

Awassi productivity under different production systems in Lebanon

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Abstract

Studies have been conducted on 11222 Awassi sheep from 39 farms in order to investigate the management practices, productive performance and economical return of different production systems in Lebanon. Ten percent of the surveyed flocks were specialized in fattening lambs and 67% owned goats together with sheep. Sheep farmers were relatively old (the average age being 54 years, with a range from 27 to 75 years). Fattening of lambs for 6-7 months results in an average weight of 55 kg/head in fattening flocks, while this weight did not exceed the mean of 48 kg/head in milk and meat flocks after 12-15 months. Fertility and prolificacy rate were respectively 0.94 and 1.28. The yield of milk per year per ewe during all lactation period was 112 kg, and varied between production systems from 30 to 170 kg. Suckled milk per lamb for a period of 2-3 months ranged from 1 to 93%, the mean being 23%. The average fat and protein content were respectively 6.9 and 5.4 percent. Economical return was better in farms where cheese processing and direct sale of dairy product is important in Vertical Transhumance and Sedentary systems. Rent of rangelands and crop residues constitutes a significant cost in Semi-Nomadic and Horizontal Transhumance systems.

Keywords: Awassi, sheep, Lebanon, productivity, milk, meat.

Introduction

Sheep production has retained its importance for centuries in agriculture (by enhancing and maintaining marginal rangelands) and economy as well as its role in human nutrition in Lebanon. In this country, like in other Middle East countries, sheep meat is traditionally preferred to any other sort of red meat (Abi Saab and Hamadeh, 1984).

The total number of Awassi sheep in Lebanon is estimated to be around 297 800 heads (MOA/FAO, 2002). It is the only indigenous breed in Lebanon (Epstein, 1982; FAO, 2001). These animals are well adapted to climatic and ecological conditions of the region, such as drought, lack of pasture and hot temperatures (Abi Saab and Sleiman, 1995; Rottensten and Ampy, 1971; Mason, 1976). They produce 6500 tons of meat and 29400 tons of milk (MOA/FAO, 2002). But the quantity of products is not as satisfactory as they are expected; an import of 1000 tonnes of sheep meat was noted between 2001 and 2003, and a 10% decrease of total sheep population was observed between 2002 and 2001. This breed shows a great productive variation in all regional countries (Iraq, Israel, Jordan, Syria and Turkey).

This study aimed to compare between sheep performance under four production systems: i) the semi-nomadic system (SN), prevailing in semi-arid region (North Bekaa) where rainfall ranged 200-300 mm/year, ii) the horizontal transhumant system (HT), moving in plain region searching for the crop residues, mainly in Bekaa valley, iii) the vertical transhumant system (VT), with flock moving conversely from low to high altitude searching for native rangelands, which is prevailing in mountain regions, and iv) the sedentary farming system (SE), which exists in all regions with flocks grazing not far from the farmers' village. Furthermore, two main sheep flocks were observed in these systems: the mixed milk and meat production flocks and the fattening ones.

Materials and methods

The thirty nine farms (Mont-Lebanon: ML, n=8; North: N, n=6; South: S, n=5 and Bekaa: B, n=20) of sheep flocks (n=13) or mixed sheep and goat flocks (26) considered in this study were drawn from the 129 farms, surveyed in 2003 and well distributed in all Lebanese territory (Srour et al., 2004). Goat's performances data are not presented here. The total number of sheep surveyed was 11 222 heads, exclusively of the fat-tailed Awassi breed. They were tri-purpose, providing their owners with milk, meat and wool.

A detailed questionnaire was used to obtain information on the composition of flocks, land size and nature, working force type and number, age of farmers, management practices, fertility rate, prolificacy rate, mortality rate, and milk and meat productivity. Feed consumption and economical cost and return (in Euro) were also determined. Data for each group and region were compared by a one-way ANOVA analysis using Gen Stat v.6.0 (VSN International Ltd, UK). Milk samples from five Awassi ewes' flocks were also taken for fat and protein determinations at the I.F.A.D. (International Fund for Agricultural Development) milk collection centre.

Results and discussion

Management practices

Ninety percent of surveyed Awassi sheep flocks are managed under extensive conditions like most of other small ruminant breeds in Lebanon. Lebanese flocks are housed at night and also by day during heavy winter rain as in other regional countries (Owen, 1976). Hand feeding is provided only during the winter months, from the beginning of December to the middle of February. Cereals (straw and barley) constitute 90% of food, given at an average of 50 kg per head per year. Ewes are mated during the months of August and September by natural mating (only one farmer used oestrus synchronisation). When the ewes lamb during February to March they stay suckling their lambs for 2 to 3 months, as also noted by Bhattacharya and Harb (1973). Total weaning is achieved generally in May; this period depends for many transhumant farmers (VT and SN systems) on movement of herds to summer grazing. Milking is done by hand for 5-6 months, once a day under suckling period and twice after the weaning period and lasts until beginning of August or even the middle of August depending on the date of the mating season. Sheep are shorn in first summer, but wool has no economic value. Most farmers (n=26) herded a few goats with the sheep, the mean being 19.6 ± 3.6 % with no significant difference among regions and production systems. Lands of large size were noted for HT systems (88.3 ± 18.5 ha), prevailing in Bekaa. Family labour is highest in ML region (3.7 ± 0.5) and for SN system (3.2 ± 0.7), the mean is being (2.1 ± 0.3). Sheep farmers, with an average experience of 37.7 ± 2.3 year were generally old, 33% being more than 60 years old and only 13% less than 40 years old.

Meat and reproductive performance of Lebanese Awassi

Buying lambs at 25 kg of weight and fattening them until 6-7 months on concentrate or crop residues to a weight of 55 to 60 kg was practiced in four surveyed flocks specialized in meat production. For all mixed milk and meat production flocks, fattened lambs on grazing resources are sold the next season at a mean weight of 48.6 ± 3.53 kg. In Lebanon, as in many other countries (Egypt, Algeria, Libya, Cyprus, Israel, Jordan), mutton production is preferred to lamb production (Boyazoglu, 1989).

The adult mortality was about 4.7 ± 0.8 % with no difference between regions and production systems. However, mortality of new born lambs was about 14.9 ± 1.6 % and was

variable between regions. Fertility rate was 0.94 ± 0.01 , the lowest means observed in ML region ($87.8 \pm 4.7\%$) being due to hard climatic conditions. Prolificacy rate is good, at 1.28 ± 0.04 . In surveyed flocks, the average number of sheep was 280.5 ± 40.6 , from 17 to 1000 heads, with 60% ewes in the total population.

Milk yield of Awassi breed on different region and management system

Lactation period for almost all surveyed ewe flocks is subdivided into three phases: i) the first phase comprised one month of nursing, when ewes are totally suckled by lambs, ii) the second phase of lactation covering 2 to 3 months, during which ewes are milked once a day by farmer and at evening by lambs, and iii) the third phase started when the lambs were weaned and the ewes had access to a good pasture or summer grazing in mountains. Mean lactation yield (including that suckled by lambs and auto-consumed by farmers) is around 112 kg under the existing extensive conditions. An average of 100 kg per ewe was noted by FAO (1980), Epstein (1982) and Hamadey (1996). But the reported yield value for the Awassi breed when fed under ideal conditions is 125 kg for a 150 days period after weaning (Mason, 1967; Finci, 1957; Khoury, 1965; Epstein, 1985). The average fat and protein content on tested milk were, respectively 6.9 and 5.4 percent (N=50).

Table 1 gives the comparative results of lactation performances of Awassi breed in Lebanon. Depending on the management system and the aim of farmer, lactation yields vary between regions. The important demand for typical dairy sheep milk in the north region farms explains the highest lactation yield in this region. Sometimes, the lack in labour observed on certain VT farms gave the young lambs a chance to suckle the majority of milk, making significant difference between production systems.

Table 1. Average milk production in different region and production systems

		Number of observations	Milk yield / female sold + auto consumed (litre)	Milk suckled by lamb / Milk yield (%)
M ± SE		36	112.85 ± 4.44	23.34 ± 2.81
Region	Mont Lebanon	7	93.00 ± 9.12^a	30.91 ± 5.84^a
	Bekaa	18	111.44 ± 5.68^a	18.20 ± 3.89^a
	North	6	136.28 ± 9.85^b	19.97 ± 6.74^a
	South	5	117.58 ± 10.79^{ab}	33.76 ± 7.38^a
System	Sedentary	7	140.36 ± 8.62^x	23.04 ± 5.49^x
	Vertical transhumance	5	91.49 ± 10.20^x	43.31 ± 6.94^y
	Horizontal transhumance	14	112.09 ± 6.10^x	16.88 ± 4.15^x
	Semi-Nomadic	10	105.34 ± 7.22^x	22.64 ± 4.91^x
Sheep		25	104.71 ± 4.78^m	19.37 ± 3.26^m
Sheep and Goat		11	131.34 ± 7.20ⁿ	31.61 ± 4.71ⁿ

*Means (± s.e.m.) followed by different letters differ ($p < 0.05$) from each other.

Economical performances

Values of net margin in South Lebanon were 65% higher than in the Bekaa region, same results being observed in HT system which is prevailing in Bekaa. High direct sale of products which increases the net product value and the low supplementary aliment given to the animals are the major factors which explain the difference (Table 2).

Operational costs were highest for HT system and meat production flocks, due to the rent of lands for grazing (rangelands or crop residues) and the high cost of concentrate imported to the farm, which constitutes an important part of this cost.

The mean of veterinarian costs was 1.86 ± 0.29 Euros per head, not different between regions and farming systems but highest for fattening flocks. Meat is the principal product in fattening system, the mean value of marketing meat reaching 79.10 ± 7.99 Euros per head per year, when it is only 42.76 ± 3.55 Euros per head for all surveyed farms. Net margin per litre of milk per lactation was 0.65 ± 0.05 Euro; this depends specially on cheese fabrication by farmers. Cheese processing is more important on VT and SE systems than in HT and SN systems. The presence of cow milk in Bekaa and the high demand for typical products by mountain inhabitants confirm this difference. The mean cost of concentrate was 12.77 ± 1.48 Euros per head per year, but easy accessibility of flocks to common rangelands, at different levels in the mountain, decreases the mean to 5.22 ± 3.88 Euros per head per year in the VT system.

Table 2. Economics performances for Awassi sheep flocks in Lebanon

	n	Net Product per head (Euro)	Net cost per head (Euro)	Net margin per head (Euro)
M ± SE	39	71.57 ± 4.78	25.65 ± 2.77	45.92 ± 4.54
Mont Lebanon	8	71.03 ± 9.80^a	23.55 ± 6.05^a	47.48 ± 7.82^{ab}
Bekaa	20	61.24 ± 6.12^a	30.39 ± 3.82^a	30.86 ± 4.95^a
North	6	82.83 ± 11.32^{ab}	20.68 ± 6.98^a	62.15 ± 9.03^{bc}
South	5	100.24 ± 12.40^b	16.04 ± 7.65^a	84.20 ± 9.90^c
Sedentary	8	97.00 ± 9.75^y	29.31 ± 5.50^{yz}	67.69 ± 8.73^y
Vertical transhumance	5	75.14 ± 12.34^{xy}	9.14 ± 6.96^x	66.00 ± 11.05^y
Horizontal transhumance	16	64.95 ± 6.90^x	33.22 ± 3.89^z	31.73 ± 6.17^x
Semi-Nomadic	10	60.05 ± 8.72^x	18.87 ± 4.92^{xy}	41.18 ± 7.81^x
Milk and Meat flocks	35	69.75 ± 5.03^h	22.19 ± 2.36^h	47.57 ± 4.79^h
Meat flocks	4	87.49 ± 14.88^h	55.97 ± 6.99ⁱ	31.53 ± 14.16^h

*Means ($\pm$ s.e.m.) followed by different letters differ ($p < 0.05$) from each other.

Conclusion

In general, milk production increases significantly with increasing level of feeding and management (Mavrogenis and Louca, 1980). However, Awassi's productivity of Lebanese flocks is very low when compared to that of improved breeds (Abi Sabb and Hamadeh, 1984). Also, there were large variations in individual yields between the production systems in Lebanon. The reasons for such low values are inadequate management, the economical limitations (such as lack of assets ...), the weak links between researchers or extension services and farmers, and the disorganised marketing channels.

This study revealed that there exist a great potential for improvement of sheep production in Lebanon. Here are some strategies to develop this sector:

- 1- Genetic improvement by selection. Some farmers already select sheep with high rates of milk and meat production, while conserving the same morphological characters of their breed, by crossing best progenitors chosen in other flocks.
- 2- Developing programs for pastures improvement and maintenance, which were proven being successful in Bekaa (Osman and Cocks, 1992).
- 3- Promote research related to advantageous feed resources for sheep flocks: utilization of agriculture by-products, improving nutritional values of straws by urea treatment (Abi Saab et al., 2003).
- 4- Applying a protection system of sheep typical dairy products (appellation of origin and seal of quality) may have a good effect on marketing and economics returns (best margin was observed on farms processing and sealing there own products). It is noted that Lebanese consumers know and are very attached to theses products (El Balaa et al., 2005).

- 5- Improve management practice by changing suckling procedures (reducing access time of lambs to their dam) and feeding practice (giving concentrate to ewes in latest period of milking) may have a positive effect on milk yield, which has a great price in summer.

Sustainability of Lebanese Awassi sheep sector may be improved by simple modifications of the production cycle: management, selection, marketing and environmental factors.

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