Analysis of Factors Influencing Choice of Milk Marketing Channels among Dairy Value Chain Actors in Peri-urban Areas of Nakuru County, Kenya

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Abstract

In Nakuru County of Kenya, the urban population serves as a market for milk produced both within the outskirts and neighbouring counties. Increase in human population has led to high demand for milk and milk products, a phenomenon that has created opportunities for dairy value chain actors. Using a random sample of 200 farmers, this study investigated factors influencing urban dairy farmers' choice milk marketing channels in Nakuru County. Data analysis using multinomial logit regression revealed that age, education, dairying experience, household size and frequency of milk purchases had significant influences on the type of channel chosen by the actors. To increase milk market participation and milk marketed volume, efforts should be made to strengthen the capacity of existing small and medium-scale farmers who showed a potential to enlarge their herds. It is also imperative for government and other development agencies to engage dairy value chain actors to minimize on their transaction cost for a smooth business to enhance food and nutrition security. The findings of the current study will be useful to dairy value chain actors in focusing on sustainable milk markets and dairy production in general.

Key words: Marketing channels, Dairy, Value chain

1. Introduction

The informal sector is critical in Kenya, especially for its role in providing cheap and effective marketing for smallholder dairy producers and the fact that it generates employment. Milk hawkers handle over 60% of all milk produced and marketed (80% of milk produced in Kenya is consumed unprocessed) and they cannot be wished away or ignored. Although the importance of the sector in employment creation especially of young people has been recognized, uncertainty still prevails on ways and means of assisting its growth. 'Informal sector activities are largely ignored, rarely supported, often regulated and sometimes actively discouraged by Government (ILO 2004).

Dairy production in Kenya is dominated by smallholders in crop-livestock systems in areas of high and medium cropping potential. This is favoured by the temperate climate conditions which allows for cross-breeding of local cows with exotic dairy breeds to raise productivity (Holloway *et al.,* 1999). It is, however, essential to note that not all households in practising dairy farming have access to high productivity crossbred stock.

A review of literature indicates that formal sector, particularly dairy co-operatives played a significant role in fostering dairy development, primarily by providing a stable market environment and delivering services to farmers (Liebrand & Ling 1991). Before its liberalization, the Kenya Cooperative Creameries (KCC) remained the sole milk processor and its influence in the industry increased in 1958 with the formation of the regulatory arm of the government, the Kenya Dairy Board, through the Dairy Industry Act Chapter 336 Laws of Kenya. The KCC was given powers to act as a government agent in the processing, packaging and selling of milk in urban areas. It was to ensure that no raw milk is sold in the urban areas. However, raw milk could be sold in the rural areas. The KCC was supplied milk by numerous dairy cooperatives formed by farmers (Liebrand & Ling 1991; Makokha *et al.* 2008). After liberalization, many other players have emerged in the formal sector, and their role is to process and package milk before selling them to consumers in pasteurized form.

About 20% of marketed milk flows through the KCC and private processors. The remainder of the marketed milk is sold as non-processed milk. The non-processed milk market channels include: direct milk sales to consumers by farm households (35%) (Gitau *et al.* 1994), milk collected by dairy co-operative societies, smallholder groups (SHGs) and individual milk traders who sell either directly to consumers (16%), private processors (5%) and the KCC (3%). The dramatic increase in the number of informal milk traders in milk marketing is a recent phenomenon prompted by the liberalisation of dairy sub-sector. For example, in Murang'a County, 70% of milk sales were through the KCC in 1995 (Owango *et al.* 1996) but reduced to only about 5% in 1997. The supply of milk is mainly influenced by producer prices, access to support services, the size of the national dairy herd and estimated milk yields.

Traditional markets are projected to retain importance in dairy development despite attempts to grow the agricultural sector and commercial system (Mbu *et al.* 2007). Empirical evidence suggests that this was due to demand for traditional market products that are not likely to change with increased levels of disposable income. Thus, policy makers should productively engage with traditional systems rather than exclusively concentrate on investment in formal dairy processing capacity (Makokha, *et al.* 2008). Attempts to foster commercial system development, and discourage traditional markets, have been advocated by officials concerned with health risks from unpasteurised milk consumption (ILRI 2003). It is suggested that a different development focus should concentrate on the needs of local farmers and consumers (ILRI 2006).

The informal value chain involves sales of raw milk by producers or their agents to consumers and entails spot transactions. It may also involve hawking of milk from home to home in the rural areas by itinerant traders who do not need or seek licenses to do such business. Since the marketed milk does not enter the formal marketing system, it is referred to as the informal milk marketing (Mbogoh 1995). In Kenya, the informal sector is critical, especially for its role in providing cheap and effective marketing for smallholder dairy producers and the fact that it generates a lot of employment. According to Omore *et al*. (1999) farm gate prices for raw milk are lowest in milk surplus areas such as Nyandarua and Murang'a Counties and highest at the coast, where milk deficits are acute. The prices range from Kenya Shillings (Kes) 11/litre (≈ US$ 0.18) in Nyandarua County of Kenya to Kes 35/litre (≈ US$ 0.6) in Mombasa town, reflecting extremes in milk surplus and deficit areas. Though sufficient information to assess general consumption and preference patterns is lacking, indications are that most consumers prefer and consume raw (boiled) milk, especially with tea.

Based on cattle population statistics and research reports, it is estimated that approximately 3,078 million litres of milk are produced annually; 81% of it originates from approximately 3 million dairy cattle (MoL&FD 2003). About 2.5 million of the cattle are exotic and crossbred in smallholdings, and the rest are indigenous. Almost all marketed milk comes from the dairy herd and a high proportion (about 70%) originates from the smallholder dairy herds.

2. Research Methodology

Multinomial Logit was used to establish factors that lead to the choice of certain channels by various individuals. This is a random utility framework, in which the utility in each alternative is a function of observed characteristics (individual and/or alternative specific) plus and additive error term. Here, individuals are assumed to choose the channel that has the highest utility in terms of maximizing profit margins.

The model is as shown in equation 1 below:

$$\Pr(Y_i = j) = \frac{\exp(X_i \beta_j}{1 + \sum_{j=1}^{J} \exp(X_i \beta_j} \tag{1}$$

where, for the ith individual, y_i is the observed outcome and X_i a vector of explanatory variables. The unknown parameters β_j are typically estimated by maximum likelihood. In this model, the probability of an individual choosing alternative/channel j is a simple function of explanatory variables. X_i β_j are channel-specific characteristics. When explaining the channel to trade in, for instance, this may include costs incurred, which may vary from person to person. A negative β_j then means that the utility of a channel declines if costs incurred increase. Consequently, if costs in one of the channels are reduced (while the other channels are not affected) this channel will have a higher probability of being chosen.

Further analysis can be conducted using the same modelling procedure to evaluate the welfare impacts. Consider an additive random utility model and here we think of a general multinomial model whose utility of the jth choice is specified to be given as indicated in equation 2 below:

$$U_j = V_j + \varepsilon_j, \text{j=1,2...m} \tag{2}$$

where V_j denotes the deterministic component of the utility and ε_j denotes the random component of the utility.

For the ith individual usually $V_{ij} = X_{ij}\beta$

The chosen alternative is that with the highest utility, so that

$$\Pr[y = j] = \Pr[U_j > U_k \qquad \forall k \neq j]$$

$$= \Pr[U_k - U_j \leq 0, \qquad \forall k \neq j]$$

$$= \Pr[\varepsilon_k - \varepsilon_j \leq V_j - V_k 0, \qquad \forall k \neq j] \tag{3}$$

$$= \Pr[\tilde{\varepsilon}_{ij} \leq V_{jk'} \qquad \forall k \neq j]$$

where the ith and second subscript j denote differencing with respect to reference alternative j; 1 is specified as an indirect utility function as depicted in equation 4 below:

$$V_j = V(1 - p_{j,} X_j) \tag{4}$$

where i^{th} denotes income, p_j the price of the jth alternative (a proxy for the variable can be thought of, e.g., gross margins, which could have been determined earlier), and X_j the characteristics associated with the jth alternative (chain).

3. Results

The results presented in Table 1 below shows factors that influenced decision making process of a farmer while selecting his/ her milk marketing channel. Selling price of milk per litre negatively influenced the likelihood that a farmer will sell milk to hawkers ($P<0.01$) and milk bars ($P<0.1$) significance levels while the choice of farmer cooperative was not significant. This could be attributed to low prices offered by the three marketing channels (i.e., hawkers, farmer cooperatives and milk bars). Despite selling price being a motivating factor in dairy production, seasonal effects could lead to reduced prices, especially during rainy periods when animal feeds are plenty unlike during the dry spell. Hawkers provide a market point that easily is accessible without a transaction costs being incurred by the farmer since they collect milk at the farm gate. In their study Liebrand & Ling (1991) observed that dairy farmers may accept lower prices in return for an assured market for their milk. Jensen (1990) further observed that farmers chose between cooperatives and proprietary handlers because of an assured market and better services as opposed to higher prices and low deductions.

Experience in dairy farming over the years had a positive influence on the likelihood that a farmer will sell his milk to hawkers or farmer cooperatives ($P<0.01$). This can be associated with vast knowledge gained by the farmer about various milk market actors, their support structure to the farmer and other benefits that accrue to the farmer beside revenue generated from milk sales. The fact that hawkers collect milk at farm gate reduces the cost of farmers selling the milk while farmer cooperatives have been known to pay at end month, which acts as a savings mechanism to the farmer. According to Bardhan *et al.* (2012), experience is important in generating confidence among the farmers to become receptive to new production ideas that enable them become competitive in the market. The experience in the past in many countries is that grain marketing cooperatives have to be very efficient to compete with private sector traders when both are on a level playing field. This is mainly because private traders have often been better informed than cooperatives. Private traders have been able to respond more rapidly to changing market conditions, make assessments of the risks involved and take rapid decisions based on the assessed risks as they enhance their market participation and volume of sales.

Table 1: Factors influencing farmers' choice for different milk marketing channels

Variable	Hawkers		Farmer cooperatives		Milk bars	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Dairying experience	0.069*	0.415	0.077*	0.429	-0.022	0.057
Dairy area	1.210*	0.632	-3.015*	1.744	-0.922	1.251
Age	0.018	0.028	-0.030	0.033	-0.077**	0.039
Education	0.048	0.099	-0.137	0.092	-0.180*	0.106
Purchase frequency	2.364***	0.917	1.609*	0.843	0.710	1.011
Quantity purchased	0.042	0.038	0.013	0.031	-0.196**	0.095
Selling price	-0.215***	0.059	-0.020	0.055	-0.125*	0.071
Gender	0.100	0.747	-0.339	0.812	-1.968	1.433
Household size	0.104	0.229	-0.328	0.237	-0.653**	0.286
constant	1.660	3.611	1.526	3.824	13.42**	5.540

Note: Individual consumers channel used as base category.

*, ** and *** denote significance at $P<0.01$, 0.05 and 0.1.

Dairy area had a significant positive effect on the likelihood of selecting hawkers as their marketing channel while negatively influencing the choice of farmer cooperatives. This was consistent with the findings of Bernard *et al.* (2007), in a study in Ethiopia, who reported that small dairy households are less likely to participate in dairy cooperatives but rather sell directly to individual consumers. Peri-urban dairy production is characterized by small land holding with most farmers relying on purchased fodder and concentrates to feed their livestock. Small livestock farms in peri-urban areas are small and have to side position themselves in dairy supply chain. Their inability to offer bigger quantity with standard quality of products with general lack of cooperative action among farmers decrease their chances to be well integrated in major food chains. Literally, they have been abandoned by big food processing companies. In the current situation farmers use rest of marketing channels like: small and medium sized informal food processing enterprises, green market, and direct sale to consumers. Besides that, farm household consumption, especially of livestock products, is at high level in Nakuru County. Small farms have more challenges to become well integrated in food chains.

In recent years, the aforementioned chain actors which are more oriented to small farms intensified their cooperation with dairy farmers. Cooperatives use various strategies including cooperation and coordination of dairy activities with small farms. Dairy plants invest time in extension work with farmers and capital in cooperation and provide farmers with cooling tanks and in some extreme situation with feed and some other inputs. The amount and quality of feeds that can be accessed and purchased by the farmer has an influence on the production level of each animal. The smaller the land size for holding the animals, the fewer the animals and less milk is produced. With less milk being produced per day dependent on number of animals and quality of feed, farmers will sell their milk to hawkers.

The study revealed that age reduced the likelihood of choosing milk bars as a selling point for the farmer's milk. This was significant ($P<0.05$) implying that old farmers are less likely to deliver their milk to milk bars. These results confirm findings of a study done by Misra *et al.* (1993) on factors influencing southern dairy farmers' choice of milk handlers, who established that indeed as dairy farmers get older, they are less likely to change their milk marketing channel. This could be explained by the trust build between the buyer and the farmer over the years that they have been trading.

Literate households are expected to have better skills and better access to information and ability to process information. Education plays an important role in adoption of new technologies and believed to improve readiness of a head to accept new ideas and innovations. It also enables a head to get updated demand and supply information on milk. However, in the current study, education levels of the farmer was found to reduce the likelihood of selecting milk bar as his/her selling point and further no significant effect on selection of hawkers and farmer cooperatives as a milk marketing channels. This was inconsistent with study findings of a study by Angula (2010) who found that education enhances managerial competence and successful implementation of improved production, processing and marketing practices.

The frequency of milk purchases has positive effect on the likelihood of selecting both hawkers (P<0.01) farmer cooperatives (P<0.1) as their milk marketing channels. This could be attributed to the fact that regular demand by these actors forms a stable market for the farmer's milk hence ensuring that he/she has smooth cash inflows from the dairy enterprise. Amount of milk produced and sold determines the farmer's commitment to supplying a specific market. In the current study, quantity of milk produced and sold had a negative significant effect on farmer's likelihood of choosing milk bar while hawkers and farmer cooperatives were not significant which was contrary to a study by Omiti *et al.* (2009). This implies that with increased scale of production, producers preferred to sell to milk bars, probably because of offer of higher price as compared to hawker and cooperatives. This study also revealed that urban dairy farmers feature prominently at the higher end of scale of milk production and distribution to urban residents. This implies that given the right institutional incentives and market infrastructure, they are capable of scaling-up milk production and hence commercialize their dairy enterprises. Escape from poverty requires the production of a marketed surplus over basic subsistence needs, to pay for productive inputs and consumer goods and to meet immediate cash requirements. Although herd or flock expansion may be based on the natural processes of reproduction and growth, the initial investment in a new enterprise and other forms of asset accumulation require cash savings or credit supplies. Purely subsistence households are relatively rare and the vast majority of peri-urban households are engaged to some extent in market activities, although they also aim to produce food for the family.

Size of household membership had a negative influence on the likelihood of delivering milk to the milk bars. Household size had no significant effect on selection of hawkers and farmer cooperatives as alternative marketing channels. Household size increases domestic consumption requirements and may render households more risk averse. Families with more household members tend to consume more milk which in turn decreases milk market participation and marketed milk surplus. Current results are consistent with findings of Heltberg & Tarp (2002), Lapar *et al*. (2003). This implies that interventions aimed at promoting family planning amongst farm communities can contribute to commercial transformation of smallholder dairy farming. Consequently, by controlling for labour supply, larger households are expected to have lower market participation.

4 Conclusions and recommendations
Most of the urban dairy farmers live in medium and low density areas, and use their residential units as places where dairy production is practiced. The dairy farmers in urban areas have little access to grazing land and mainly rely on purchased feeds. The findings in the current study revealed that milk was marketed through different marketing channels. The most important marketing type was formal marketing. Dairy collectors were responsible for buying milk from smallholders and delivering to milk processing companies. The marketing system for milk was predominantly traditional and fragmented, and characterized by no licensing requirements. Generally, dairy marketing system in the area was characterized by under developed and inefficient type of market. To increase milk market participation and milk marketed volume, efforts should be made to strengthen the capacity of existing small- and medium-scale farmers who showed a potential to enlarge their herds. Smallholders should, whenever possible, be encouraged into interest groups to increase market participation. Organizational approach should be encouraged by forming interest groups or clubs rather than cooperatives. Active exchange of experiences need to be promoted by extension service providers to private farms and existing interest groups to improve milk production. Moreover, financial and market access seem to be very important factors. Consequently, the County and national governments could pay more attention to enhance their access to finances and markets. The findings of the current study will be useful to dairy value chain actors in focusing on sustainable milk markets and dairy production in general.

References
Angula, M.N. (2010), "*Determinants of Sustainable Coffee Marketing Channel Choice and Supply Response Among Organic and Certified Smallholder Farmers: Evidence from Uganda*", Masters of Science Thesis, Department of Agricultural, Food and Resource Economics, Michigan State University, USA.
Bardhan, D., Sharma, M.L., & Saxena, R. (2012), "Market participation behaviour of smallholder dairy farmers in Uttarakhand: a disaggregated analysis", *Agricultural Economics Research Review* 25(2), 243-254.
Bernard, T., Gabre-Madhin, E., & Taffesse, A.S. (2007), "Heterogeneous impacts of cooperatives on smallholders' commercialization behavior: evidence from Ethiopia", *In: Proceedings of the Second International Conference of the African Association of Agricultural Economists (AAAE), August 20-22, 2007, Accra, Ghana (No. 52161).*

Gitau, G.K., McDermott, Waltner-Toews, D., Lissemore, K.D., Osumo, J.M., & Muriuki, D. (1994), "Factors influencing calf morbidity and mortality in smallholder dairy farms in Kiambu District of Kenya", *Preventive Veterinary Medicine* 21, 167-177.

Gitu, K.W., Mburu, L., & Wakhungu, J.W. (2007), "Determinants of smallholder dairy farmers' adoption of various milk marketing channels in Kenya highlands", *Livestock Research for Rural Development* 19(9).

Heltberg, G., & Tarp, F. (2002), "Agricultural supply response and poverty in Mozambique", *Food Policy* 27,103-124.

Holloway, G., Nicholson, C., & Delgado, C. (1999), "*Agro industrialization Through Institutional Innovation: Transaction Costs, Cooperatives, and Milk Market Development in the Ethiopian Highlands*", International Food Policy Research Institute, Washington DC, USA.

ILO (2004), "*Studies on the SYNDICOOP Strategy for Organizing Workers in the Informal Economy*", ACTRAV/COOP, ILO, Geneva.

ILRI (2003), "*Enhancing Milk Markets Vital to the Poor*", Retrieved September 30, 2015, from http://www.ilri.org/ilripubaware/Uploaded%20Files/200481194430.02BR_ISS _EnhancingMilkMarketsVitalToThePoor.htm

ILRI (2006), "*Informal Traders Lock Horns with the Formal Milk Industry: The Role of Research in Pro-poor Dairy Policy Shift in Kenya*",

Jensen, K. (1990), "*Factors Associated with the Selection of Cooperative vs. Proprietary Handlers of Milk in Tennessee*", Journal *Agriculture Cooperation* 5, 27-35.

Lapar, M.L., Holloway, G., & Ehui, S. (2003), "Policy options promoting market participation among smallholder livestock producers: A case study from the Philippines", *Food Policy* 28, 187-211.

Liebrand, C.B., & Ling, K.C. (1991), "*Value of Cooperative Benefits to Southern Dairy Farmers*", U.S. Department of Agriculture, Washington, DC, Agricultural Cooperative Service Research Report No. 99.

Makokha, S.N., Karugia, J.T., Staal, S J., & Oluoch-Kosura, W. (2008), "Analysis of factors influencing adoption of dairy technologies in western Kenya", *In: Proceedings of the 2ndAfrican Association of Agricultural Economists (AAAE) International conference on Agricultural Growth, Poverty Reduction and Millennium Development Goals in Africa, August 20–22, 2007, Accra, Ghana.*

Mbogoh, S.G. (1995). "Impact of marketing liberalization on dairy marketing and the dairy marketing system in Kenya: strategies for market orientation of small-scale milk producers and their organizations", *In: Proceedings of a Workshop Held on March, 20-24, 1995 at Morogoro Hotel, Morogoro, Tanzania,.*

Misra, S.K., Carley, D.H., & Fletcher, S.M. (1993), "Factors influencing southern dairy farmers' choice of milk handlers. *Journal of Agricultural & Applied Economics* 25, 197-197.

MoL&FD (2003), "*Livestock Production Annual Report 2002*", Ministry of Livestock and Fisheries Development, Nairobi, Kenya.

Omiti, J., Otieno, D., Nyanamba, T., & McCullough, E. (2009), "Factors influencing the intensity of market participation by smallholder farmers: a case study of rural and peri-urban areas of Kenya", *African Journal of Agricultural & Resource Economics* 3(1), *57-82.*

Omore, A., Muriuki, H., Kenyanjui, M., Owango, M., & Staal, S. (1999), "*The Kenya Dairy Sub-Sector: A Rapid Appraisal*", Smallholder Dairy (Research and Development) Project Report, 51 pp.

Owango, M.O., Staal, S., Kenyanjui, M., Lukuyu, B., Njubi, D., & Thorpe, W. (1996), "Liberalization in the livestock industry: evidence of impact from Dairy Co-operative Societies in Central Province, Kenya", *In: Proceedings of the 5th Scientific Conference of the Kenya Agricultural Research Institute, October 14-16, 1996, Nairobi, Kenya, pp. 345-36.*