Market Performance of Dairy Goats and its Products in Kongwa and Mvomero Districts, Tanzania

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Abstract

Despite the potential of dairy goat in the reduction of rural malnutrition and poverty, the dairy goat sub-sector still faces poor development in both input and output markets. The poor development of these markets has partly been contributed by the direction of past researches on dairy goats, which were focusing on increasing milk production, thus, leaving institutional and community based challenges unresolved. This study therefore, examined market performance of dairy goats and its product in Kongwa and Mvomero districts where the dairy goats were introduced under Crop and Goat Project (CGP) of Sokoine University of Agriculture - Tanzania. Specifically, the study assessed market operations as institutional issues in the project villages of Ihanda and Masinyeti (in Kongwa District) and Kunke and Wami Luhindo (in Mvomero district). Primary data was obtained by surveying 106 project farmers and 60 consumers who were selected randomly in the project villages. Secondary data were collected from project reports and other various sources. The structure-conduct-performance (S-C-P) model was used to assess market performance whereby gross and net margins (GM and NM) were determined. The findings show that dairy goat milk was preferred due to its nutritious value. The price for dairy goat milk prevailed was generally 17% higher than the cow's milk. The supply and demand for dairy goat milk was poor thus, affecting both market performances. There were no actual or specified places for commodity exchange hence affecting market conduct of dairy goat milk and its products. The findings also show further that about 30% of farmers were producing milk which contributed about 64% of the total household revenue. In the case of monthly earnings per individual farmers, the revenue estimated was Tsh. 35 200 for Ihanda; Tsh. 36 000 for Masinyeti; Tsh. 33 100 for Kunke and Tsh. 37 500 for Wami Luhindo. The main cost driver in dairy goat keeping was the feed cost which was estimated to be 76% of the total variable cost. Although the overall GM determined was positive, about 70% of all farmers had negative GM while only 20% experienced positive NM. Therefore, in order to improve the situation, both supply and demand sides should be strengthened through farmers educational and promotional activities. Besides, sensitization on consuming of dairy goat milk is required while the supply side can be strengthened by encouraging farmers to increase the number of dairy goats kept and improvement of management practices.

Keywords: profitability, marketing margins, milk products, Morogoro

Introduction

The dairy goats have been realized to have potential to eradicate rural malnutrition and poverty (Msalya *et al.,* 2017). This potential has attracted various development and research agents such as Farm Africa, Heifer International, Sokoine University of Agriculture (SUA) and other religious organizations to invest in the development and promotion of dairy goats in Tanzania. These programs have resulted in increased dairy goats in Tanzania from 40 000 in 2005 to about 400,000 in 2015 (URT, 2017; Lie, 2011).

The past practice of promoting dairy goats in Tanzania, and within the East African region at large, has been categorized into

two approaches; institutional (bilateral) and community based (Nziku *et al.,* 2016). The institutional approach was based on establishing centres for breeding and distribution of the dairy goats to farmers only without accompanying services such as improvements in animal health care, feeding and management required (URT, 2017; Karnuah *et al.,* 2017).

The community based approach was focusing on empowering community with dairy goat breeding and management skills (Karnuah *et al.,* 2018) and it emphasized on feeding and health care of goats as part and parcel of the breeding system. However, the community based approach, as was the institutional approach, was focusing on the farmers with little or no attention to other key players in the dairy goats' value chain. The oversight of these approaches led to unfolding of various challenges and barriers which hampered the development of full potential of the dairy goats' production under smallholder farming in Tanzania (Nziku *et al.,* 2017; URT, 2017).

Thus, the initial dairy goat development approaches or frameworks i.e., the institutional and community based, created a gap of undeveloped markets of dairy goat products and inputs. That is, although some farmers realized higher returns, the challenge was high transaction costs associated with fragmented production, high costs of collection and transportation to urban areas, and less customer demand for goat milk as compared to cow milk (Stergiadis *et al.,* 2019). Therefore, these challenges should be reversed through various innovative development programs and interventions and policies reforms. In addition, for the interventions to be effective, they should be holistic and target production, inputs and outputs markets as well. However, such approaches are possible if the existing performance of the current dairy goat marketing is known including inputs and output markets challenges faced; and that is the focus behind this study.

Theoretical framework

Generally, in assessing the market performance of dairy goats and its products, a structure-conduct-performance (S-C-P) model was employed. Initially the model was used in industrial organization researches pioneered by Bain (1959). Inclusion of the model in agriculture commenced about the time the article of Clodius and Mueller (1961) titled Market Structure Analysis as Orientation for Research in Agricultural Economics which applied the S-C-P framework to food industries as cited by Myers *et al.* (2010) was published. The article identified the key strategic characteristics of a market structure as the number and size distribution of buyers and sellers, extent of product differentiation, and conditions of entry.

The 'structure' then determined market conduct which is defined to include decisions on price, quantity, product characteristics, product promotion, and interactions with rival firms or entrants. The 'conduct' in turn determined market performance, which was evaluated in several dimensions, including price-average cost margin, efficiency of production, relative promotion expenditures, design/quality of products, and innovativeness of the industry. The 'performance' represents the outcomes of the selected structure and conduct in terms of efficiency, equity, and profit and price -cost margin

Specifically, the described market performance of dairy goats and its products was based on the nature of milk and manure products, their supply and demand, and production practices employed. The conduct was explained through interaction of buyers and sellers of these products. Therefore, the S-C-P model adopted in the study was analysed descriptively and quantitatively.

The descriptive analysis involved products characteristics and suitability, level of outputs, pricing, supply, and competition. The market performance was analysed quantitatively using marginal analysis for Gross Margin (GM) and Net Margin (NM). Further analysis was also done to determine the factors influencing positivity of GM using logit model for binary choices as presented in equations 1, 2 and 3.

Gross margin analysis

Gross margin is the difference between Total Revenues (TR) and the Total Variable Costs (TVC), and is estimated as presented in

equation 1.

$$GMi = \sum_{i=1}^{n} \left(TRi - TVCi \right) \quad \text{.....(1)}$$

Whereby

GMi = Gross Margin of each farmer i
TRi = Total revenue of each farmer i
TVCi = Total variable costs of each farmer i

The assumption behind gross margin analysis is that farmers are profit oriented and maximize the gross margin within the limited farm resources.

Factors influencing gross margin:

The factors influencing gross margin was analysed using a logit model whereby the expected output are binary outcomes of either positive or not as presented in equation 2.

$$Probe\left[GM_i = 1 \right] = \frac{\exp\left(\beta' x_i \right)}{1 + \exp\left(\beta' x_i \right)} = \Lambda\left(\beta' x_i \right) \text{..(2)}$$

Where by

β' = estimated coefficients
xi = ith factor influencing positivity of GM
ith = sex, milk quantity, number of goats, feed cost, district respectively

Basic assumptions that must be met for logistic regression include independence of errors, linearity in the logit for continuous variables, absence of multicollinearity, and lack of strongly influential outliers.

Net margin analysis:

Net margin analysis is the difference between Total Revenues (TR) and the Total Costs (TC), and its estimated as presented in equation 3.

Net Margin;

$$NMi = \sum_{i=1}^{n} \left(TRi - TCi \right) \quad \text{.....(3)}$$

Where by

NMi = Gross Margin of each farmer i
TRi = Total revenue of each farmer i
TCi = Total costs of each farmer i

The assumption behind net margin analysis is the same as for gross margin.

Methodology

This study was carried out in Kongwa and Mvomero Districts, Tanzania. Two villages were selected from each district whereby Ihanda and Masinyeti villages were selected in Kongwa District while Kunke and Wami Luhindo villages were selected in Mvomero District. The study areas were purposively selected due to the introduction of dairy goats by CGP in Tanzania, which was initially based on the history of dairy development and accessibility to markets in these villages. Besides, the two districts differ in their agro-climatical conditions whereby Kongwa is in arid condition while Mvomero is in semi-arid environment. The sample size included all 106 dairy goat keepers who received dairy goats from the project whereby 58 farmers were from Kongwa while 48 famers were from Mvomero Districts. These farmers were randomly selected prior receiving dairy goats and thus, become the initial source of the primary data. The approaches used to collect the information were structured interview and Focus Group Discussion (FGD) for the primary data while secondary data were collected from various project reports.

Results and discussion

Market structure, product characteristics, pricing and supply

Dairy goats' products produced in the study areas were fresh and fermented milk, manure, and offsprings. Fresh milk dominated the market and was the most traded commodity than others. Offsprings were not traded at all since project requires them to be distributed to a new set of farmers in the village for free. These 106 farmers with 245 dairy goats produced about 993 litres of milk per month and about three tons of manure. About 64% of manure was used by farmers themselves and shared with neighbours. About 99% of fermented milk was consumed at household level, while 298 litres of fresh milk equivalent to 30% were traded. This was higher than findings by Mbindyo *et al.,* (2018) in their study in Kenya whereby 25% of fresh milk was traded.

Product characteristics and suitability of dairy goats' milk:

Dairy goat milk is considered as being more nutritious than cows' milk (Table 1). In addition, goat milk contents do not significantly change due to change of physical forms of feeds as compared to cows' milk (Stergiadis *et al.,* 2019). However, goat milk is condemned for inherited characteristic of goat flavour (Park *et al.,* 2017) such that it affects widespread consumption of goat milk in the study areas. About 80% of consumers surveyed expressed their concern about goat odour in the fresh milk. In addition, to intrinsic factors contributing to odour in goat milk, hygienic conditions during milking also affects milk odour as also noted by Zine-eddine *et al.* (2021).

Pricing

The dairy goat milk was sold at Tsh. 400 - 600 per 800 ml bottle, equivalent to Tsh. 500 – 750 per litre. The lowest price was experienced in Masinyeti village and the highest price was in Kunke village. On average, this was about 17% higher than cow milk in the study areas. The main milk pricing strategy was the comparison to prevailing price of cows' milk which was Tsh. 350 per 800 ml bottle in Kongwa district and Tsh. 500 per 800 ml bottle in Mvomero district. However, goat milk price was being increased due to the perceptions of its high nutritional value. Therefore, the pricing strategy adopted by farmers was a result of poorly developed value chain of dairy goat milk and its products similar to that observed by Wibawa *et al.* (2019)

Table 1: Comparative nutritional contents of goat and cows' milk

Content	Goat	Cow
Protein %	3.0	3.0
Fat %	3.8	3.6
Calories/100ml	70	69
Vitamin A (i.u./gram fat	39	21
Vitamin B (ug/100ml)	68	45
Riboflavin (ug/100ml)	210	159
Vitamin C (mg ascorbic acid/100m)	2	2
Vitamin D (i.u./gram fat)	0.7	0.7
Calcium	0.19	0.18
Iron	0.07	0.06
Phosphorus	0.27	0.23
Cholesterol mg/100ml	Low	15

Source: Kaberia *et al.* (2003)

The findings show further that the suitability of goat milk was attached to its nutritional richness. That is, all surveyed community members connected their preference to consume the goat milk to its nutritional values. The emphasis was also attached to children consumption, as critical for nutritional and growth needs. However, to some people, goat milk is considered as less allergic as compared to cows' milk as claimed by Zine-eddine *et al.* (2021)

and Bett *et al.* (2009) whereby dairy cattle value chain used to propose marketing channels of dairy goat products in Indonesia and East Africa respectively.

In addition, the production factors, supply level and quality factors were not taken into consideration in pricing strategy. This situation might have contributed to the shortage in both the demand and supply sides. The poor demand for dairy goat milk was simply due to unawareness of consumers in using goat milk. It was only in Wami Luhindo village where they have been keeping traditional goats had experience in goat

milk marketing. On the other hand, the supply side was not continuous due to probably small number of goats kept per household and poor knowledge of livestock management practices, thus led to low marketable volumes of goat milk in the target market.

Supply

The supply of dairy goat milk in study areas was done by individual farmers who were provided with goats through CGP program. About 296 litres equivalent to 30% of produced milk was sold to neighbours and occasionally to some food vendors. In terms of percentage the findings were less than those of Mbindyo *et al.* (2019) in their study in Kenya where goat milk supply in the market was 43% of milk produced. However, the challenge facing milk supply from farmers was lack of continuity. That is, most farmers do milk their goats within two months as compared to six months reported in the literature (Miller and Lu, 2019). The main causes of fewer milking months might have been caused by poor feeding to offspring, thus continue to rely on their mother's milk.

Hence, in order to improve the situation, both supply and demand challenges should be resolved through educational and promotional activities especially in sensitizing dairy goat milk consumption by farmers and other community members. The supply side can be strengthened by increasing the number of dairy goats per farmer and improving management practices.

Market conduct, domination, competition and performance

Market conduct

Market conduct of dairy milk was affected by factors explained earlier in the market structure. Due to low supply of goat milk, there were no place allocated for commodity exchange in all the study sites. The commodity exchange was taking place at farmers' homesteads. There were neither goat milk collection centres nor cooperative selling the milk produced. There were no price differences or product preferences for milk sold to food vendors and farmers' neighbours.

The mode of payment for the neighbours was billing system which was paid weekly, while food vendors were purchasing on cash basis. Although farmers had already formed their dairy goat keepers' associations, they did not use them to market their products due to lack of experience of their leaders. However, the associations can be strengthened by learning from success stories from similar association called Twawose group which was formed by dairy goat keepers in Mgeta Division, in Morogoro District which was established in 1988 (Sonola 2015; Lie, 2011).

Market domination

Dairy goat milk market was completely dominated by milk producers unlike the cow milk where market was dominated by producers and collectors. For instance, in Ihanda village, cows' milk producers competed with collectors who brought milk from Kongwa Ranch operated by National Ranches Company (NARCO) located in Kibaigwa.

However, despite the fact that farmers dominated the market, milk marketing is still underdeveloped due to low supply volumes as experienced in most developing countries (Miller and Lu, 2019) although consumers are willing to pay premium price for goat milk. It is claimed that consumers' willingness to pay for a premium price is attached to health reasons associated with goat milk. It is often claimed that goat milk is medicinal for the sick and weak patients, especially those affected by HIV/AIDS and those allergic to cows' milk (Park and Haenlein, 2021).

Competition

Based on consumers' preference, price, and availability of milk, the major competitor to dairy goat milk was cows' milk. Consumers preferred cows' milk simply because they are used to it and do not have inherited odour. Milk availability and price were also claimed to be among the factors considered to influence goat milk consumption when compared to cows' milk. However, for the case of nutritional contributions, consumers preferred goat milk. When availability factor was assessed, dairy goat milk had a higher potential to access market than cows' milk because of its medicinal

properties.

Market performance

Market performance was analysed using gross and net margins at the household level. The cost factors considered were feed, veterinary services, and breeding which were variable while fixed cost was goat housing and live-goat prices. The revenue factors were milk and manure values which were obtained through direct sell, family consumption or both. In addition, social factors such as place of residence, sex, and number of household members were included in the analysis. The margins were then compared among farmers and between villages to determine the variations among the dairy goat keepers as presented in Table 2.

Farmers' revenue accrued from milk and manure, costs and margins

Farmers' total revenue included revenue from milk and manure. The revenue was from direct sales or/and consumption of these products. For the case of individual farmers, the average income was Tsh 35 200 in Ihanda, Tsh 36 000 in Masinyeti, Tsh 33 100 in Kunke, and Tsh 37 500 in Wami Luhindo per month from the milk revenue.

Milk revenue

About 30% of famers produced on average of 994 litres of milk per month. Milk revenue represented 64% of the total revenue. For the farmers who produce milk, it contributed about 80% of their total household revenue obtained from dairy goat keeping.

There were no significant differences in milk revenues within villages and between districts ($P<0.01$). In addition, the revenue of individual farmers did not differ significantly in the study villages. The income might have been contributed by the homogeneity of the dairy goat practices within the study areas.

Manure value

Manure value represented 36% of the household revenue from dairy goats. Manure values between Kongwa and Mvomero districts were significantly different ($P<0.01$). The value of manure was higher in Kongwa district than in Mvomero district by 25%. In case of villages, manure value was the same in all villages other than Ihanda and Wami Luhindo. There were significant differences between Ihanda and Wami Luhindo. Manure is among variable treasured differently depending on the application in non-commercial subsistence livestock production (Msalya *et al.,* 2017). This can be a reason for this difference.

Farmers' Cost

Farmers' costs considered were total variable costs (TVC) and total fixed costs (TFC). The TVC comprised the costs of feed, veterinary services and breeding, while total TFC comprised of live-goats purchase cost and housing costs. The labour costs were ignored due to little time expressed in handling dairy goats in the study villages, since labour used in dairy goats was provided by all farmers in that house and therefore almost constant and did not differ very much from one family to the other as compared to other activities in the project sites. Therefore, since the number of goats kept by family is small, i.e. from one to four, it was not possible to trace the actual labour that have been used to care for one goat per month in the study villages.

Feed costs

Feed costs consisted of costs of natural feeds, supplements and mineral salts. These costs were calculated using actual cost of purchase of feeds or hay equivalent, depending on the situation. The results showed that, on average, feed cost was Tsh.1 122 790 accounted for 76% of the TVC which was Tsh.1 486 890. Feed cost was the highest compared to other factors in variable costs. This concurs with the findings of Al-Khazaleh *et al.* (2015) in their study on economic analysis of goat production in Jordan, where they found that expense on feed made the largest contribution to overall costs up to 75%.

The amount feed cost contributed to the TVC was significantly different ($P<0.01$) between two districts. It was Tsh. 451 562 equivalent to 73% in Mvomero district and Tsh. 671 228 equivalent to 77% in Kongwa

district. Further analysis showed that there is a significant difference in feed costs between Masinyeti and Kunke villages, with Tsh. 390 000 and Tsh. 279 570 respectively. This might be attributed to better access of feeds, supplementary and minerals. That is, Kunke can easily access maize bran, sunflower cakes and other inputs relatively than Masinyeti. Besides, the nearby market from Kunke i.e. Madizini, is located within 3 Km (or about 15 minutes' walk) while the nearest town market from Masinyeti, i.e. Kibaigwa, is located 20 Km (about 2 hours walk). This might have influence on the access to feeds and other inputs required for the goat keeping practices.

Veterinary costs

Veterinary costs are based on the actual value of drugs purchased. The charges on treatment were paid by GCP Tanzania. On average, veterinary costs were Tsh. 219 900 equivalent to 15% of TVC. The veterinary cost between two districts was the same ($P<0.01$). This might have been attributed by similar sources of veterinary drugs which might have small differences in their prices of their products sold in the study areas.

Breeding costs

Breeding costs was comprised the costs of mating female goats for reproduction hence milk and offspring production. Breeding costs were Tsh. 144 200 equivalent to 9% of the TVC. The costs were significantly different ($P<0.01$) between Kongwa and Mvomero. It was cheaper in Kongwa than in Mvomero. This might have been attributed by different ways used to pay the breeding costs. In Kongwa, the breeding costs were paid through contribution of feeds at specified time while in Mvomero, (specifically in Wami Luhindo) it was paid through monthly contribution of cash. Therefore, paying through monthly contribution was more expensive to farmers than feed contribution.

Goats cost

The dairy goats were purchased by CGP and distributed freely to selected keepers. However, farmers were required in turn to give for free the female offspring to the neighbour. Therefore, the price of goat was determined by off-spring given to other farmers. In the focus group discussion, it was agreed that at least in one year one goat would be given to another farmer. This would be a price farmer had incurred on owning the dairy goats. The price was averaged to Tsh. 135 000 per goat hence Tsh. 11 250 per month as fixed cost of dairy goat per farmer.

Goat housing

There were variations of goat housing within villages and between districts. The building costs also varied significantly. The building costs were significantly different in two districts ($P<0.01$). On average, it costs about Tsh. 48 000 to build a goat house in Kongwa district while its costs about Tsh. 108 000 in Mvomero. The house costs differences have been attributed by differences in prices of building materials used and the type of goat houses built in the two areas. Therefore, the quality goat houses built in Mvomero district were better and durable than those of Kongwa district.

Gross and net margins

Gross margins

The villages and farmers who had positive and negative margins were examined to know the effects of cost items and other socio economic factors on the dairy goat keeping in Mvomero and Kongwa districts. Positive gross margin indicates that the farmers were able to recover the variable costs used in production.

The findings show that 30% of the farmers obtained positive gross margin whereby in Kongwa they were 38% while in Mvomero they were 21%. Further analysis showed that Ihanda had large number of farmers with positive margin within the village while Wami Luhindo had the least (Table 2).

Table 2: Number and percentage of positive margin within the village

Village	Frequency	Percent
Ihanda	12	43
Masinyeti	10	33
Kunke	7	23
Wami Luhindo	3	17

In addition, analysis was done to assess how socio-economic factors, cost factors, and income factors influenced positivity of gross margin in the study areas. In the case of socio-economic factors, sex and district location were selected. Feed cost and number of goats were selected in cost factors, while milk quantity was selected on income factors. This was carried out using logit model for binary outcomes as explained in equation 2.

Table 3: Cost factors, income factor and social factors influencing GM

Predictor	Coefficient	Sig.
Sex (Male)	1.792	.425
Milk Quantity	0.342	.008
Number of goats	10.569	.083
Feed cost	-0.003	.173
District (Kongwa)	-4.325	.195
Constant	1.549	.875

The positivity of gross margin is influenced significantly by milk quantity and number of goats. They both have positive sign, which implied that with increase in milk production at household level and the number of dairy goats kept will increase the chance of having positive gross margin. However, sex of farmers and the district they come from were not important factors to influence the sign of gross margin.

Net margin

Net margin determines whether the farmers made profit from the dairy goat rearing. About 20% of all farmers were making profit per month. In Kongwa district, 28% of farmers were making profit while in Mvomero they were 10%. The worse loser farmer got loss of Tsh. 27 727 from Wami Luhindo village while the best gainer farmer got profit of Tsh. 26 510 from Masinyeti.

Conclusion and Recommendations

Conclusion

This study examined market performance of dairy goats and its product in Kongwa and Mvomero districts. The study was carried in four villages of Kunke and Wami Luhindo in Mvomero district and Ihanda and Masinyeti in Kongwa district. Primary data was collected from 106 farmers and 60 consumers. The market performance was analysed through Structure-Conduct-Performance (S-C-P) model. The 'structure' and 'conduct' were analysed descriptively while 'performance' was analysed quantitatively using Gross Margin (GM) and Net Margin (NM). The results would be used as the way to improve access of both inputs and outputs markets of dairy goat and its products.

The study found that market structure of the dairy goat products was dominated by fresh milk, which was accepted based on its nutritious values. The goat milk price was based on prevailing market price of cow milk, and which was 17% higher. Farmers were the only suppliers of dairy goat milk. The market was conducted between farmers and either neighbours or food vendors. There was no place specified for milk selling neither milk collection. Payments were done on spot basis by food vendors and weekly billing for neighbours.

On market performance, farmers with positive GM were 30%; about 38% in Kongwa and 21% in Mvomero. The average GM was positive, which indicated that farmers could afford to cover variable costs. The positivity of the GM was significantly influenced by milk quantity and number of goats. Increase of those items could increase the chance of the farmers having positive margin. Moreover, the sex of the farmer, feed cost and district of residence did not have any significant influence on positivity of GM. On other hand about 20% (about 28% in Kongwa and 10% in Mvomero) of farmers were making profit by having positive NM.

Recommendations

The market performance as determined by structure-conduct-performance model indicated undeveloped markets for goat outputs. There was low demand for goat milk which was the main product. This can be contributed by low supply of goat milk and which was relatively new in the study areas. In case of income to farmers; although the general GM was positive, still 70% had negative GM and only about 20% were making profit.

Therefore, in order to improve the situation, both sides of supply and demand should be

strengthened. Although strengthening them simultaneously would not be feasible, the demand side should be first to be attended. This can be done through educational and promotional activities concerning consumption of dairy goat milk. Then, the supply side can be improved by increasing number of dairy goats per farmer and improving management practices. This approach will avoid milk loss when the supply side has been improved without improving the demand side.

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References

Al-Khaza'leh J., Reiber, C, Al Baqain, R. and Valle Zárate, A. (2015). A comparative economic analysis of goat production systems in Jordan with an emphasis on water use. Livestock Research for Rural Development. Volume 27, Article No. 81

Bain, J.S. (1968). Industrial organization (2nd edition). New York: John Wiley and Soys

Bett, R.C., Kosgey, I.S., Kahi, A.K. and Peters, K.J. (2009). Realities in breed improvement programmes for dairy goats in East and Central Africa. Small Ruminant Research, 85, pp. 157-160

Kaberia B., P. Mutia and Ahuya, C. (2003). Farmers' dairy goat production handbook. Farm Africa. Nairobi

Karnuah, A.B, Dunga, G., and Rewe, T. (2018). Community based breeding program for improve goat production in Liberia. MOJ Current Research and Reviews Vol. 1, 5 – 2018

Lie, H. (2011). Making better use of goats in Tanzania – improving smallholder livelihoods through local value chains for goat milk yoghurt: A case study. Norwegian University of Life Sciences. p 155.

Mbindyo, C.M., Gitao, C.G. and Peter, S.G. (2018). Constraints affecting dairy goats milk production in Kenya. Tropical Animal Health and Production (2018) 50: 37–41

Miller, B.A. and Lu, C.D. Lu (2019). Current status of global dairy goat production: an overview. *Asian-Australasian Journal of Animal Sciences* 32(8):1219-1232.

Mulia, W.B., Ardiantono, D.S. and Pragnya, Y. N. (2019). Value Chain Analysis on Goat Processed Products in Surabaya. *Indonesian Journal of Business and Entrepreneurship,* 5(2), May 2019

Msalya G. Sonola, V.S., Ngoda, P., Kifaro, G.C. and Eik, L.O. (2017). Evaluation of growth, milk and manure production in Norwegian dairy goats in one highland of Tanzania 30 years after introduction. *South African Journal of Animal Science,* 47(2).

Myers, R.J., Richard, S.J., and G.T. Willian (2010). A Century of Research on Agricultural Markets. *American Journal of Agricultural Economics,* 92(2), 376–403.

Nziku, Z.C., Kifaro, G.C., Eik, L.O, Steine, T. and Ådnøy T. (2016). Reasons for keeping dairy goats in Tanzania, and possible goals for a sustainable breeding program. Animal Production Science, 57(2): 338-346

Nziku, Z.C., Kifaro, G.C., Eik, L.O., Steine, T., Msalya, G., and Ådnøy T. (2017). Situation analysis and prospects for establishing a dairy goat breeding program in Tanzania. Livestock Research for Rural Development. Volume 29, Article 223

Park, Y.W., Jeanjulien, C. and Siddique, A. (2017). Factors Affecting Sensory Quality of Goat Milk Cheeses: A Review. Advances in Dairy Research Vol 5, 3

Park, Y.W. and Haenlein, G.F. W. (2021). A2 Bovine Milk and Caprine Milk as a Means of Remedy for Milk Protein Allergy. Dairy 2021, 2, 191–201

Sonola, V. S. (2015). Evaluation of Performance of Norwegian Dairy Goats in Mgeta Morogoro. A Dissertation Submitted in Partial Fulfilment of The Requirements for The Degree of Master of Science in Tropical Animal Production of Sokoine University of Agriculture. Morogoro, Tanzania.

Stergiadis S., Natalja, P. Nørskov, S.P., Givens, I. and Lee, M.R.F. (2019). Comparative Nutrient Profiling of Retail Goat and Cow Milk. Nutrients 2019, 11, 2282;

United Republic of Tanzania (2017). Tanzania

Livestock Sector Analysis (2016/2017 – 2031/2032). Ministry of Livestock and Fisheries. Dar es Salaam, Tanzania.

Zine-eddine, Y.L., Zinelabidine, H., Kzaiber, F., Oussama, A., and Boutoial, K. (2021). Analysis of acceptance and factors affecting the consumption of goat's milk in Morocco. Small Ruminant Research 197 106338.