

Analysis of Marketing Performance of the Dairy Value Chain in Tanga city, Tanzania

Ibrahim A.W^{1*}, A.M. Akyoo² and N.L. Kanuya³

¹Water Institute, Department of Planning, Monitoring and Evaluation,
P.O. Box 35059, Dar es Salaam, Tanzania.

²Sokoine University of Agriculture, School of Agricultural Economics and Business Studies,
P.O. Box 3007, Morogoro, Tanzania.

³Sokoine University of Agriculture, College of Veterinary Medicine and Biomedical Science,
P.O. Box 3020, Morogoro, Tanzania

*Corresponding author: ibrahimwikedzi@yahoo.com

Abstract

This study was conducted in Tanga city with the general purpose of analyzing market performance of dairy value chain and specifically to quantify and assess production costs of raw milk and to characterize the market structure, conduct and performance of the milk market. A formal survey was carried out to a random sample of 80 smallholder farmers and 30 milk traders using a questionnaire. Two processors were interviewed using a checklist. Accounting method was used to quantify milk dairy farmers' production costs whereas dairy market performance was descriptively analyzed within the framework of the Structure-Conduct-Performance (S-C-P) market model. Gross profit margins for the major players (producers, traders and processors) at specific nodes along the dairy value chain were calculated. The average unit cost of production was found to be TSh 550 per litre of raw milk with contributions from labour (45.7%), feeds (19.4%) and dairy operations (e.g. veterinary services) (34.9%). The average production cost per litre (TSh 550) and farm gate price per litre (TSh 580) of raw milk were found to be statistically different at $p \leq 0.05$ level of significance indicating cost effectiveness of going producer price. Smallholder dairy farmers received gross profit margins of 5.2% and 21.4% in the formal and informal channels respectively while processors and vendors received gross profit margins of 18.8% and 36.1% per litre of milk respectively. Milk traders received higher Gross Profit Margin (GPM) because they sold their milk in informal chains which offer relatively higher prices. Low price for raw milk and limited bargaining power of Tanga Dairy Cooperative Union (TDCU) were revealed as barriers to dairy development in the City. It is recommended that a liberalized marketing system in price setting strategy and producers' training on production techniques that will improve dairy productivity in the study area.

Key words: Marketing Performance, S-C-P market model, Dairy Value Chain Actors, Tanga

Introduction

Tanzania ranks second in Africa after Ethiopia in cattle population (NBS, 2018). The country's cattle population is about 30.5 million out of which 680 000 (2.23%) are dairy stocks which mainly consist of Friesian, Jersey, Ayrshire breeds and their crosses with the East African Zebu (MLFD, 2011; Njombe *et al.*, 2011, NBS, 2018). Notwithstanding its high ranking position in terms of cattle population, Tanzania is still very low in production, processing and

marketing of milk and milk products, compared to other African countries. According to Karaja (2003), improved dairy cattle in Tanzania produces up to 3075 litres per cow per year while in Kenya the average milk production is up to 7083 litres per cow per year. This huge difference in milk production is accounted for by the higher use of other supplementary inputs in Kenya e.g. production of improved forages, purchase of feeds, disease control measures and improved record keeping as contrasted with

Tanzania (TechnoServe, 2008).

Milk production in Tanzania is carried out under two major production systems. These are the subsistence traditional and the commercial dairy production systems. Within the traditional system, milk is mainly produced by indigenous cattle raised as dual purpose animals that are for both milk and meat production (Shem and Mdoe, 2002; Njombe *et al.*, 2011). Within the commercial dairy production system, improved dairy cattle of exotic dairy breeds are kept. This system is characterized by commercialized large, medium and small holder dairy farms. Generally, in Tanzania, dairy farms with cows ranging from 1–5 cows per household are considered to be small dairy farms while those with 10–50 and more than 50 cows per farm are considered to be medium and large dairy farms respectively (MLFD, 2010). According to MLD (2006), smallholder dairy farming is mainly concentrated in the urban and peri-urban areas of Arusha, Kilimanjaro, Kagera, Iringa, Mbeya and Tanga. There are few companies (e.g. Tanga Fresh Ltd, Musoma Dairy and ASAS Dairies–Iringa) in the market that are slowly expanding but at the same time facing many obstacles in the process of selling milk and milk products. The major problems include strong competition from attractively packaged and cheap imported milk products, small domestic market, lack of financial credit and difficulties in sourcing large amounts of milk of stable quality (Quaedackers, 2010).

This study derived its justification from the fact that marketing is a very important aspect of the dairy chain. Presence of close-by markets for milk and dairy products is a key motivating factor for milk producers. Milk marketing entails gathering of milk from several producers, transforming it to an acceptable marketable product and delivering it to consumers at the desirable time and at an affordable price (Ndambi *et al.*, 2007).

Most researches in dairy sub-sector in Tanzania have mainly focused on milk production and marketing aspects (Mdoe, 1993; Kurwijila *et al.*, 1997; Omoro *et al.*, 2004; Franzel *et al.*,

2007). Furthermore, besides the -dairy value chain in Tanga city being well established as compared to other cities/urban areas in Tanzania, limited research has been done on quantifying production costs and profit margins respectively incurred and received by actors along the chain, so little is known on ‘who gets what’ among the chain actors (Schooman and Swai, 2011). There is insufficient knowledge on the marketing performance of the dairy value chain to ascertain whether the chain operates profitably and efficiently. Therefore, understanding the role of each actor and their profit margins is the foremost essential contributing factor towards development of a viable dairy industry in the study area. Therefore, a study was conducted in order: (i) To quantify the per unit cost of production of raw milk for dairy farmers in the Tanga city, and (ii) To assess marketing performance of the dairy market in the Tanga city and its implications for policy advice and strategies for improvement.

In pursuit of the specific objectives above, the following null hypotheses were tested: (i) Raw milk farm gate price in the formal chain is not cost-effective, and (ii) Margins obtained at various stages in the value chain do not break even.

Methodology

Descriptive statistics

Descriptive and qualitative analyses employed in this study were based on the specific objectives and hypotheses of the study. For descriptive statistics, the use of means, percentages and ranges were employed to describe the characteristics of the actors.

Based on the hypothesis that “*Raw milk farm gate price in the formal chain is not cost-effective*” an accounting method was used to quantify production cost per litre of raw milk and the value obtained was compared to the revenue (price) a dairy farmer received per litre. Then a paired t-test was used to compare the two means. In testing the hypothesis that “*Margins obtained at various stages in the value chain do not break even*”, gross profit margins received by milk value chain actors both in the formal

and informal channels were calculated and compared accordingly using a paired sample t-test.

Gross profit margin analysis

Gross profit margin is the difference between revenues, (quantities x prices the customer pay) and the sum of costs incurred in the production and delivery of the product/service including variable and fixed costs. The difference between Gross Profit Margin (GPM) and Gross Margin (GM) is that the latter does not take into account fixed costs by the assumption that variations in fixed cost are not significant. GM ignores the contribution of fixed capital and depreciation to profitability of competing enterprises and thus overestimates the degree of competitiveness. GM can also differ considerably from farm to farm which results in differences in performance levels or methods of recording (Hassall, 2003). Therefore, GPM is an absolute measure of profitability and efficiency in the use of resources available in small scale agriculture because it takes into account fixed costs. Successful studies that employed GPM include Mbiha (2008) and McClure (2004).

The gross profit margin was calculated at each node. According to FAO (2011), a marketing node is defined as any point in the marketing chain where an exchange and/or transformation of a dairy product takes place. At each node of the dairy value chain, gross profit margin was obtained or calculated by subtracting the estimated total costs (variable and fixed costs of production, processing and marketing) from total revenue as shown in the following formula (i):

$$GPM_i = Tr_i - (TVC_i + TFC_i) \dots \dots \dots (i)$$

Where;

- (GPM_i) Profit margin of producer/milk trader/processor
- (TR_i) Total revenue of producer/milk trader/processor
- (TVC_i) Total variable cost of producer/milk trader/processor
- (TFC_i) Total fixed cost of producer/milk trader/processor

i = 1–nth producer/milk traders/processors

Variables that were considered in the formula

(i) Total revenue (TR_i)

The quantities (output) and selling prices were obtained directly from farmers, traders and processors. Total revenue per actor for farmers, traders and processors was the product of selling prices and quantity. Selling prices differed between actors depending on time of selling or type of buyer. High prices were matched with high total variable costs emanating from incremental handling costs incurred especially on processing.

(ii) Total variable costs (TVC_i)

These were obtained from dairy farmers/all actors in the milk value chain. The producer’s cost of each item was calculated according to the costs involved including charges for feeds, hired labour, utensils, fuel, transport, veterinary services, manure disposal and utilities cost. Processor’s costs include costs for milk procurement, transport, payment of labourers, milk additives, packaging materials, sanitary costs and depreciation cost of assets (e.g. buildings, machinery and equipment). Gross profit margin was the basic unit of analysis in evaluating farmers’, traders’ and processors’ profitability.

(iii) Total fixed costs (TFC_i)

These were collected from dairy farmers, market agents and processors through interviews. The farmers’ costs involved charges for purchase of cattle; cattle shed construction, building repair and depreciation, while for processors fixed costs involved permanent staff salaries, premises rent, municipal fees, license, depreciation, income taxes and other taxes and levies. Traders’ fixed costs include cost of purchasing bicycles and utensils (buckets and measuring containers).

The importance of gross profit margins for each actor

One of the aims of the study was to characterize the structure, conduct and performance of the milk value chain. Gross profit margin was used as proxy for measuring the performance. This was so because it was important to know who

gets what among the actors (producers, milk traders and processors) along the milk chain in the city.

According to Purcell *et al.* (2008), the gross profit margin analysis for each actor enables the researcher to determine how the value chain really operates. Therefore, gross profit margins are considered when a researcher aimed to find out whether a value chain is accessible to new entrants and has potential to grow in the future.

Data requirements and sources

A total of 112 respondents (80 smallholder dairy farmers, 30 traders and 2 processors / distributors) were directly interviewed using semi-structured questionnaire and checklist guides. Both quantitative and qualitative data were collected from respondents using the 2011/12 season as a reference. Necessary precautions were taken during sampling to ensure a representative sample through accurate sampling so as to minimize the risk of sampling bias and enhance the possibility of drawing reliable inferences about the population. These precautions included selecting study subjects randomly in a manner that gave each sampling unit in the population an equal chance of being selected in addition to using subtle probing techniques during questionnaire enumeration to avoid asking leading questions in the interviews.

Results and Discussion

Quantification of Production Cost of Smallholder Dairy Farmers

Production cost is one of the important components in any production system that helps in the evaluation of the performance of the value chain. Findings on annual production cost per dairy cow* are presented in Table 1. These results show that the average annual production cost was TSh 458 869 per cow-equivalent mostly accounted for by contribution from labour charges and feeds. Labour charges accounted for 45.7% of the total production cost and the feeds cost was 19.4% of total production cost. The remaining dairying activities accounted for 34.9% of the total cost.

The findings are in line with the study carried out by Sayeed *et al.* (2005) on economics of dairy

farms in Bangladesh. They reported that labour was the major cost followed by feeds. However, the cost of feeds was lower when compared with finding reported by Alam *et al.* (2007), where feeds cost alone accounted for more than 50% of the total production cost in Bangladesh. This could explain the low productivity in the study area (6 litres per day per cow) as most producers feed maize bran only as supplement due to high cost of feeds (price ranging between TSh. 150–200 per kilogram of maize bran).

Due to lower usage of feeds and reliance on open grazing, feeding costs are somewhat lower in the semi-grazing system. These lower costs, however, are compensated by other higher costs, including drugs and veterinary service charges. Individual costs vary widely between respondents/households depending on the quantity and type of feed used and whether they are commercially produced or 'home-made'. Interviews uncovered a wide range of practices such as zero grazing, semi-grazing and extensive or open grazing leading to very different findings both in terms of yields achieved and the cost structure.

It was observed that, on average in each household there were 5 cow-equivalent. About 50% of the herds were milking cows equivalent to 2.4–5 cows per household. Average lactation length was observed to be 290 days and average milk price was TSh 580 per litre in formal market channel. Quantity of milk produced per cow stood at 6 litres per day equivalent to 4176 litres per 2.4 milked cows per lactation duration (290 days) which translates into cost of production per litre of TSh. 550. Table 1 shows the annual production cost per cow-equivalent. Since households kept herds of 5 cows-equivalent, the total production cost per household is TSh. 2 294 345 per year. It was also found that the production cost per litre was TSh. 550 against revenue of TSh. 580 per litre of milk, which was an average selling price per litre in the formal channel.

Actor's Gross Profit Margins

Smallholder dairy farmers

The average Gross profit margin for smallholder

Table 1: Annual production cost per dairy cow*

Cost for various dairy activities	Average cost of production/cow/year (TSh)
Variable cost	
Feeds	89 063
Commercial minerals	11 117
Labour charges	209 556
Utensils	3 581
Transport	10 048
Veterinary/breeding services	20 907
Utilities	20 433
Miscellaneous	9 538
Fixed cost	
Depreciation of cow	33 457
Depreciation of cow sheds	20 652
Own capital	30 517
Grand total cost	458 869

*Cow equivalent is stipulated as 1 heifer = 0.8 cows; 1 calf = 0.4 cows and 1 bull = 1 cow (Alam *et al.*, 2007)

dairy producers in the study area was TSh. 30 and TSh. 150 per litre of milk when traded their milk through formal and informal market channels respectively. Producers selling through formal channel received low profit margin (TSh. 30 per litre), compared to other actors as the prevailing price at the milk collection centres (MCC) was averaging at TSh. 580 per litre while the production cost per litre was TSh. 550. The finding shows that 36.2% and 6.2% of smallholder producers sold all their milk at the farm gate and retailers/kiosk/shops respectively. They received higher prices of TSh. 700 per litre which is higher compared to the average price at MCC (formal channel). Hence, producers' profit margin through informal market was observed to be higher (by TSh. 150 per litre) than profit margin (TSh. 30 per litre) obtained in the formal channel. The remaining 57.6% of the producers admitted to sell their milk to both formal and informal market channels. They intend/target to sell through the informal channel when milk remain unsold then they sell to formal channel.

Processors' gross profit margin

Processors' (Tanga Fresh and Ammy Brothers) gross profit margin were TSh 244 and TSh 242 per litre of milk purchased and processed respectively. It was obtained by taking the total

revenue obtained minus the total cost per year divided by total litres of milk processed per year. Depending on the demand prevailing at the time, the processor decides the product to be released. For example, if the yoghurt is highly demanded then the processor will process all the milk into yoghurt. However, it was observed that yoghurt and pasteurized milk were the main products produced in Tanga city.

It was observed that low processor's gross profit margin compared to milk traders' was a result of stiff competition facing traders in the informal sector. The competition with informal sector is by far the largest constraint to the processor's milk procurement. Hence during the dry season processors operate under capacity. Furthermore, processors argued that the competition is unfair because the informal sector is not being regulated by the government and can consequently get away with lowering costs through adulterating milk. Similar results were reported in Kenya by Collinson *et al.* (2002).

Milk traders' gross profit margin

Milk traders' gross profit margin was found to be TSh 253 per litre of milk sold (Table 2). This was obtained by taking the difference between total revenue and total marketing cost per year,

divided by amount of sold milk per year. Milk traders make higher gross profit margins than the rest (other actors) in the chain, because they channeled all the milk bought into the informal sector which offers higher price. However, this channel seems to be more profitable than the formal channel but really did not take into consideration consumer's health risks. This was proved by 88.5% of the traders who reported to have done nothing in the quality control measures. Furthermore, they reported that there were not paying taxes or any kind of business registration charges.

the milk marketing system. The study findings indicate that, the actors received different gross profit margins which are statistically different at $p \leq 0.05$ level of significance following a t-value of 1.16 and P-value of 0.0452. Smallholder dairy farmers received gross profit margins of 5.2% and 21.4% in the formal and informal channels respectively while processors and traders received gross profit margins of 18.8% and 36.1% per litre of milk respectively. Therefore, the GPM findings indicate market inefficiency.

Table 2: Gross profit margins per litre of milk in the formal and informal markets

Particulars (TSh/litre)	Informal		Formal	
	Producers	Traders	Producers	Processors
(a) Average SP per litre	700	900	580	1300
(b) Average BP + handling cost	N/A	747	N/A	580
(c) Average revenue per litre	700	253	580	720
(d) Cost of production/processing per unit/litre	550	N/A	550	476
(e) GPM (c-d)	150	253	30	244

Key: SP – Selling price; BP – Buying price and GPM – Gross profit margins and (c-d) is the difference between Average revenue and cost of production/processing; N/A- Not applicable.

Therefore, according to the S-C-P model, performance is greatly influenced by the structure and conduct. Economists traditionally understand a well-doing market as one in which the supply and demand works most efficiently, which means that maximum earnings are achieved for each actor. Hence, poor performance is the end result of lack of good pre-requisites for a fair competition along the milk marketing system. In this study, it was observed that smallholder dairy farmers received small gross profit margins as compared to processors and milk traders because of high production costs, diseconomies of scale as well as low producer price for raw milk.

The paired t-test was used to test the hypothesis that producers' raw milk price in the formal chain is not cost-effective. Based on paired t-test findings (t-value = 9.34 and P-value = 0.042), producer's raw milk price was found to be cost-effective. Gross profit margin was used to determine the performance/efficiency of

Conclusions and recommendations

The dairy industry/sector in the Tanga city provides employment and economic benefits to many producers, traders and processors. Urban and peri-urban dairying contribute immensely towards filling in the large demand-supply gap for milk and milk products in urban centres, where consumption of dairy products is remarkably high as compared to rural areas. Therefore, improving marketing performance can increase benefits to communities as well as improving productivity of the dairy sector.

Furthermore, it is recommended that capacity building through sharing of knowledge on dairy keeping practices, storage and marketing activities to farmers and traders and formal market channels should be enhanced to improve efficiency in the value chain. Likewise, information asymmetries as well as monopolistic tendencies should be addressed so as to strengthen and intergrate the existing market channels. On the other hand, primary

dairy cooperatives should be strengthened and cooperative management teams must be aware of business oriented market behaviour (e.g. searching new market opportunities) that will uphold the benefits of the members (dairy producers) as well as promote value addition through diversification of their operations by processing the collected milk into butter, cheese, yoghurt and sour milk depending on market demand and resource availability and sequentially exploring the economies of scale.

Acknowledgements

Authors are grateful to the ASARECA for funding this study through a research grant received from Sokoine University of Agriculture (SUA) which is also acknowledged for their support.

References

- Alam, M.G.S., Rahman, M.A., Khatun, M. and Ahmed, T.C. (2007). Feed Supplementation and Weight Change, Milk Yield and Post-Partum Oestrus in Desi Cows. *Bangladesh Veterinary* 26: 39 – 47.
- Collinson, C.D., Kleih, U. and Burnett, D.G. (2002). *Transaction Cost Analysis*. The Natural Resources Institute, Kenya. 39pp.
- FAO (2011). Food and Agriculture Organization of the United Nations [www.faostat.fao.org] site visited on 6/7/2012.
- Franzel, S., Wambungu, C., Nanok, T., Kavana, P., Njau, T., Aithal, A. Muriuki, J., and Kitanyi, A. (2007). The production and marketing of leaf meal from fodder shrubs in Tanga, Tanzania: A pro-poor enterprise for improving livestock productivity. ICRAF Working paper No. 50. World Agroforestry Centre, Nairobi.
- Hassall, I. (2003). Review of Gross Margin Analysis and Modeling Tools for Sheep Enterprises. [http://www.sheepre.org] site visited on 20/9/2012.
- Karanja, A. (2003). Dairy Industry in Kenya: Post-Liberalization Agenda. [www.aec.msu.edu] site visited on 26/10/2011.
- Kurwijila, L.R., Jorgensen, P. and Mdoe, N.S.Y. (1997). Market Oriented Dairying: The Case of Tanzania. Paper presented at the FAO workshop held at Anand, India, 1–3 December 1997. FAO, Rome, Italy.86–102pp.
- Mbiha, G.E. (2008). Analysis of the Dairy Value Chain in Dar es Salaam Milk Shed. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania.147pp.
- McClure, B. (2004). Fundamentals of Gross Profit Margin. [www.invetopedia.co] site visited on 27/9/2012.
- Mdoe, N.Y.S (1993). Smallholder Dairy Production and Marketing in Hai District, Tanzania. Dissertation for Award of PhD Degree at University of Reading, UK.137pp.
- MLD (2006). National Livestock Policy.[www.mifugo.go.tz] site visited on 8/2/2012.
- MLFD (2010). Investment Opportunities in the Livestock Industry. [http://www.mifugo.go.tz] site visited on 20/2/2012.
- MLFD (2011). Livestock Sector Development Programme. [http://www.mifugo.go.tz] site visited on 10/1/2012.
- NBS (2018). Annual Agriculture Sample Survey Crop and Livestock Report 2016-2017. [http://www.nbs.go.tz] site visited on 1/10/2019.
- NBS (2018). Survey report. [http://www.nbs.go.tz] site visited on 28/9/2019.
- Ndambi, O.T., Hemme, T. and Lohmann, U. (2007). Dairying in Africa–Status and Recent Developments. *Livestock Research for Rural Development* 19(8): 1 – 10.
- Njombe, A.P., Msanga, Y., Mbwambo, N. and Makembe, N. (2011). The Tanzania Dairy Industry: Status, Opportunities and Prospects. Ministry of Livestock and Fisheries Development. Paper presented to the 7th African Dairy Conference and Exhibition. Dar es Salaam, Tanzania. 27May, 2011. 78pp.
- Omoro, A., Staal, S.J., Osafo, E.L.K., Kurwijila, L., Barton, D., Mdoe, N. Nurah, G. and Aning, G. (2004).Market Mechanisms, Efficiency, Processing and Public Health Risks in Peri-Urban Dairy Product Markets: Synthesis of Findings from Ghana and Tanzania. ILRI, Ghana: 127pp.
- Purcell, T., Gniel, S. and Van Gent, R. (2008). Value Chain Analysis Tools. [www.

- valuechains4poor.org] site visited on 15/8/2012.
- Quaedackers, P (2010). Developing Market Linkages for Smallholder Farmers. The Tanzanian Dairy Industry. Dissertation for Award of MSc Degree at Copenhagen Business School, Copenhagen, Denmark. 102pp.
- Sayed, M.A., Rahaman, S.M.A., Alam, J. and Begum, J. (2005). Economics of Milk Production in Dhaka District 7(1): 49– 55.
- Schooman, L. and Swai, E.S. (2011). Marketing, Handling and Physical Quality of Raw Marketed Milk in Tanga Region of Tanzania. Livestock Research for Rural Development. [<http://www.lrrd.org>] site visited on 16/09/2012.
- Shem, M.N. and Mdoe, N.S.Y. (2002). Dairy Production and Poverty Alleviation in Tanzania: A Historical Perspective. Paper presented during the Joint Meeting of the Society of Animal Production and Tanzania Veterinary Association, Arusha, Tanzania. December, 2002. 98pp.
- TechnoServe (2008). Dairy Value Chain in Kenya– East Africa Dairy Development Programme (EADD). Nairobi, Kenya. 67pp.