They first collected data from the milk-

Table 1 Involvement of men and women in decision-making of milk purchasing

Groups	Women	Men	Both	Total
	%			
Rural non-producer	26	55	20	100
Urban slum	39	40	21	100

Source Survey conducted by the Agriculture and Food Security Programme of BRAC during 2016.

producing area. Samples from rural areas were selected from a previous survey of the AFSP. Sampled households from urban slums were selected randomly. Data analysis was limited to simple descriptive statistics.

3 Results and discussion

3.1 Sample characteristics

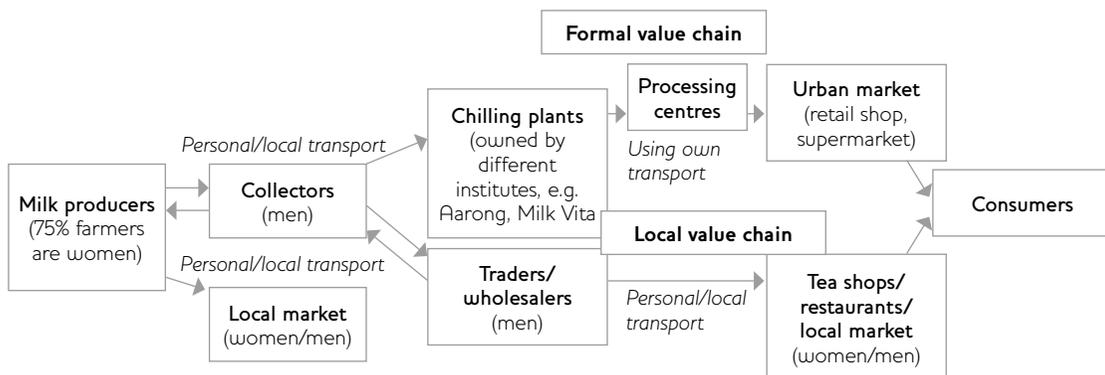
It was observed that the average number of household members was between four and five. Ninety-four per cent of household heads were male and their ages ranged between 40 and 47 years. In the dairy-producing area, it was observed that 45 per cent of the rural milk-producer household heads were primarily engaged in agriculture. Only 15 per cent of them undertook milk production as their main profession. They also engaged in day labour (15 per cent) and business (13 per cent). In non-milk-producing areas, the largest proportion of household heads (38 per cent) were engaged in day labour. They were also engaged in agriculture (25 per cent) and small businesses (16 per cent). In the urban slum, most of the household heads were engaged in small contractual services (32 per cent); they were also engaged in small businesses (17 per cent) and day labour (27 per cent). The average per head monthly income of milk-producing, non-producing, and urban slum households was US\$30, US\$48 and US\$37 respectively.

In the milk-producing area, households produced milk for eight months of the year. Every household produced on average eight litres of milk per day. They sold seven litres and the remaining one litre they kept for their own consumption. Ninety-eight per cent of the households sold milk direct to traders and only 2 per cent sold milk to their neighbours.

3.2 Value chains

Smallholder dairy producers are the starting point of the value chain. They are the person or household, often landless or without assets, involved in milk production for economic return on surplus milk, and usually owning up to two cows. Family labour is the only source of labour for this group. In most cases, women are responsible for cleaning the cowshed, feeding, and milking. Women are more involved in income-generating activities. Thus, their contribution is at the production level, and they also make a significant contribution in sales and distribution, and decision-making in the dairy value chain.

Figure 2 Dairy value chain of milk-producing area at Sonatala upazila, Bogra District



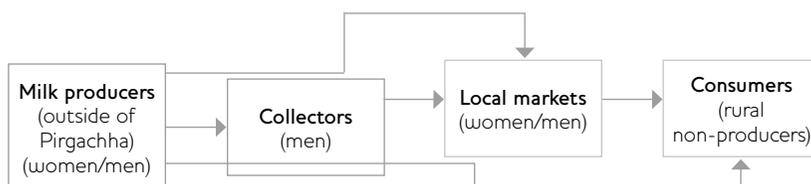
Source Survey conducted by the Agriculture and Food Security Programme of BRAC during 2016.

Regarding decision-making, in the rural milk-producing areas both male and female household members agree to keep some milk for daily consumption and together decide to sell the bulk of the milk in the market for cash.

But the scenario is different in other areas. In non-milk-producing areas, decision-making about purchasing milk is different: 55 per cent of males and only 26 per cent of female members of the household take decisions to purchase milk (Table 1). In the urban slum, 40 per cent of males and 39 per cent of females take this decision. Therefore, women are contributing more in decision-making about purchasing milk in the urban slum than in rural non-milk-producing areas.

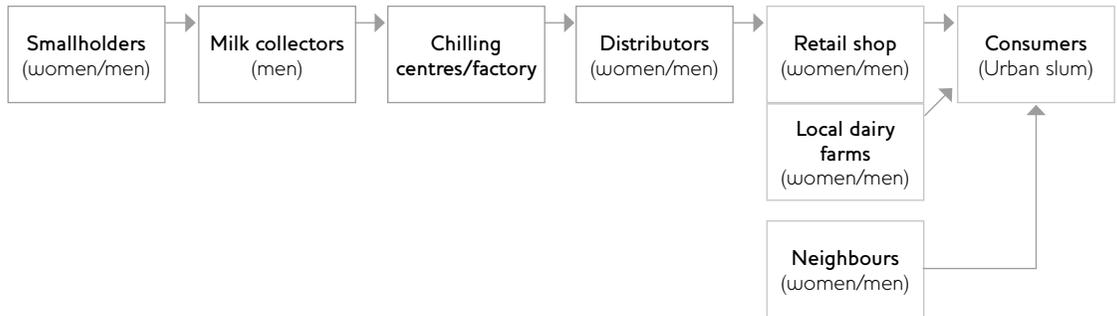
Both informal and formal dairy value chains coexist in rural milk-producing areas (Figure 2). It was observed that rural producers did not buy any milk from the market: rather, they regularly consumed their own cow’s milk. Smallholder milk producers in rural areas sell their milk in two ways, i.e. to the milk businessman (collector) or directly to the rural market. Most of the producers (75 per cent) are women. In formal value chains in rural areas, milk collectors sell to the nearest chilling plants and then the milk goes to the urban market after processing. In informal (local) value chains, the collectors sell milk to the local trader or wholesaler. The traders then sell the milk to the local tea shops, restaurants, and in local markets.

Figure 3 Dairy value chain of non-milk-producing area at Pirgachha upazila, Rangpur District



Source Survey conducted by the Agriculture and Food Security Programme of BRAC during 2016.

Figure 4 Dairy value chain of urban slum area at Karail slum, Dhaka



Source Survey conducted by the Agriculture and Food Security Programme of BRAC during 2016.

Figure 3 illustrates the value chain in rural non-milk-producing areas. In rural non-milk-producing areas, it is important to mention that a significant proportion of people (80 per cent) in households do not consume milk. Those that do, buy raw milk from the market irregularly; they are not in the habit of purchasing pasteurised milk. Ninety-nine per cent of them buy milk from the local market. Milk collectors collect milk from milk producers in neighbouring areas and bring it to the local markets of the study areas. Milk producers are not from Pirogachha, but are from neighbouring milk-producing areas. In some cases, milk producers directly sell their milk to the local markets. Only 1 per cent of consumers directly purchase from the milk producers of neighbouring areas.

Figure 4 depicts the urban milk value chain. The urban study area was a slum where relatively poor people of the city live. The study does not represent the scenario of the whole city. Here also, significant numbers (77 per cent) of households are not consuming milk regularly. They cannot recall the last date that they consumed milk in their households. There are some non-institutional dairy farms in Dhaka city. People living next to these farms collect fresh milk from these dairies, but in most cases people buy milk from retail shops. What they buy is pasteurised full-cream liquid milk. These products should be refrigerated below 4 degrees Celsius and can be kept for up to seven days. There is also UHT-processed milk available in the city, and respondents indicated that pasteurised milk is always available in the retail shops nearby. Of the people who buy milk in the slum, 83 per cent of them purchase milk (pasteurised) from small urban retail shops. Sixteen per cent of them purchased raw cow's milk from local dairy farms, and only one per cent purchased raw cow's milk from neighbours. People very rarely consume powdered milk in the urban slum area – even for their children, they use raw cow's milk or pasteurised milk.

3.3 Product quality

In analysing the dairy value chain process, it was not possible to test the quality of milk in order to ensure that it was 'safe for the consumer at the point of purchase and at consumption' within the household. Nevertheless, it is important to know the kinds (e.g. raw, boiled,

Table 2 Type of milk consumption by different groups (household level)

Groups	Boiled	Pasteurised/UHT
	%	
Rural producer (RP)	100	0
Rural non-producer (RNP)	100	0
Urban slum (Urb)	76	24

Note Ninety-six per cent of RP, 20 per cent of RNP, 23 per cent of Urb consume milk. Source Survey conducted by the Agriculture and Food Security Programme of BRAC during 2016.

pasteurised, etc.) of milk that different distributors carry from one step to another, and also to know the forms of consumption. In the study, both rural producers and non-producers were found to be consuming milk in boiled form (Table 2). These households do not buy pasteurised or UHT milk from the market. Seventy-six per cent of urban slum households consume milk in boiled form and the rest of the households have it in pasteurised form. So, whether raw in boiled form, pasteurised or UHT, the quality of the consumed milk is being ensured in every location.

It is similarly important to know how the milk is being stored at different stages. In earlier tests, milk from the organised dairy farm kept well in aluminium containers for up to ten hours, but milk from villages deteriorated after six hours. The keeping qualities of milk were poorer in other containers, and worst in earthen containers (Rahman *et al.* 2012). In the study, we observed that rural producers do not store their milk for long. They consume milk regularly after collection from their own cow. Only 5 per cent of households in the other two areas stored milk before consumption, and they stored it for three hours. Among this 5 per cent, 33 per cent of rural non-producers store milk in clay pots and 67 per cent store it in steel pots, whereas 60 per cent of people in urban slums store milk in clay pots and the rest store it in steel pots.

3.4 Price

It was a major concern before the study that the price may be a key reason for low milk consumption: it was assumed that poor people may not purchase milk if the price becomes higher compared to other food items. The price of milk varies in different locations. In rural milk-producing areas, the producers sold milk at 32BDT⁴ per litre but the consumer buys the same milk for 40–44BDT per litre. People in urban slums were paying 65BDT per litre for pasteurised milk and 70–80BDT per litre for fresh milk. Regarding willingness to pay, the people who did not consume milk regularly said that, even if their income were to increase or the price of milk to reduce, they would not start consuming milk. Discussions revealed that they are aware of the nutritional importance of milk, but they habitually prioritise other nutrient-rich foods such as rice, fish, vegetables, and meat over milk. This is a partial explanation as to why low milk consumption is quite

Table 3 Milk consumption in households by area

	Rural producer	Rural non-producer	Urban slum
	%		
Do not consume	4	80	77
51–250ml	5	14	16
251–500ml	28	5	3
501–1,000ml	57	1	4
1,001–1,500ml	5	0	0
More than 1,500ml	1	0	0
Total	100	100	100

Source Survey conducted by the Agriculture and Food Security Programme of BRAC during 2016.

pronounced in Bangladesh overall. Considering consumption at daily and weekly intervals together, nearly half of Dhaka city households are not consuming milk (PPRC 2016).

3.5 A comparison of milk consumption behaviour

Table 3 summarises the marked differences in milk consumption behaviour between the three areas. In rural milk-producer households, 96 per cent of the households were consuming milk, whereas only 20 per cent of rural non-producers and 23 per cent of urban slum households were consuming milk regularly. On average, rural producers were consuming 668ml of milk per household, whereas rural non-producers and urban slum households were consuming 41–59ml respectively. It was observed that 57 per cent of rural producer households were consuming 501–1,000ml of milk regularly. In the rural non-producer group, 80 per cent were not consuming milk at all and only 14 per cent were consuming between 51–250ml of milk. In the urban slum, 77 per cent of households were not consuming milk, and 16 per cent of them were consuming only 51–250ml. Therefore, a significant finding of the study was that most of the rural milk producers are producing milk through their own cows and consuming milk regularly. On the other hand, a very small proportion of rural non-producers and poor people in the urban slums were consuming milk regularly.

It was observed that in rural producer groups, 13 per cent of women and 15 per cent of children do not consume milk (Table 4). The main reason identified through the survey was said to be that they do not like the taste of liquid milk. The rest of this group are consuming milk in different amounts. Forty-five per cent of the women and 49 per cent of children are consuming 126–200ml of milk regularly. Thirty-five per cent of women and 24 per cent of children are consuming 101–125ml of milk. It seems that women and children are consuming milk in a lower amount than the recommended 250ml/person/day.

Table 4 Household-level milk consumption (% of members)

	Women			Male			Child		
	Rural producer	Rural non-producer	Urban slum	Rural producer	Rural non-producer	Urban slum	Rural producer	Rural non-producer	Urban slum
Do not consume	13	89	88	11	84	88	15	96	92
51–100ml	1	7	4	2	13	5	2	0	2
101–125ml	35	2	5	27	2	5	24	0	2
126–200ml	45	1	2	54	1	2	49	4	4
201–250ml	5	0	0	3	0	0	2	0	0
More than 250ml	2	0	0	4	0	1	7	0	0

Source Survey conducted by the Agriculture and Food Security Programme of BRAC during 2016.

4 Conclusions and recommendations

The dairy industry has great potential in developing the economy of a country like Bangladesh. It is necessary to make liquid milk available in the market for many reasons. Firstly, it is evident that women's participation in the dairy sector is important, from production – care of cows and milking practices – to sales of milk, which generally were a subject of joint household decision-making and of economic benefit to the household. Even landless households could engage in dairy production, and own-consumption benefited even poor rural producing households. It plays an important role in enhancing nutritional status across all age groups, and has a significant role in child feeding, and through sales, for the household economy.

However, the principal finding from this study is that a large proportion of people in non-milk-producing areas and in urban slum areas are not consuming milk. Lack of consumer acceptance is a significant reason for low levels of consumption, and this low willingness to consume was conflated with low willingness to pay in rural non-producing areas in particular. Urban slum consumers were paying prices with a significant margin compared to rural and producer prices. No significant issues concerning the health and safety of milk were noted: household-level processing was common where milk was not treated industrially, and milk was not stored for long in unhygienic conditions.

In every area, the women and children were consuming less milk than the national recommendation. For improving diets, it is necessary to increase awareness and convey information about the importance of milk consumption, but at the same time, national production needs to be increased. Information dissemination and behavioural change communication may be the way to change the food habits of people.

In terms of Maestre *et al.* (2017), milk appears to be a safe food and a handle up to consumption in hygienic value chains. However, milk is not readily available, nor necessarily affordable, nor indeed is it acceptable,

as a significant source of micronutrient nutrition to all sections of the Bangladesh population, to the extent that it can be consumed by vulnerable groups in adequate quantities. It was observed that women engage more in milk production and decision-making. Market prices vary from the policy recommendations. These recommendations should also include emphasis on encouraging more women to engage in the dairy sector; stabilising market prices, ensuring proper marketing systems and information dissemination, proper processing, and appropriate packaging;

National initiatives could play a part in boosting the dairy sector and milk consumption. To meet the current market demand, the government has initiated various measures such as training at grass-roots level and low-interest loans for cow rearing (*The Daily Star* 2016). However, adequate consideration is required in other related problem areas such as the development of proper value chains, pricing mechanisms that help to sustain farmers' incomes, and awareness campaigns on food hygiene and consumption behaviours. Systematic and wide-ranging analysis is required to formulate effective longer-term policies. Milk is available in all the studied areas, but there is a lack of acceptability observed in both rural and urban environments. While increasing dairy consumption is a valid nutritional objective, public health authorities need to give attention to the consumption of other animal source foods for vulnerable groups who choose not to consume milk.

This exploratory study relied on limited sampling and only descriptive statistics have been reported. Having identified the principal value chains in the Bangladesh dairy sector, a more detailed quantitative study is needed to follow up the prices and margins from production to consumption. The study addresses most of the requirements outlined in Maestre *et al.* (2017). However, a new quantitative analysis is necessary to address the levels and flows of costs and returns, which have to be sufficiently attractive in the context of the business requirements and associated risks and uncertainties, to assess the returns to commercial stakeholders, and to ensure that the value chain benefits are distributed equitably among participants – notably female entrepreneurs. An equitable process capturing the value of costs, risks, and contractual incentives for quality is an important requirement, particularly the interrelationships at the intersection of informal and formal, or industrialised chains. Finally, as Maestre *et al.* note, the responsibilities for commercial nutrition-sensitive value chains are shared by other stakeholders:

The public sector state shapes market competition and provision of finance for agribusiness investment, provision of information and marketing, food standards and regulation, management of business risks and insurance. Both under- and over-regulation can increase transaction costs and risk to the extent that all value is eroded, and business fails. Civil society can play a major role in awareness raising and advocacy that influences both business and policy-makers (2017: 37).

Notes

- 1 <https://sustainabledevelopment.un.org/?page=view&nr=164&type=230>.
- 2 <http://baenbd.net/overview-of-bracs-agriculture-programme/>.
- 3 An *upazila* is a geographical region in Bangladesh used for administrative or other purposes. *Upazilas* function as sub-units of districts and are the country's second lowest tier of regional administration.
- 4 £1 sterling = Bangladeshi Taka 110 (26 September 2017).

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