

REGULAR ARTICLE

Camel milk value chain in Northern Saudi Arabia

Bernard Faye^{1,2*}, Hassani Madani² and Sageed A. H. El-Rouili¹

¹Camel and Range Research Center, P. O. Box n°322, Sakaka, Al-Jouf, Saudi Arabia

²UMR SELMET, CIRAD-ES, Campus International de Baillarguet, TA-C/112A, 34398 Montpellier, France

Abstract

In Saudi Arabia, the increasing demand in camel milk by a growing urbanized population is stimulating the development of camel dairy farms, especially around the towns. The average per capita consumption in the country is about 33 L / year. It was reported that the production of camel milk is potentially higher than that of the cow in the same farming and climatic conditions. With an individual production between 5 to 20 l/day, the production potential of camel is far away from negligible. However, the dairy value chain is not well known except for the biggest dairy farms. In the present study, a survey including 119 camel farms belonging to all kind of farming system was achieved in the northern part of the country. It showed that only 16 farms contributed to the camel milk market, the other ones producing milk only for self-consumption. The market integrated sector is weakly organized, except for the industrial farms. Indeed, it is represented by two sub-systems: (i) an informal one based on suburban farming with traditional mini-dairy plants and delivering milk in local shops and retail outlets; (ii) a formal system represented by large modern dairy farms and dairy plants approved by Ministry of Agriculture. These two subsystems produced 1176.44 t/year, while the volume self-consumed was estimated to be 1854t/year. Such, the market potential for camel milk could be highly developed in the future.

Key words: Saudi Arabia, Camel milk, Milk value-chain, Dairy system

Introduction

In the Kingdom of Saudi Arabia (KSA), camel milk is consumed in relatively high quantity, especially during different celebrations. On the base of FAO statistics (FAO Stat, 2012), the consumption per inhabitant in KSA is approximately 33 l/hab/year which places the country among the large-scale consumers in the world (Map. 1). Elsewhere, as camel milk demand is higher than the offer, the market price is high, almost twice the cow milk price (Ismail and Al-Mutairi, 1994). Yet, in spite of the modernization of camel dairy farms (milking machine, in-door feeding, genetic selection, intensification etc.), in spite of the high demand for cultural and health reasons, the camel milk sector appears weakly organized compared to cow milk sector.

In order to understand the added value chain of the camel milk sector in KSA and to estimate the

production potential for the camel milk sector, a survey was achieved among producers, processors and distributors. The survey was limited to the Northern part of the country.

Material and Methods

Place of the study

The present study was achieved in the northern part of KSA around Nafud desert, most precisely in the neighborhood of the towns of Sakaka, Doumat-al-Jandal, Gurayat, Hail, Ar'ar and Tabarjal (Map 2). It was supported by the Camel and Range Research Center based at Sakakah (Al-Jouf province).

Added value chain approach

The added value approach for a determined product as camel milk allows identifying the relationships between the different segments of the commodity chain, their complementarity and their pathway between the different stages of process within the systems (Duteurtre et al., 2000). Three aspects have to be taken in account (Boutonnet, 2010): (i) the height of the channel including the different activities or functions (production, processing, distribution, and consumption), (ii) the width involving the different modalities of the

Received 26 May 2013; Revised 12 June 2013; Accepted 19 June 2013; Published Online 11 October 2013

*Corresponding Author

Bernard Faye
Camel project UTF/SAU/044/SAU, Center for Agriculture
Project, P. O. Box n°761 Al-Kharj 11942, Saudi Arabia

Email: bernard.faye@cirad.fr

channel within the different sub-system, and (iii) the thickness corresponding to the diversification of the products and their geographical expansion.

To achieve this approach, data on the quantification of the flow (production, marketing, purchasing, consumption) and on the strategies of production and marketing are necessary.

Survey design

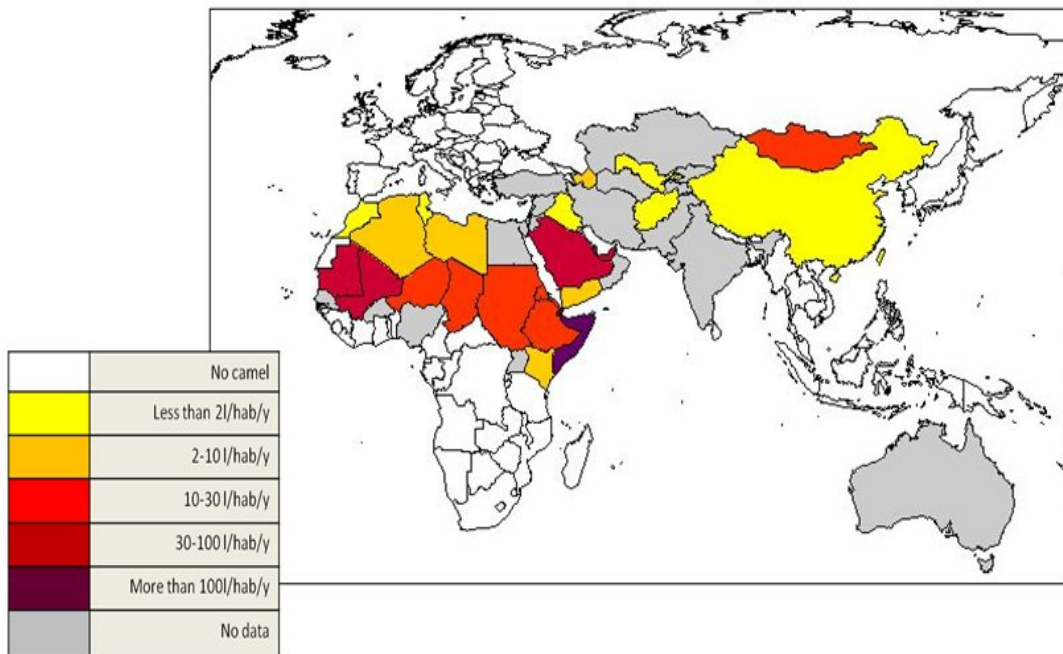
The study included two different methods: (i) the collect of indirect information from bibliography and available local statistics, and (ii) the collect of direct data among the different stakeholders of the camel milk sector (producers, carriers, processors, distributors) based on questionnaire adapted to each. The questionnaire for the producers included data on their status (place, age, tribe), the herd composition (species, breed, age), and the milk (production, price, market integration). Regarding the distributors and the shops, data on the sold and purchased quantity of milk, the prices and the benefit were collected. For dairy plants, the data involved the owner status, the processed volume, the organization of the service, the milk prices and the perspectives for the region.

Sampling procedure

The camel milk producers were selected randomly, except for the big farms processing their milk which were exhaustively interviewed. The selection of the shops was based on the knowledge of the producers. As the whole, 119 camel milk producers and 16 sale points in the main towns or along the roads were inquired.

Statistical analysis

The data were managed in Excel table, then analyzed by XLstat software (Addinsoft®). In order to obtain homogenous table including qualitative data only, the quantitative data were analyzed by Principal components analysis (PCA) followed by Ascending Hierarchical Classification (AHC), and the convenient classes were used as modalities of synthetic qualitative variables used in the final analysis. The qualitative data were analyzed by Multiple Correspondence analysis (MCA) and the types of stakeholders were identified after cluster analysis (Jobson, 1992). The variance analysis was used to determine the significant differences in quantitative data (milk production, number of camels) between modalities of qualitative variables. Chi square test was used for contingency tables crossing the qualitative variables two by two.



Map 1. Camel milk consumption in l/hab/year in 2009 (according to Faye and Bonnet, 2012).



Map 2. Localization of the study zone (Source Wikipedia).

Results and discussion

The producers

Among the 119 camel producers, 35% only were pure breeders. The sample included also retired people (24%), civil servants with the government (21%), security agents as policeman or military (13%), and education workers (7%). Thus, the multi-activity of the camel producers is highly underlined and is in accordance with the observations of Abdallah and Faye (2013): in a survey including 218 camel owners from Northern KSA, 37% were pure Bedouins living in desert, 9% were civil servants including education field and living mainly in town, 30% were agents working in security field, 17% were retired people and the remain being of different origins. Regarding the camelstock system, the producers were classified in extensive system (mainly bedouin and representing 36% of the producers), semi-intensive system (feeding supplementation, sedentarisation) representing 24% of the camel farmers, periurban system located around the towns, 35%, and intensive systems (with irrigated foddors, modern camel housing, in-door feeding), 5% only. In spite of higher mean daily production in intensive

system, no significant difference was observed between the systems (Figure 1). On average in our sample, the mean daily milk production was 5.04 ± 2.46 l/camel/day with a herd range of 3 to 14 l/day. However, few of the camel farms ($n=16$) were selling milk on the market. In the remaining farms, the milk was self-consumed.

The herd size was on average 70 ± 227 heads with a high variability within each system, explaining the lack of statistical difference between extensive (61 ± 33), semi-intensive (47 ± 45), periurban (96 ± 381) and intensive (72 ± 32). By considering all the qualitative variables describing the camel farms (multi-activity, farming system, seniority of the owner, modality of herd size, milk production level, type of milking, milk marketing, breed composition of the camel herd, choice of the reproducers and strategy for increasing milk production), the multivariate analysis (MCA + AHC) allowed identifying 3 types of camel producers (Figure 2) explaining 55% of the variance.

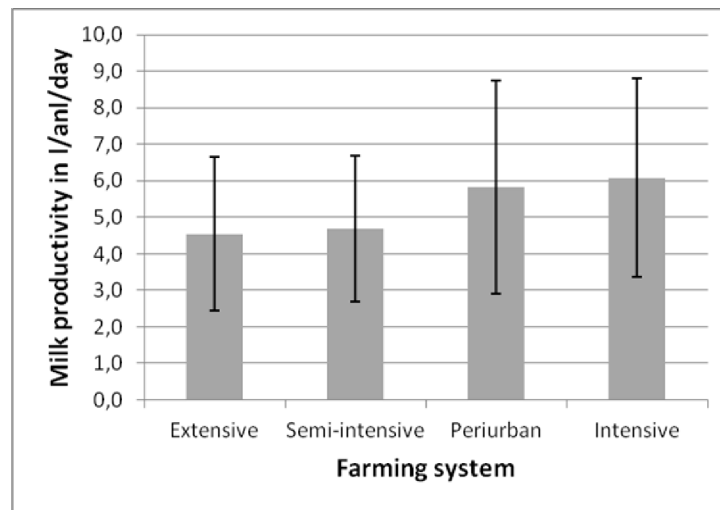


Figure 1. Mean daily milk production in camel from different farming systems.

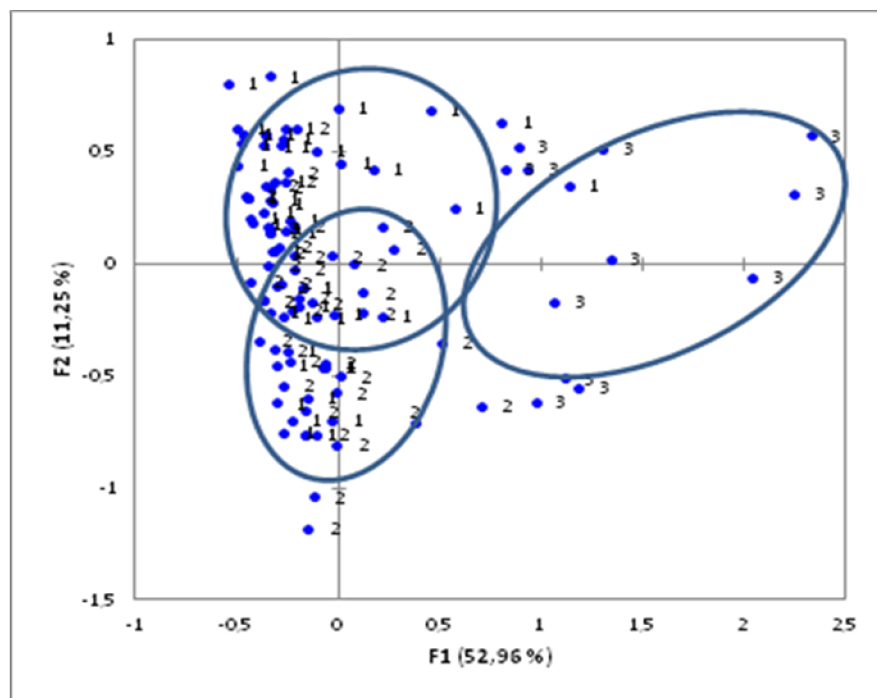


Figure 2. Projection of the 3 classes (ellipse of inertia) obtained after cluster analysis on the main factorial plan (1,2) of the MCA.

The type 1 (n=53) corresponded to farms without milk marketing, mainly in extensive system, small or medium herd size. The type 2 (n=44), did not sell milk in majority also and corresponded mainly to extensive or periurban system with small or medium herd size. The type 3 (n=12) was all farms integrated into milk market,

using milking machine, corresponding mainly to intensive system with small or big herd size. The total milk production was significantly higher in this type compared to the others (Figure 3).

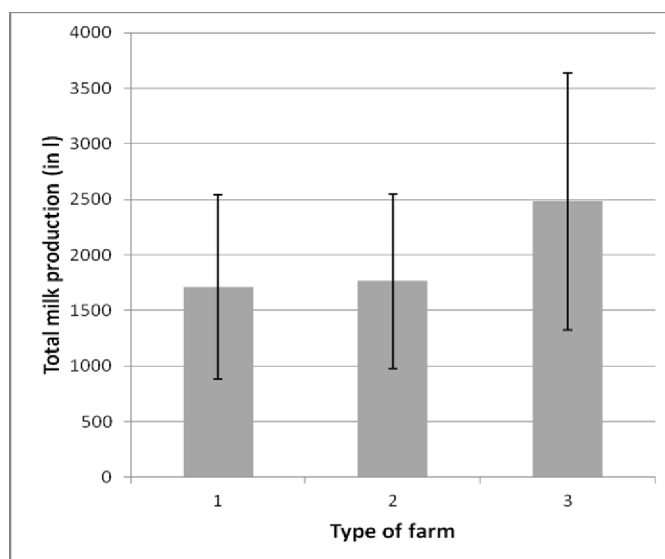


Figure 3. Total milk production per lactation/camel (in l) according to the type of farm.

Regarding the milk marketing, 2 subsystems could be described:

- The formal sub-system including two big integrated intensive farms (Watania and Turath), the farm of the Camel and Range Research Center and one producer having agreement for camel milk selling. These farms have big herd size, milking machine and dairy plant processing pasteurized milk, packaged in plastic bottles. The camel herd is under veterinary control and a part of the feed is produced on-farm. The milk productivity was 2240 l/lactation.

- The informal sub-system including periurban producers having small-scale traditional dairy plant producing raw or fermented milk, packaged in plastic bag, usually without agreement. The feed is produced out of the farm, but the non-productive part of the herd could be maintained in desert pasture. The milk productivity was 2090 l/lactation

In addition, the remaining producers were classified into “out milk market system”. The productivity was estimated to 1659 l/lactation. The separation into formal and informal sub-system in dairy sector is usual in many countries, notably in Africa (Corniaux et al., 2007; Sow Dia et al., 2007). The camel milk processing in Saudi Arabia, contrary to Mauritania for example (Abeiderrahmane, 1997), was characterized by a poor diversification of the products. Only fresh, fermented or pasteurized was proposed to the

consumers. The cheese processing was only experimental for the moment (Konuspayeva et al., 2012).

The milk marketing

As mentioned above, the sold milk was packaged either in plastic bag (in 56% of the farmers selling milk) or in plastic bottles (44% of the farmers). All the camel milk producers managed the packaging themselves. There was no dairy plant out of the camel farms. Three market chains were used by the farmers: (i) producers having traditional dairy workshop selling milk to local small shops and mini-markets and a lower part directly to the consumers; (ii) producers mainly in Ar’ar region, having medium herd size in settled enclosures (*chabek*) and selling all the milk directly to the consumers in bulk, along the roads; (iii) producers selling all the milk to distributors or having their own distribution network, notably the big integrated dairy farms like Watania.

The camel milk price was 7 to 12 Saudi Rials (SAR) per liter according to the type of packaging and the type of milk (fresh, fermented or pasteurized). The milk bottle (1l) produced by small scale dairy plant was sold 8 SAR. It was 10 SAR for pasteurized milk from big dairy companies. The margin between production price and consumption price was around one SAR/l (0.21 €).

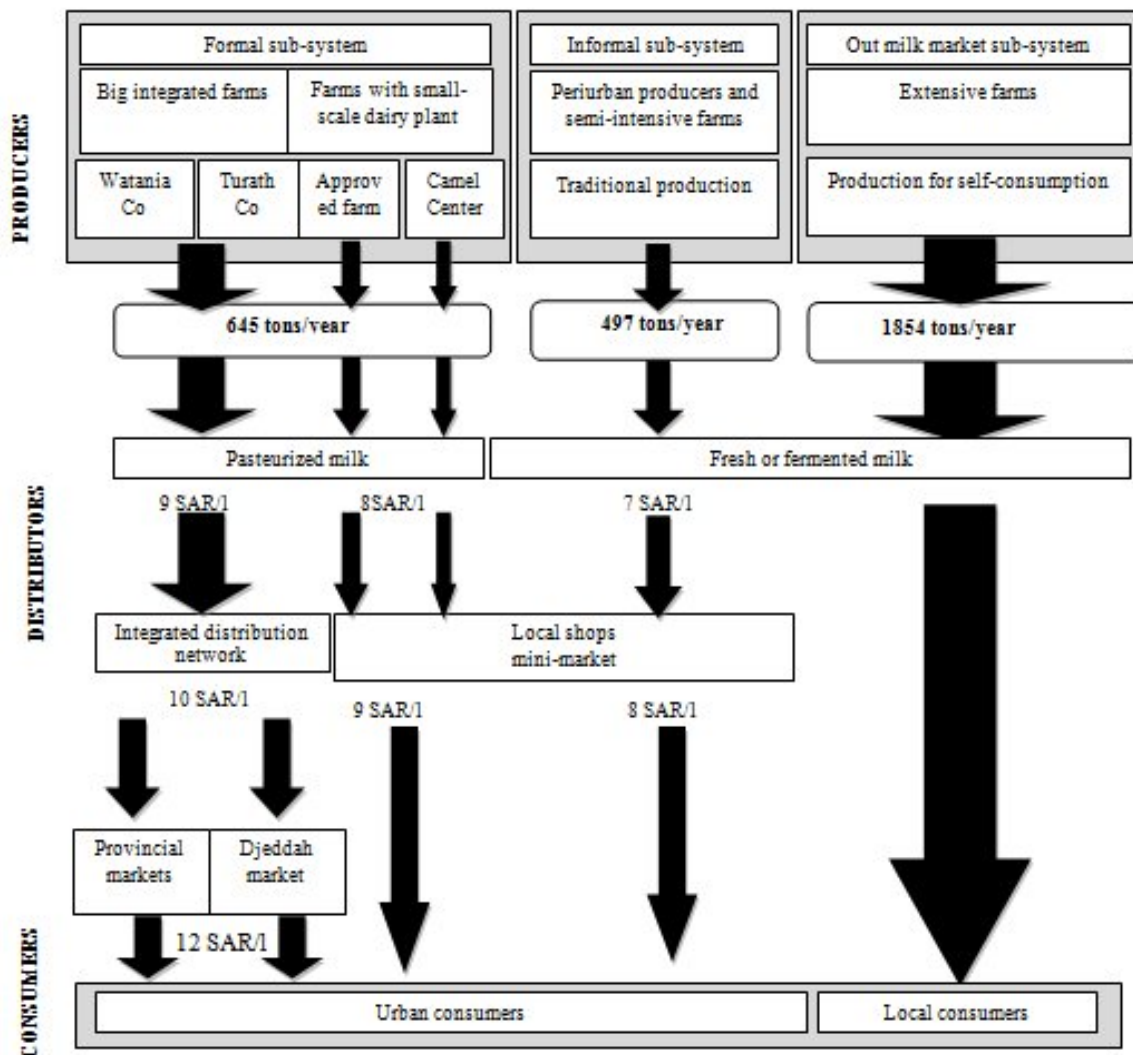


Figure 4. Conceptual model of the camel milk value chain in Northern Saudi-Arabia.

The milk flow

The total milk flow was estimated according to the number of lactating animal in formal and informal sector and of their mean milk productivity. The data were checked beside the selling point. Regarding the camel farmers no selling milk (n=103), ten of them did not milk the lactating animals at the time of the survey (all milk was given to the camel calf). In the remaining producers, self-consumption was estimated according to the number of milked animals and to their productivity.

Finally, the camel milk quantity available for consumers was estimated to 654 tons/year in formal sector, 497 tons/year for informal sector, and the self-consumption was estimated to 1854

tons/year, probably under-estimated. Based on these data, a conceptual model of the camel milk value chain in Northern KSA could be proposed (Figure 4).

The added value chain analysis was already applied to study the camel milk commodity channel in Mauritania (Kouassi, 1998).

Conclusion

Traditionally regarded as a gift for the visitors, the camel milk was recently integrated in the market in many countries of the camel world. The urbanization and the modernization of the farming systems had contributed to the development of a camel milk commodity channel although, the organization of this value chain is just beginning. In Saudi Arabia, the potential for high development

of a camel milk sector is existing, but is still dominated by informal sector (not only in volume, but mainly in number of stakeholders) and by self-consumption. The distribution network, except for the big integrated farms, is limited to small shops in the towns. For example, it is noticeable that camel milk is very rarely available in the main chain of supermarkets in the northern part of the country. Yet, the demand is increasing in spite of the high price of the camel milk. The development of the camel milk value chain requires a better selection of the best dairy animals, a better access to the urban market, an efficient quality control and a distribution network fleshed out.

Acknowledgements

This study was achieved in the frame of the FAO project UTF/SAU/044/SAU and with the support of the Camel and Range Research Center. We thank especially all the interviewed stakeholders (producers, processors, distributors) for their patience.

References

- Abdallah, H. and B. Faye. 2013. Typology of camel farming system in Saudi Arabia. *Emir. J. Food Agric.* 25(4):250-260.
- Abeiderrahmane, N. 1997. Camel milk and modern industry. *J. Camel Pract. Res.* 4:223-228.
- Kouassi, M. 1998. Étude de la filière du lait de la chamelle (*camelus dromedarius*) en Mauritanie. Thèse doctorat, école inter-états des sciences et médecine vétérinaires de Dakar, p. 8.
- Boutonnet, J. P. 2010. Principes d'étude du fonctionnement et de la dynamique des filières de produits agricoles. INRA/SAD 34060 Montpellier Cedex, p. 27.
- Corniaux, C., B. Bonfoh, A. Diallo, R. Pocard-Chapuis and G. Vias. 2007. Réseaux de collecte et de distribution du lait dans les villes d'Afrique soudano-sahélienne. *Rev. Elev. Méd. Vét. Pays Trop.* 60 (4):21-28.
- Duteurtre, G., M. O. Koussou and H. Leteuil. 2000. Une méthode d'analyse des filières: synthèse de l'atelier de formation du 10 au 14 avril 2000 », rapport PRASAC / LRVZ / DPPASA, p. 46.
- Faye, B. and P. Bonnet. 2012. Camel sciences and economy in the world: Current situation and perspectives. Proc. 3rd ISOCARD conference. Keynote presentations. 29th January -1st February, 2012, Sultanate of Oman, pp. 2-15.
- Jobson, J. D. 1992. Applied Multivariate Data Analysis. Volume II: Categorical and Multivariate Methods. Springer-Verlag, New York, pp. 483-568.
- Konuspayeva, G., B. Faye, A. Baubekova and G. Loiseau. 2012. Camel gruyere cheese making. Proc. 3rd ISOCARD conference (E. H. Johnson et al. (Eds.), pp. 218-219. 29th January -1st February, 2012, Sultanate of Oman.
- Ismail, M. D. and S. E. Almutairi. 1994. Milk production potential of dairy camels in northern Saudi Arabia. Dromedaries and camels, milking animals. Actes du colloque, 24-26 October 1994, Nouakchott, Mauritanie. pp. 35-40.
- Sow Dia, F., J. Somda and M. Kamuanga. 2007. Dynamique des filières laitières en zone sahélienne : cas de l'offre et de la demande du lait en zone agropastorale centre du Sénégal. *Rev. Elev. Méd. Vét. Pays Trop.* 60(1):77-88.