Supply chain analysis of wholesale milk market in selected areas of Dhaka district

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Abstract

This study is an attempt to examine the prevailing milk supply chain based on primary data collected from 55 respondents, which were randomly selected from the study area in Dhaka district. The sample included 25 producers, 15 Beparis, 10 wholesalers and 5 sweetmeat shops. Milk producers were selected from Keranigonj and Sutrapur Upazilas and traders were selected from wholesale milk market (Rathkhola Bazar).The study finds out that the main actors involved in the milk supply chain are the milk producers, feed supplier, Beparis, Pick-up and Van drivers, farm labourers, wholesalers and Aratdars and ghosh. The study also revealed that an annual growth rate of milk production was about 2 per cent over the period of 1994-95 to 2003-04. In the period of 1999-2000 to 2003-04 production risk increased for milk production and coefficient of variation was 4.17 due to fluctuation of production than previous period of 1994-95 to 1998-99 which have coefficient of variation of 2.63. And the overall coefficient of variation was 5.46, which shows higher risks for higher fluctuation of production. Shortage of capital, high price of concentrate feed, lack of green grass, lack of veterinary service, lack of storage facility, and dominance of intermediaries, scattered milk production, lack of adequate market facility and price fluctuation were the major problems associated with production and marketing of milk. On the basis of the findings of the study some recommendations were made for the development of dairy farms.

Keywords: Supply Chain, Wholesale milk market, Growth rate, Milk production

Introduction

The concept of supply chain has come into existence since 1980s. A supply chain is a network of facilities and distribution options that performs the functions of (a) procurement of materials, (b) transformation of these materials into intermediate and finished products and services, and (c) the distribution and delivery of these finished products or final services to customers. Each supply chain thus provides certain or specific types of end products or services to the end users at the end point of the supply chain (Douma *et al.*, 2004)

The market supply of agricultural products is the end point of a chain of service activities ranging from input supply and farm services to processing, quality control and product marketing. The market success of particular commodities thus depends on the efficiency and competitiveness of the entire supply chain, in which farm production is just one step.

In service management, the supply chain concept is particularly relevant for identifying potential innovations and designing commodity specific support services. The agricultural supply chain concept links all functions and entities that contribute to the market delivery of a particular agricultural commodity and presents them as a sequence of steps. There are basically four steps in any supply chain, e.g. pre-production services, farm production, post-production services and final consumption.

The advantages of the chain concept are the fact that it allows the user to understand the forces driving change in a commodity sector. The central aim of supply chain is to have the right quantities at the right moment at minimal cost. It addresses the interrelated issues of customer satisfaction, inventory management and flexibility (of course, profit for the business) (Haque, 2003). It is easier to identify the policies which can be implemented to enable individual producers (or countries) to increase their share of these gains. Another important application of supply chain is the quality assurance of food products (Douma *et al.*, 2004).

Bangladesh is essentially an agricultural country. Market development for agricultural programme has been long overdue. Specially the dairy sector has still been a neglected field. Without any attempt to develop it the achievement of the goal of self sufficiency in food which is first and foremost of the basic necessary of life will be difficult. Only a scientific study can help to find out objectively the impact of the rural markets on the production, processing and consumption of milk. No systematic study has yet been undertaken so far to determine the overall supply chain of locally produced milk. Thus recognizing the important contribution of milk in the national economy, the present study will examine the supply chain of locally produced milk in the selected areas.

Materials and Methods

Keeping in mind the main objectives of the present study, some preliminary visits were made in wholesale milk market and its adjoining areas. Milk supply comes from Sutrapur, Keranigonj, Manikgonj, Sadar Ghat and Munshigonj to the wholesale milk market (Rathkhola Bazar) and this milk is distributed from wholesale market. Finally Sutrapur and Keranigonj Upazilas under Dhaka district were selected considering concentration of milk roduction. The sample included milk producers and traders (Bepari, wholesaler, sweet-meat shop). At first a list of 80 milk producers in Keranigonj and Sutrapur who supply milk in the wholesale market (Rathkhola Bazar) and a list of 100 traders who purchase milk at Rathkhola Bazar were collected. Among the two selected Upazilas 13 and 12 milk producers were selected randomly from Keranigonj and Sutrapur respectively and 15 Beparis, 10 wholesalers and 5 sweet-meat shops were taken randomly from wholesale milk market (Rathkhola Bazar) for the study.

Analyzing supply chains includes identifying all the functions performed in a specific commodity sector, organizing them into a sequence, and analyzing each function in relation to both the preceding steps and subsequent ones. In constructing the chain, two criteria merit particular attention (Douma et al., 2004):

a.   The specificity of a function performed. The question is whether a service is highly specific to a particular product (e.g. production of a particular seed variety or specialized credit line) or rather unspecific, supporting a variety of commodities (e.g. general purpose transport).
b.   The interdependence of functions within the chain. Here the first possibility is a highly interdependent, closely knit chain, where each function can only be performed if the preceding steps follow well-defined standards, as in the case of high- value products which require quality control at all stages, careful handling and the observation of deadlines for product delivery. The opposite possibility, low interdependence, means that functions are performed independently of each other, e.g. traders buying produce of different qualities and from different farmers throughout the season (Douma et al., 2004).

The supply chain analysis involves the following aspects:
*   The promotion of commodity production and marketing through chain formation and supply chain.
*   The identification and development of new service functions for specific commodities. In this case, supply chain analysis helps articulate demand and identify new tasks.
*   The promotion of agricultural innovations. High-value commercial products require constant technical improvements. This is a consequence of changing market demand and consumption patterns under conditions of strong competition. Research should continue to identify new research topics by observing the evolution of supply chains.
*   Quality management and control. Food safety programs regularly use the supply chain concept to check on the factors relevant for the final product quality all the way along the chain (Douma et al., 2004).

We are particularly concerned with the resources and persons involved within the milk supply chain. Milk supply chain analysis will give us a picture of milk producing farms and milk traders who are related with the milk trading.

The growth rate of milk production over the period 1994-1995 to 2003-2004 is estimated by using the following function.

The exponential trend function is

$$Y = ae^{bt}$$
$$\ln Y = \ln a + bt$$

Where, Y = Dependent variable [production of milk (tonne)].
        a = Intercept
        b = Growth parameter
        t = Time (year)
        ln = Natural log of the variable.

To check the significance of result, t- test was also employed. The null hypothesis, H_0: b = 0 was tested. The test statistic was:

$$t = \frac{b}{s.e. (b)} \text{ with (n-2) d.f.}$$

Where,
N = Number of observations
s.e. (b) = The standard error of the growth parameter.

Coefficient of variation was also used to measure the production risk of milk. Production risk was measured in terms of coefficient of variation over the period 1994-95 to 2003-2004.

$$\text{Coefficient of Variation (CV)} = \frac{\text{Standard Deviation}}{\text{Mean}} \times 100$$

CV as parameter is normally distributed and free of absolute unit of measurement.

Results and Discussion

Since the era of economic liberalization is going to reduce government intervention farming by small producers can be more efficiently run if production, processing and trading are more integrated. Information on the value addition in the chain and on the competitiveness of local producers as compared to other countries/regions is, therefore, crucial to determine the best areas for production (areas which have comparative advantage), the necessary scale of production, processing and trading, etc. The consumer could be as close to the producer as in same village or could be as consumer of cash crops living on the other side of the world (Haque, 2006).

Actors involved in milk supply chain

There are many actors in the chain. Some are more powerful than others. The main actors involved in the supply chain are discussed below:

Milk producers

Milk producers are the main actor and play dominant role in the milk supply chain. Milk producers in the study area were farmers who did not produce milk with commercial objectives. They mainly kept cows as draft power and earned an additional income by selling milk. The milk producers were scattered in the study area. There were no commercial and specialized dairy farms. They generally took dairy enterprise as subsidiary occupation. The production of milk was small in amount and they got buyer easily. Beparis collect their milk and sometimes milk producers sell milk to the urban ultimate consumers.

Beparis

Milk trading was the major occupation of the Beparis. Beparis collected small amount of milk from different milk producers and assembled that milk. The collected large volume of milk was then sold to the wholesalers and sweetmeat shops at Rathkhola Bazar of Nababpur road, old Dhaka. Beparis did not process milk.

Pick-up and Van drivers

There are many poor people, who are engaged in pick-up and Van driving for milk transportation. Traders used this type of vehicles for milk transport from milk producer to the wholesale milk market at Rathkhola Bazar and distributed the milk to the sweetmeat shops, tea stall, urban consumer, and hot milk shop. So dairy farming has created opportunities for these types of occupations.

Farm labourers

Both male and female labourers are involved in the dairy farming. The activities of dairy farming created new employment for both male and female labour. There are two categories of farm labour such as family labour and hired labour. In all the farms hired labour was employed on monthly salary basis. So it can be said that farm labourer was the important actor of milk supply chain.

Wholesalers

Wholesalers are one of the important actors of milk supply chain. Wholesalers purchased large volume of milk from Beparis and sold to the sweetmeat shops, milk shops, tea-stall, occasional purpose such as marriage ceremony and urban consumers. Generally wholesalers sold large volume of milk to the sweetmeat shops and small amount to tea-stall and urban consumers.

Aratdars

There are two Aratdars in the wholesale milk market. They determine the price of milk. They give some marketing facility such as shed, lighting etc. For this facility the Aratdars charged Tk 10 per trader per day. They had fixed establishment in the wholesale milk market (Rathkhola Bazar) and play dominant role in the milk supply chain.

Main features of milk supply chain

The milk chain started from Milch cow supplier. Milk producer purchases milch cow from the Beparis or Farias. After producing milk, the milk producers sell milk to the Beparis and urban consumers through home delivery. Major portion goes to the Beparis. Beparis collect milk from house to house and then go to the wholesale market for sale. From the market wholesaler and ghosh purchase this milk and they distribute milk to the hot milk shop, sweetmeat shop, tea stall and urban consumers. The milk supply chain is depicted in Fig. 1 and the main features of milk supply chain are described below:
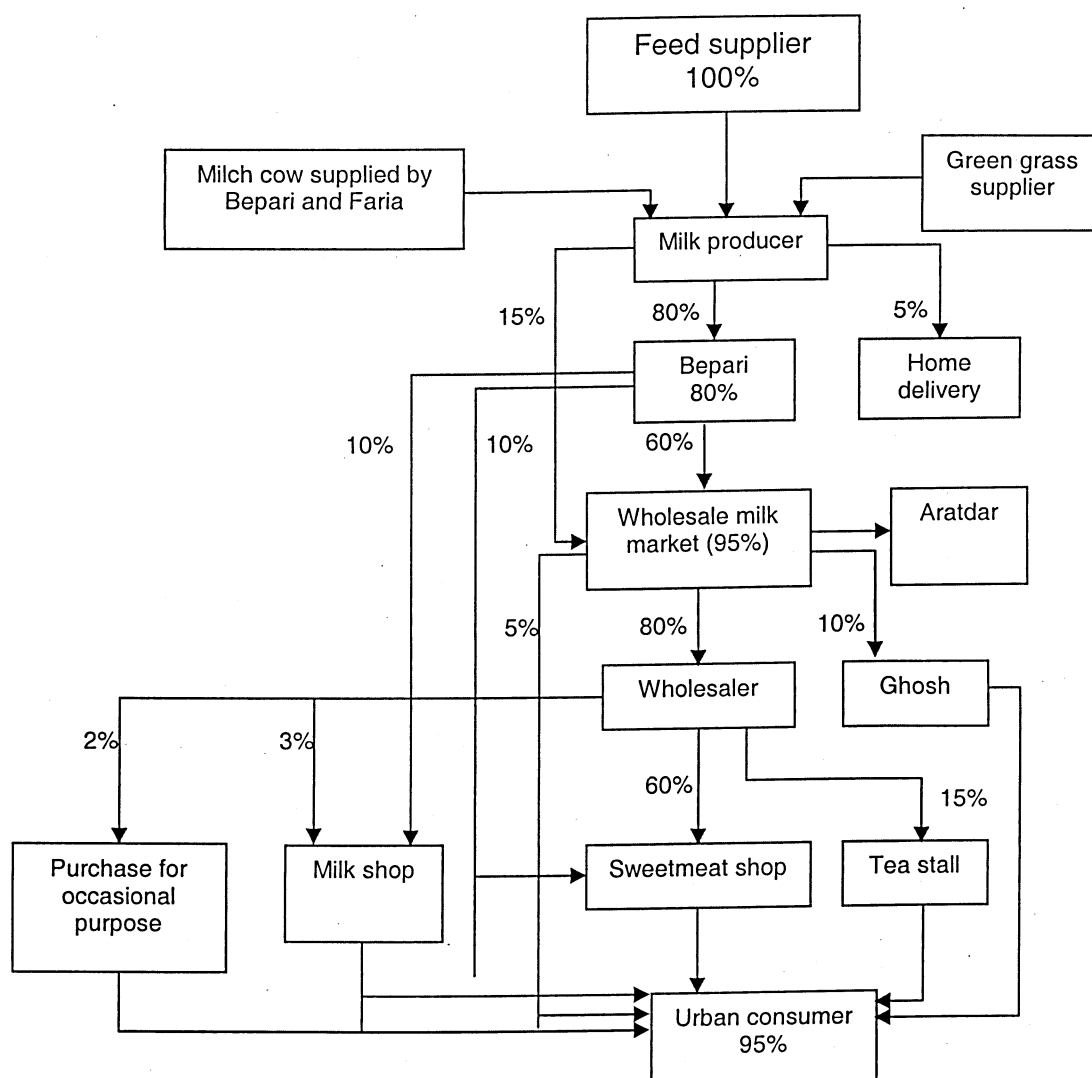
Fig. 1. Milk supply chain in the study area

Milch cow supply by Bepari and Faria

Milch cow is very essential for dairy farming. The milk producer purchases milch cow from different market such as Zinzira Bazar, Savar. Bepari or Faria supplies this milch cow. Sometimes the milk producer purchases milch cow or calves from another milk producer who sells their cows. They purchase cross bred dairy cow and native dairy cow. The price of cross bred dairy cow is higher than that of the native dairy cow.

Feed supply to the milk producer

Different types of feed ingredients are used in dairy rearing such as rice bran, wheat bran, oil cake, molasses, etc. These feeds were purchased from nearby dairy feed dealer or wholesaler who was getting feed ingredients either from the feed mills or any other sources like raw material supplier.

Green grass supply to the milk producer

Green grass is very important for dairy cows. In the study area many poor people supply green grass and water hyacinth. Milk producers give water hyacinth to their dairy cattle during the shortage of green grass. The milk producers purchase green grass or water hyacinth from nearby green grass supplier by bundle.

Wholesale milk market

Wholesale milk market (Rathkhola Bazar) was established about a hundred years ago. It was situated at 20, 21, and 22 Nababpur road at old Dhaka. There are one hundred traders in the wholesale milk market. Milk traders come from Keranigonj, Sutrapur, Sadarghat, Doyagonj and Shampur. Beparis come to this wholesale milk market with milk. In the market different traders do purchase this milk.

Ghosh

Many of the *ghosh* have their own establishment in semi-urban areas. But most of them are too poor to produce any milk product. Now a days they perform simply the exchange activities in marketing of milk. Most of the *ghosh* produce *Ghol* and *Matha*. A very few of them produce ghee. They mostly supply their products to the urban consumer and sweetmeat producer. Milk trading is a life long business for most of them. In respect of knowledge and experience in milk trading, they are efficient. Their main problem regarding this business is their financial insolvency.

Purchase for occasional purpose

There are large volume of milk in the wholesale milk market (Rathkhola Bazar). Milk comes from Keranigonj, Doyagonj, Sutrapur, Sadarghat etc. Generally wholesalers purchase this milk in large volume. Sometimes many persons purchase milk for occasional purposes such as marriage ceremony. They also purchase large volume of milk. They get lower price of milk comparatively than other retail markets.

Milk shop

There are many milk shops besides the road in the study areas. The milk shop owners purchased milk from wholesalers and Beparis. Sometimes they collected milk from the milk producer's home. Wholesalers supplied their milk in their shop. The milk shop owners boiled the milk and mixed some sugar. Then they sold this milk at ten taka per glass. The passerby drink this sweet milk.

Sweetmeat shop

The sweet meat shop owners bought their required volume of milk daily from milk traders. They purchased milk for preparing sweetmeat, curd, ghee and other products for sale to the consumers. Their demand was relatively stable but at the time of festivals (Eid and Puza etc) their demand for milk increased. Sweetmeat shop owners are the largest buyers of milk at the wholesale milk market in the study area.

Tea stall

The tea stall owners purchase their milk from milk traders for preparing tea. This type of tea is very popular to the people and the taste is good than that of tea prepared with condensed milk. They also provided a good market for milk in the study area.

Urban consumer

Consumers, the end user of milk and milk products, are at the end point of the supply chain. Individual consumers collect their milk from urban markets or received it at their residents as home delivery. Their requirement of milk remains stable over time. They are the main buyers of milk and provide a good market for milk.

Price of milk in Bangladesh

The average wholesale price of milk increased from 1994-95 to 1999-2000. The price declined during the two years (2000-01 and 2001-02) and then started to increase. The price trend is shown in Fig. 2.
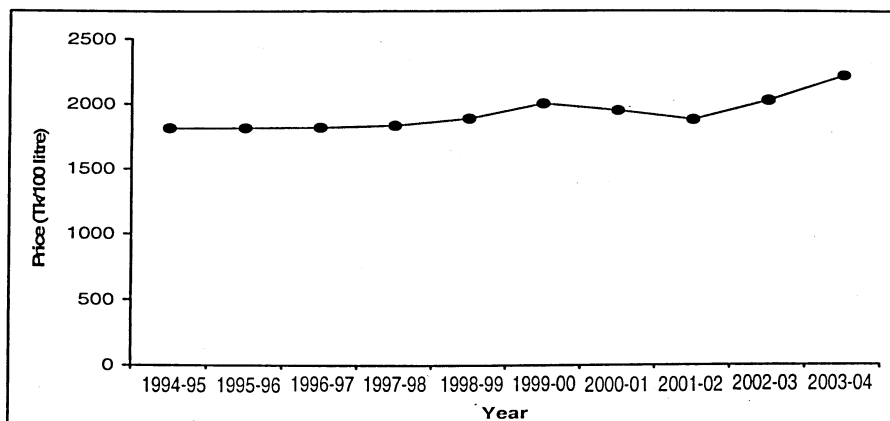

Fig 2 Line graph of the year-wise average wholesale price of milk (BBS, 2004)

Production of milk in Bangladesh

Fig. 3 shows annual production and a trend model has been estimated by fitting a log liner equation of milk for the period of 1994-95 to 2003-04 of Bangladesh. The estimated exponential trend equation is for overall period 1994-95 to 2003-04.

ln Y = 7.33 + 0.02 t
   (4.317) $R^2 = 0.87$ N = 10

The above exponential trend equation shows that annual growth rates of milk production was about 2 per cent over the period of 1994-95 to 2003-04. And it is statistically significant at 5% level of significance.
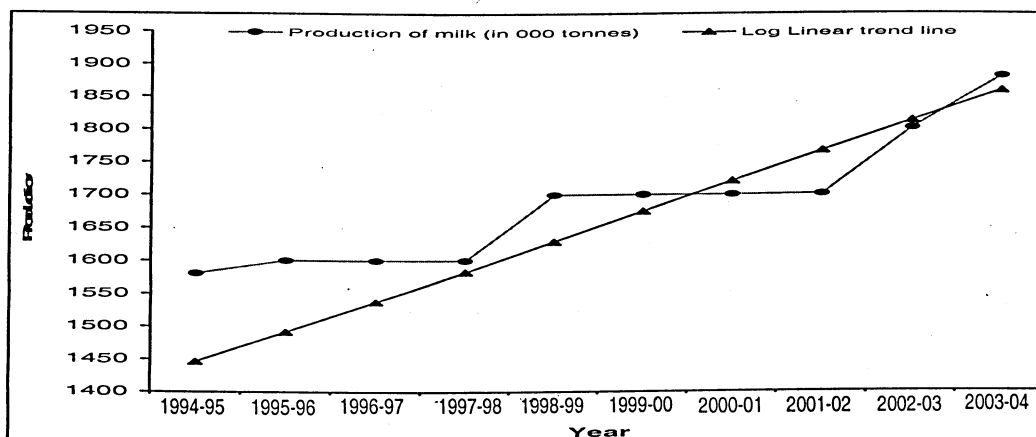

Fig. 3. Growth rate of milk production over the year 1994-95 to 2003-04 (GOB, 1996-2005)

Production risks measure of milk

Production instability is measured in terms of coefficient of variation which referred to as production risks. Variation in production of dairy farms, technological changes and institutional factors like changes in government policies and other miscellaneous occurrences beyond adequate control or accurate prediction of dairy farm owners may be attributed to the root causes of risk and uncertainty in milk production. Farmers faced with new choices and decisions in farm production and handling as well as in marketing via new marketing channels. New relationships have evolved among new and old players in the supply chain, and all face production risks.

Table 1 shows that in the period of 1999-2000 to 2003-2004, production risk increased for milk production and coefficient of variation is 4.17 due to fluctuation of production which was higher than 2.63 which was for the period of 1994-95 to 1998-99 and the overall coefficient of variation was 5.46, which shows higher risks for higher production fluctuation. Technological changes and changes in government policies are the causes of production fluctuation.

Table 1 Coefficient of variation of production of milk

Period	Standard deviation	Mean	Coefficient of variations
1994-95 to 1998-99	42.56	1616.35	2.63
1999-2000 to 2003- 2004	73.21	1756.25	4.17
Overall	92.08	1686.30	5.46

(Authors own calculation by using the data on production of milk in Bangladesh from GOB, 1994-2004)

Problems faced by different actors involved in Milk supply chain

The present study identified some of the problems associated with supply chain of milk. Most of the milk producers and traders faced many problems in production and marketing. Some identified major problems of milk producers were shortage of capital, high price of concentrate feed, lack of green grass/grazing land, high fees of veterinary doctors, high price and lack of veterinary medicine, ignorance and illiteracy of the milk producer. On the other hand marketing problems of milk producers were transportation and communication, lack of storage facility and dominance of intermediaries. To overcome this problems government should ensure institutional credit at a lower interest, reducing feed cost, ensuring adequate medicine and veterinary service, supply of green grass, adequate extension service and training, improved transportation and communication facilities and storage and preservation facilities.

Some identified major problems of milk traders were scattered milk production, lack of storage facilities, shortage of capital, lack of adequate market facility and price fluctuation. To solve these problems government or NGO or milk traders should develop milk collection centre, storage facility, supply of credit and development of organized milk market.

Conclusion

The study was designed to examine the supply chain analyses of wholesale milk market in selected areas of Dhaka district. The study finds out that the main actors involved in the milk supply chain are the milk producers, Beparis, Pick-up and Van divers, farm labourers, wholesalers and Aratdars. In the period of 1999 - 2000 to 2003 - 2004 production risk increased for milk production and coefficient of variation is 4.17 due to fluctuation of production. The rate of fluctuation for the previous period of 1994-95 to 1998-99 was 2.63 which was lower. The overall coefficient of variation was 5.46, which shows higher risks for higher production fluctuation.

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