

Goat milk production and processing in the NIAYES in Senegal

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Abstract

This study was carried out from February to December 2003 to analyse goat milk production and processing in the districts of Thies and Mbour located in the Sahelian area, 70 km from Dakar. Among the suppliers of the three processing units identified, 45 milk producers were identified and surveyed. 45 milk samples from farmers and 30 cheese samples from a processor were collected and submitted to chemical and microbiological analysis. The flock sizes averaged 45 animals per household and were equally owned by men (51.1%) and women (48.9%). Feeding was based on extensive grazing under the control of a shepherd. Only 17.7% of the farmers fed agricultural by-products (beans and groundnut haulm) to lactating goats; 4.5% dewormed their animals. The lactating goats were milked once a day, 77.8% by women, 20% by men and 2.2% by children. Average daily milk production was 0.54 ± 0.12 L for the duration of a lactation of 3.6 months. The processing units collected the milk 2-3 times per week and the price paid (350-400 FCFA) was higher compared to cattle milk (300-350 FCFA). Two types of cheese were produced and sold to supermarkets and hotels. The processing yield was 12-15%. The chemical composition of milk (dry matter: 169.7 ± 9.56 g/L, protein: 50.5 ± 1.1 g/L, fat: 69 ± 14.2 g/L) was good. The low-input dairy goat system contributes to household income. It is recommended that possible management improvements and interventions be examined to increase the efficiency of production in a sustainable manner. Small changes in feeding and milking management may lead to significant improvements.

Keywords: Goat husbandry, milk processing, cheese, milk and cheese quality, Senegal

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Introduction

Senegal is a country where livestock accounts for 7.4% of the national GDP and 35.5% of the primary sector (Soned Afrique, 1999). Local milk production is low and 60% of domestic demand is met by imports (Metzer *et al.*, 1995). From 1980 to 2003 the quantity of milk products imported rose from 87083 t in 1980 to 120674 t in 2001, while intake of milk products decreased dramatically from 34.6 kg/head/year to 25.4 kg/head/year (FAO, 2002).

Goats could contribute to self-sufficiency in milk and milk products due to their adaptation to the harsh environment of Senegal, their short production cycle and their ease of husbandry. Moreover, the most common Senegalese goat breed, the Sahelian goat, has a good potential for milk production and thus milk processing (Missohou *et al.*, 2003). Despite this, the dairy goat is neglected in milk production improvement schemes, which are focused mainly on cattle (Denis & Mbaye, 1981). Due to private initiatives an industrial sector has evolved during this last decade that is concentrating on the collection and processing of goat milk. In Senegal most of the studies available on goat production are related to rural areas (Faugere, 1990; Moulin *et al.*, 1994; Tourand *et al.*, 1996) while the suburban production and processing systems are poorly documented. The objective of the present work was to analyse goat milk production and processing in the Niayes.

Materials and Methods

This study was carried out from February to December 2003 in the Niayes, specifically in districts of Thies and Mbour, about 70 km from Dakar. In this area the climate is Sahelian with one rainy season (July to October) and an annual rainfall and temperature of 600-700 mm and 26 °C, respectively. The vegetation is

grassland and the main cultivated crops are millet, sorghum, groundnut and maize, as well as horticulture. Due to intense tourism activities, many hotels are located in the area.

A survey was conducted in 45 households to analyse the characteristics of the goat production and processing systems. The farmers were randomly chosen from a list of suppliers available in the three milk processors identified in the working area. The survey guide was a questionnaire related to socio-economic status of the holders, flock characteristics, management and use. In every household, milk was sampled once while 30 cheese samples were collected from the main cheese producer. All samples were kept in an ice-cooled box and sent to Ecole Inter-Etats des Sciences et Médecine Vétérinaires de Dakar for analysis. The pH was measured by a pH-meter, and milk composition (Dry matter, protein, fat, ashes) was determined as described by Lecoq (1965). For microbiological analysis, dilution rate ranged from 10^{-1} to 10^{-7} . The isolation and enumeration of mesophilic aerobic, coliforms and *Staphylococcus aureus* were performed according to IDF (1997). These data were processed using the Statistical Package for the Social Science (SPSS).

Results and Discussion

Table 1 Goat milk production characteristics in the Niayes, Senegal

Socio-economic status	
Ethnic groups	
Fulani (%)	93
Serer (%)	7
Women share in ownership (%)	
	48.9
Flock size and composition	
Size (n)	44.6
Number of reproductive females	16.8
Number of reproductive males	6.7
Number of young animals	21.1
Husbandry (%)	
Supplementation	17.7
Person responsible for milking	
Women	77.8
Men	20
Children	2.2
Deworming	4.7
Milk production	
Average daily production (L)	0.54 ± 0.12
Lactating length (months)	3.6 ± 0.38

Goat milk production characteristics of the Niayes are presented in Table 1. Goat holders were equally men (51.1%) and women (48.9%). Crop farmers, stockbreeders or both were mainly of the Fulani ethnic group (93%). The average herd size was 44.6 ± 26.8 , and was composed on average of 17 reproductive females, seven reproductive males and 21 young animals. The relatively high number of adult males is in disagreement with previous studies in rural areas where males are used early and intensively (the use started at a very young stage and concerned almost every male) (Tourand, 1996). Animals are grazed on natural pasture under the control of a shepherd and have access to drinking water once a day. Only 17.7% of the farmers fed agricultural by-products (beans and groundnut haulm) to lactating goats. These lactating goats were hand-milked once a day by women (77.8%), men (20%) or children (2.2%), after allowing one to two minutes of suckling by the kid. Deworming of the stock was practised in 4.5% of the surveyed households. Average daily milk production was 0.54 ± 0.12 L for an average length of lactation of 3.6 months. The price

of goat milk was 350-400 FCFA/L (1 euro = 656 FCFA). It was higher than the price paid for cattle milk in the area (300-350 FCFA) and provides holders with a substantial income, averaging 2 954 FCFA/day. Two types of cheese were produced (fresh and mature) twice (two processors) or three times (one processor) a week with an average yield of 12-15%. The cheese was conditioned in 100-110 g units and sold to hotels and supermarkets.

The pH of the milk was 6.71 ± 0.26 (Table 2), within the normal range for fresh goat milk. It could indicate a low incidence of mastitis. The dry matter (169.7 ± 9.56 g/L) and protein (50.5 ± 1.1 g/L) concentrations compared favourably with results reported by Najari *et al.*, (2000) on a local breed, but were higher than those obtained in European breeds by the same authors. This could be the consequence of the low level of milk production. However, Talaki (2002) reported that the Sahelian goat possesses a high frequency of the alleles A and B at the casein locus which, according to Grosclaude *et al.* (1987), is associated with a high level of α_{s1} -casein synthesis, milk protein and cheese yields.

Table 2 Goat milk physico-chemical properties in the Niayes, Senegal

Parameters	Mean + s.d.
pH	6.71 ± 0.26
Composition	
Dry matter (g/L)	169.7 ± 9.56
Protein (g/L)	50.5 ± 1.1
Fat (g/L)	69.0 ± 14.2
Ash (g/L)	7.14 ± 0.5

The milk produced in the Niayes showed a high microbial count (Table 3). The count averaged 19.2×10^7 cfu/mL for mesophilic aerobic, 4.9 cfu/mL for *Staphylococcus aureus*, and 32.2×10^4 for coliforms. This coliform count was particularly high compared to international standards (10^3). The high contamination of milk in this study is in agreement with previous results in cattle (Nyaga *et al.*, 1982; Seydi & Ndiaye, 1993) and are related to low hygiene (udder, hand and utensil cleaning) during milking. Contrary to milk, cheese microbiological quality was more acceptable with 22.2×10^7 cfu/mL (mesophilic aerobic), 0 cfu/mL (*Staphylococcus aureus*) and 296.3×10^4 (coliforms).

Table 3 Milk and cheese microbiological qualities in the Niayes, Dakar

Microbes	Milk (cfu/mL)	Cheese (cfu/mL)
Mesophilic aerobic	19.2×10^7	22.2×10^7
<i>Staphylococcus aureus</i> ,	4.9	0
Coliforms	32.2×10^4	296.3×10^4

Conclusions

This study shows that in the Niayes the low input goat production system, in conjunction with an evolving processing sector, contributed to household income. It could play a key role in poverty and malnutrition alleviation if some of its constraints are tackled in a sustainable manner. Improving the milking and processing hygiene is of primary importance. Feeding could be improved through, for instance, the use of molasses-urea supplements.

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