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Small ruminant production systems in north Lebanon: Technical and economic analysis

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SUMMARY – A study was conducted to evaluate small ruminant production systems and productivity in the northern area of Lebanon. Fifty-one small ruminant holders were monitored over two years focusing on the technical and economic situation of the herd. Another 19 farmers were covered by a technical and economic questionnaire of analysis in accordance with the "Recueil d'indicateurs de fonctionnement des systèmes laitiers" proposed on the Cirval website (www.cirval.asso.fr). The average number of head per flock is 72 for sheep and 61 for goats. The analysis revealed many systems of production: subsistence, sedentary, semi-nomadic, transhumant and intensive (the last one being the least important). 50% of the sheep holders and 59% of the goat holders have farms less than 1 ha. 20% of the sheep holders and 15% of the goat holders do not own land. Cultivated areas for pasture are absent in Lebanon and the main source of pasture is the Mediterranean rangeland and forest. The main sheep breed is the Awassi with fat tail and mixed production of meat and milk. The average production of ewe's milk is around 190 l/head. Goat is mainly from the local population "Baladi" with a double production of meat and milk. Average goat milk production is around 140 l/head. Lamb and kids are slaughtered at around 50 kg of body weight. Milk is marketed in the traditional way without any formal process of collection. The main expenses are due to the feeding when supplements are used or to the range rental.

Keywords: Goat, sheep, production system, economic situation, Lebanon.

RESUME – *"Systèmes de production de petits ruminants au nord du Liban : Analyse technique et économique". Une étude est conduite dans le but d'évaluer les systèmes de production de petits ruminants et leur productivité au Liban Nord. 51 petits éleveurs ont été suivis pendant plus de deux ans en évaluant la situation technico-économique de leurs troupeaux. 19 autres éleveurs sont enquêtés par un questionnaire technico-économique établi en conformité avec le recueil d'indicateurs de fonctionnement des systèmes laitiers proposé sur le site web du Cirval (www.cirval.asso.fr). Le nombre moyen de têtes par troupeau est de 72 pour les ovins, alors que celui des caprins est de 61. Plusieurs systèmes de production existent : subsistance, sédentaire, semi-nomade, transhumant et intensif. 50% des éleveurs ovins et 59% des éleveurs caprins possèdent une exploitation de moins de 1 ha de superficie cultivable dans leurs exploitations. 20% des éleveurs ovins et 15% des éleveurs caprins ne possèdent pas de terre de culture. Les terres de parcours disponibles sont les parcours méditerranéens et les forêts. La principale race ovine est l'Awassi à queue grasse et sa production est mixte viande et lait. La moyenne de la production laitière ovine est d'environ 190 l/tête. Les chèvres sont principalement de la population locale Baladi à production mixte viande et lait. La moyenne de la production laitière caprine est d'environ 145 l/tête. L'abattage des chevreaux et des agneaux se fait à des poids d'environ 50 kg. Le lait est commercialisé d'une façon artisanale sans avoir des procédures formelles de collecte. Les principales voies de dépenses sont dues à l'alimentation et à la location des parcours.*

Mots-clés : *Chèvres, brebis, systèmes d'élevage, situation économique, Liban.*

Introduction

Small ruminants have historically and traditionally been raised in the Mediterranean area and in Lebanon. Referring to the FAO (2000) survey, the Lebanese goat herd counts around 436,000 head, 95% of which is from the local population "Baladi" in extensive systems and 5% from the Damascus breed in intensive systems. The Lebanese sheep herd has around 350,000 head and is principally made up of the Awassi breed (FAO, 2000). Despite these numbers, Lebanon is considered an importing country of sheep and goat products. Productivity of the Lebanese herd is limited by the traditionally methods of production (Abi Saab and Sleiman, 1995). Grazing systems in semi-arid areas offer only limited potential for intensification and livestock production is becoming increasingly crop-based (Bistanji *et al.*, 2000). Small ruminant production is mainly conducted by small farmers in

marginal lands, where milk is an important source of income (Hosri and El Khoury, 2004). In a survey conducted in the Lebanese Bekaa valley, Hamadeh *et al*. (1996) reported low productivity in sheep and goats and distinguished three systems of production in the studied area. The small ruminant production could be improved through better nutrition management, screening for diseases and rehabilitation of extension services. In the same study, the authors concluded that sheep and goat provided an important source of income to farmers and a detailed bio-economic analysis is imperative to determine future trends of the small ruminant sector in Lebanon (Hamadeh *et al*., 1996). In his introduction, Boyazoglu (2002) indicated that the systems of production should be economically efficient and must be consistent with the optimum use of resources; particularly in sensitive environments with complex ecological balances.

Within this context and to have an idea about the future of the small ruminant sector in Lebanon and its economic sustainability, this study was conducted to evaluate sheep and goat production systems and productivity.

Materials and methods

The study was conducted in the north, one of the five provinces of Lebanon (Fig. 1).

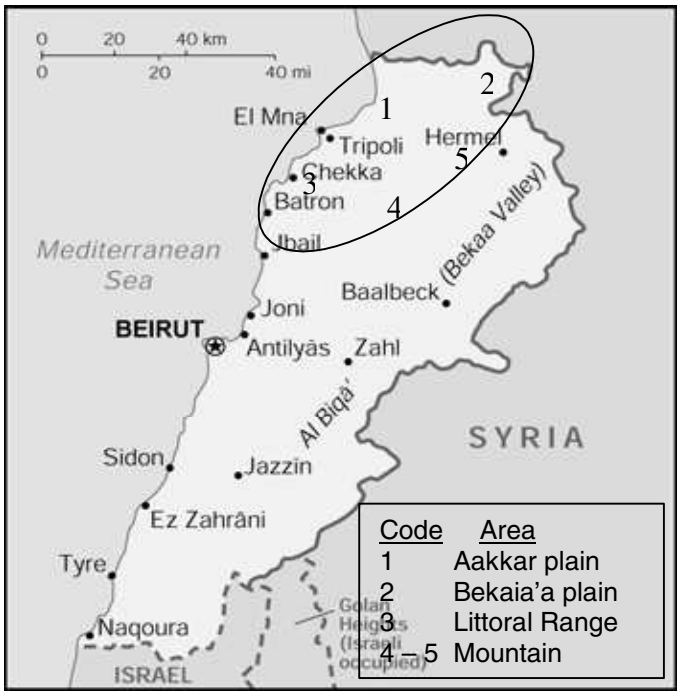

Fig. 1. The area of study in the north of Lebanon.

The geographic area covered is representative of the Lebanese production conditions. This area includes littoral and mountain rangeland, the Mediterranean fertile plain of Akkar (located at sea level) and the valley of Bekaia'a (a high-altitude fertile plain [600 m] with a semi-continental climate). The average annual rainfall during mid October and mid April ranges between 400 and 750 mm. The north of Lebanon contains a diversity of agricultural production (rainfed and irrigated) including cereals, vegetables, fruits and rangeland.

Data used in this study were obtained from two groups of small ruminant's farmers owning 1512 sheep and 2985 goats. Sheep belong to the fat-tailed Awassi breed raised for their meat and milk. Goats are mainly of the local rustic population known as "Baladi". The first group made up of 51 livestock farmers was monitored for two years by a specialized technician in order to evaluate the farming systems and the productivity. A single interview survey with a detailed questionnaire of analysis was used to cover the second group made up of 19 livestock farmers. The questionnaire was

developed in accordance with the "recueil d'indicateurs de fonctionnement des systèmes laitiers" proposed by the Cirval ("Centre International de Ressources et de Valorisation de l'Information des Filières Laitières Petits Ruminants", www.cirval.asso.fr). This 70 farmers were distributed into 21 sheep farmers, 28 goat farmers and 21 goat and sheep farmers.

The performance of the herd was calculated according to the survey results and taking into consideration: (i) that the period of milk production is counted after weaning or 70 days after kidding; (ii) the price of milk varies largely between the systems of production according to the degree of valorization by the farmer; and (iii) the number of kids slaughtered at an average of 50 kg after deducting the kids designated for reproduction.

Results and discussion

Production systems

The five systems of production vary largely with the area of production (Table 1). In the two plains of Aakkar and Bekaia'a where cereal is produced, we saw transhumant and sedentary systems, respectively. These two systems of production are also notified by Hamadeh *et al.* (1996) in the Bekaa valley where agricultural production is similar to that practiced in the Aakkar and Bekaia'a. In these two systems feeding of flocks depends on the crop residues available in these plains.

Table 1. Rearing systems on small ruminant production in north Lebanon

Production system	Farmer	Flock size (head ± SD)	Ratio of sheep to goats (head)	% of rangelands use
Subsistence	44	9 ± 2.1	1:4	20
Sedentary	6	135 ± 16.5	1:2	35
Semi nomadic	6	267 ± 41.2	1:2	80
Transhumant	8	150 ± 30.5	1:1	60
Intensive	6	83 ± 11.1	0:1	0

In the southern part of north Lebanon, we noticed mainly the usage of the semi-nomadic system between the littoral and the mountain rangelands. This system is mainly based on rented rangeland as a source of feeding. The subsistence and the intensive systems of production spread throughout the entire area of the north are encouraged by the projects of rural development. All these systems are in accordance with those identified by Srour *et al.* (2004) except for the horizontal transhumance cited by these authors and which is practiced mainly in the Bekaa valley.

Flock size and system of production are interdependent. Farmers with small-sized flocks practiced the subsistence systems and the ones having larger-sized flocks used the semi-nomadic system. It was noticed that intensive production system was used for improved goats because the local goat and the Awassi sheep are not suitable to be raised intensively under zero grazing (Table 1).

Area indicators

More than 70% of sheep and goat farmers have less than 1 ha of agricultural area (Table 2). Feeding is based on rangeland resources and the crop residues usually rented. The forage production sector is growing since 2001 when the public subsidy for sugarbeet pulp was stopped.

Technical and economic results.

The flocks showed seasonality of reproduction. Kidding period takes place mainly between January and March. This is in accordance with Hamadeh *et al.* (1996) who mentioned that the mating

period took place between June and November with the highest rate of conception occurring in August and September.

Table 2. Agricultural area used by sheep and goat farmers (without natural pastures)

Farm size	Sheep		Goat		Sheep and goat	
	No. of farmers	%	No. of farmers		No. of farmers	%
0 ha	4	19	4	16	4	19
< 1 ha	11	52	17	59	12	57
> 1 ha	6	29	7	25	5	24
Total	21	100	28	100	21	100

Sheep and goat milk production varies largely with the systems of production and the feed resources. This variability is due principally to the rangelands and the roughage quality which are highly affected by the dry climate. In the sedentary, semi-nomadic and transhumant systems, meat production is the main source of revenue. In the subsistence and intensive systems, milk production appears to be the main source of revenue (Table 3).

Table 3. Small ruminant performance by system in north Lebanon (results refer to one year)

Performance		Production system				
		Sb	Sd	Sn	Tr	In
Goats						
Milk	Kg/ head/year	201	61	108	96	347
	Period† (days)	150	60	120	90	180
	Average revenue†† $/head/year	127	31	54	48	219
Kids	Born (No./dam)	1.4	1.1	1.2	1.1	1.5
	Weaned (No./dam)	1.3	0.8	0.7	0.8	1.35
	Slaughtered††† (No./dam)	0.9	0.5	0.4	0.5	1
	Average revenue $/ head/year	112	62	50	62	125
Manure	Kg/head/year	525	320	230	320	550
	Average revenue $/head/year	10	19	14	19	11
Sheep						
Milk	Kg/head/ year	255	95	235	165	-
	Period† (days)	130	60	120	90	-
	Average revenue†† $/head/year	128	38	94	66	-
Lambs	Born (No./dam)	1.2	1.0	1.1	1.1	-
	Weaned (No./dam)	1.1	0.85	0.6	0.9	-
	Slaughtered††† (No./dam)	0.7	0.6	0.3	0.6	-
	Average revenue $/head/year	88	75	38	75	-
Manure	Kg/head/year	545	350	250	350	-
	Average revenue $/head/year	11	21	15	21	-

Sb = Subsistence; Sd = Sedentary; Sn = Semi-nomadic; Tr = Transhumant; In = Intensive.
†The period of milk production is counted after weaning or 70 days after kidding.
††The price of milk varies largely between the systems of production according to the degree of valorization by the farmer.
†††Number of kids slaughtered at an average of 50 kg after deducting the kids designated for the reproduction.

Milk was sold fresh and directly from the farm in the sedentary, semi-nomadic and transhumant systems at an average of 0.5 $/kg for the goat's milk and 0.4 $/kg for the sheep's milk. In the subsistence and intensive system's farmer, part of the milk was valorized by the traditional transformations (Laban, labneh and traditional cheeses). The average price of milk in these systems was 0.63 $/kg for goat's milk and 0.5 $/kg for sheep's milk. Collection of milk was done by "hallabs" (private collectors) without any formal procedure of transport and refrigeration.

Lambs and kids were weaned at 70 days of age and sold for slaughtering at the average weight of 50 kg for a price of 2.5 $/kg (live weight basis). The carcass yield is 53% for the lambs and 45% for the kids. This is in accordance with Hammad (1995) and Hamadeh *et al.* (2001) who mentioned that the revenues from live animals are of importance in the farms.

Reproductive performance decreased drastically in the more extensive systems (sedentary, semi nomadic and transhumant). The mortality rate of weaned kids and lambs reached 40% and 45% respectively. This high mortality rate varies largely from one year to another and is due principally to the raising conditions and animal health problems.

Manure has also a minor contribution to the revenues of farmers.

The annual average of input cost of systems is presented in Table 4. In the extensive systems (sedentary, semi-nomadic and transhumant), labour expenses accounted for the largest share of inputs and farmers family members participated to the herd production. Similar findings were reported in the extensive systems of the Bekaa valley by Hamadeh *et al.* (2001). In the intensive systems, feed cost accounted for the largest share of inputs.

Table 4. Input cost distribution for the systems of production in north Lebanon

Activities		System				
		Sb	Sd	Sn	Tr	In
Feeding	Average cost of feed purchase ($/head/year)	72	32	25	29	136
	Pasture rent ($/head/year)	3	7	20	16	0
	Water ($/head/year)	2	3	3	3	2
Labour	($/head/year)	31	34	37	36	31
Various	Medication, local rehabilitation, etc. ($/head/year)	12	7.3	7.3	7.3	15

Sb = Subsistence; Sd = Sedentary; Sn = Semi-nomadic; Tr = Transhumant; In = Intensive.

The extensive systems are made fragile by the complete dependence on rangeland conditions. Rental prices are independent from the quality of the feeding and vary from one year to another in these rangelands. The semi nomadic system survival appears unclear due to the poor management of the rangelands and the overgrazing situation.

Conclusion

The systems analysed in this study can be distinguished according to the use of rangelands and cereal residues into two parts, the traditional extensive systems (sedentary, semi nomadic and transhumant) and the improved systems (sedentary and intensive). When the climate is dry, the quality of the roughage becomes poor and the extensive small ruminant's production systems in the marginal lands revealed negative returns in the economic analysis. In this way farmers in traditional systems still considered small ruminants to be a store of insurance capital when cash is needed. With the high rate of kids and lambs mortality in the extensive systems, animal health seems to be one of the major factor limiting productivity and sustainability of these systems. Detailed studies on feeding practices, optimum feeding systems and rangelands management and mapping are needed in order to ensure the sustainability of these systems. The improved systems were monitored for the last years by some development programmes and they show better results on kids' mortality.

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