55th EAAP Annual Meeting, 5-9 September 2004, Bled, Slovenia

Session LMP3: Indicators of environmental impact in livestock systems

LMP3.3

Agro-environmental sustainability of small ruminant production in Lebanon

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Introduction

Small ruminant production systems in Lebanon are economical activities with evident social and cultural dimensions. In 2002, the Lebanese small ruminant population included 706 000 heads, of which sheep (320 000 heads) are 100% of Awassi breed, and Goats for 95% of Baladi breed, both animals of low productivity but well adapted to difficult arid conditions, the 5% remaining goats being of Damasquine / Chami or European (Saanen and Alpine) breeds.

During the last years, a decrease of small ruminant flocks was observed (RGA 1999). This decrease is mainly due to the low availability of feed, as marginal lands very important for small ruminants (Sanchez-Rodriguez & al.1996) are getting transformed for tourist projects, to the increase of production costs, to the fact that the population considers this sector as dangerous for forest and environment, and also to the low attractiveness of this sector for the new generation.

Survival of this sector, valorising range land which represents 29% of the Lebanese agricultural land, is considered as a priority because it supports numerous families in rural regions with low economical potential and facing human desertification.

Hamadeh *et al.* (2001) studied economic sustainability of small ruminant production systems in marginal areas of Bekaa valley, using a cost-benefit analysis technique (CBA). They showed that feed expenses, when coupled with grazing costs, represent a major constraint for profitability.

So, it appears that further development of small ruminant production, which is highly desirable, has to take into account environmental impact and long-term sustainability. This study aims at assessing the agro-environmental sustainability of small ruminant production systems in all Lebanese areas, using the French method IDEA (Indicateurs de Durabilité d'une Exploitation Agricole, Vilain, 2003).

Materials and methods

Data from one hundred and twenty nine farms of small ruminants, with a total of 38 000 heads (5.4% of the national stock), were collected between May and September 2003. Thirty to thirty five farmers were surveyed in each of the four Lebanese regions (South, North, Mont-Liban and Bekaa, Fig. 1). The following production systems, when present, were included in each regional sample:

1- Zero grazing system.
2- Sedentary system (pasture in the same village).
3- Vertical transhumant system (displacement from low to high altitude between summer and winter inside the same region).
4- Horizontal transhumant system (displacement in the same region in the plain areas).

5- Semi-nomadic system (displacement between different areas for a maximum benefit of grazing lands).

Seventeen sustainability indicators were computed from 58 elementary variables belonging to the following four categories:
1. General information about the farm (regional situation, manpower, flock number, kind of animals, utilized agricultural area), grazing management (kind and land of grazing) and the kind of production.
2. Biodiversity aspects (plant and animal biodiversity).
3. Land management (crop rotation, parcels of land and organic matter management).
4. Agricultural practices (such as fertilizer level, animal welfare and energetic independency).

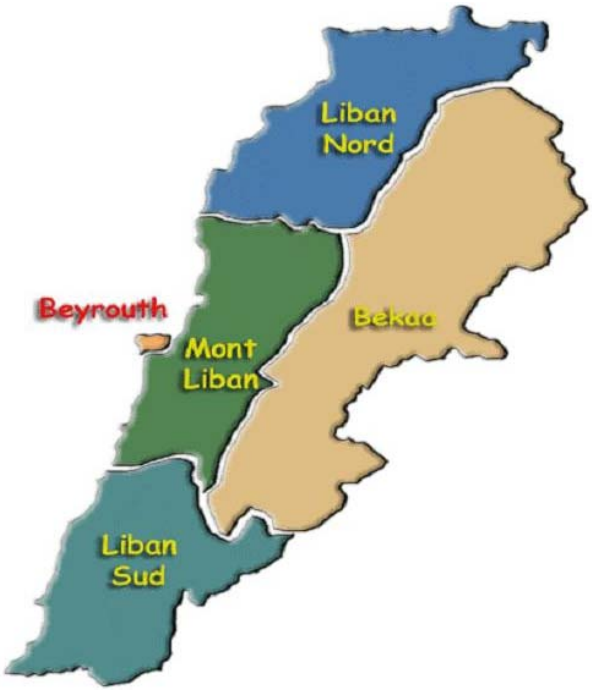

Figure 1: Map of Lebanon

Results and discussion

1- Global view
The best score is for agricultural practices with 21 for a 33 theoretical maximum score, followed by land management and biodiversity (respectively 15/34 and 10/33). Figure 2 shows the important variability between maximal and minimal observed values, which indicates the important diversity of the surveyed farms.
As a function of production systems, scores for agricultural practices are significantly lower in the zero grazing system, while biodiversity is lower in the vertical transhumant system (rarely coupled to presence of culture), and land management is significantly best rated in the sedentary system.

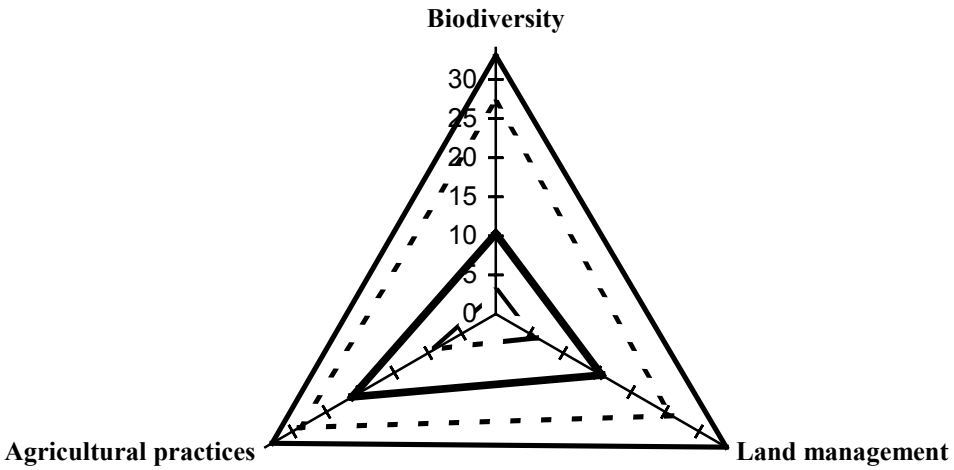

Figure 2: Tri-dimensional view of agro-environmental indicators
(—— Maximal possible score, ----- Maximum observed, ▬▬ Mean, —— -- Minimal score).

2- Biodiversity

Low mean values observed in figure 3 for cultural (annual and perennial) biodiversity and for associated plants (with landscape function) are due to monoculture and the absence of land for most of the farms. On the other hand, animal biodiversity (indicator A4) and conservation of genetic heritage (indicator A5) are satisfactory, due to the presence of mixed local flocks (goat and sheep, with high resistance for disease and very well adapted to Lebanese conditions, bred together) and absence of imported breeds, which are less adapted to difficult grazing conditions.

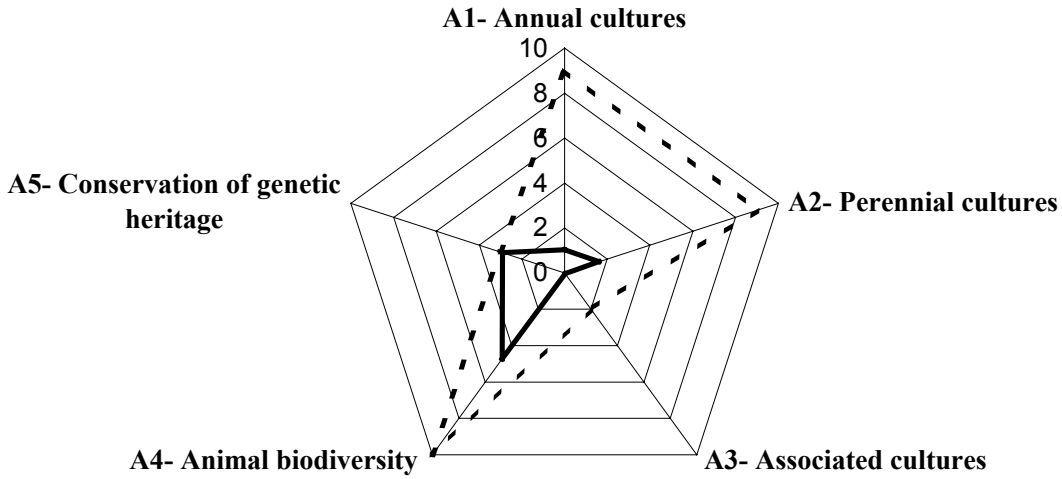

Figure 3: Biodiversity indicators scores (—— Means, ------ Maximal score).

3- Land management

Low values observed for the A8 indicator (organic matter management) is due to the absence of compost, and to the dung exportation outside of the farm, because small ruminants dung is very appraised by high added value cultures (such as floriculture, green house cultures, …). The low value for A12 (forage management) is explained by the low percentage of farmers (27%) cultivating forage and the presence of monoculture in those lands. Moreover, the small dimension of land units for most of the farmers, preventing the utilization of mechanization, and the presence of very big parcels in some Bekaa farms have the effect to decrease value of A7 (parcel of land) indicator (figure 4).

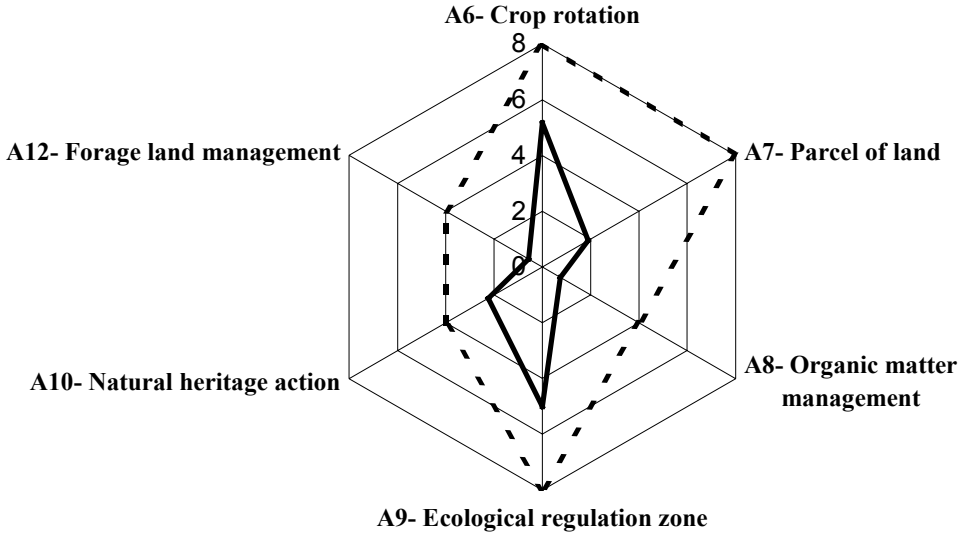

Figure 4: Land management indicators. (—— Means, ------ Maximal score).

4- Agricultural practices

Positive aspect are constituted by the high level of the indicators A15 (pesticides and veterinarian product use), A18 (water management) and A19 (energetic independency). Indeed, pesticides and veterinary products are used moderately. When water is present, it is managed economically through the way of drip or sprinkler irrigation. The autonomous nature of small ruminant production systems in Lebanon regarding energetic resources (low need for electricity due to manual milking, low expenses for product transformation) results in a high score for energetic independency.

On the other hand, high slope ground in mountains is affected by erosion when grazed by ruminants, which results in low values observed for A17 indicator (soil protection), while A14 indicator (effluents treatment) score is low because most of the farmers discharge waste directly in the environment.

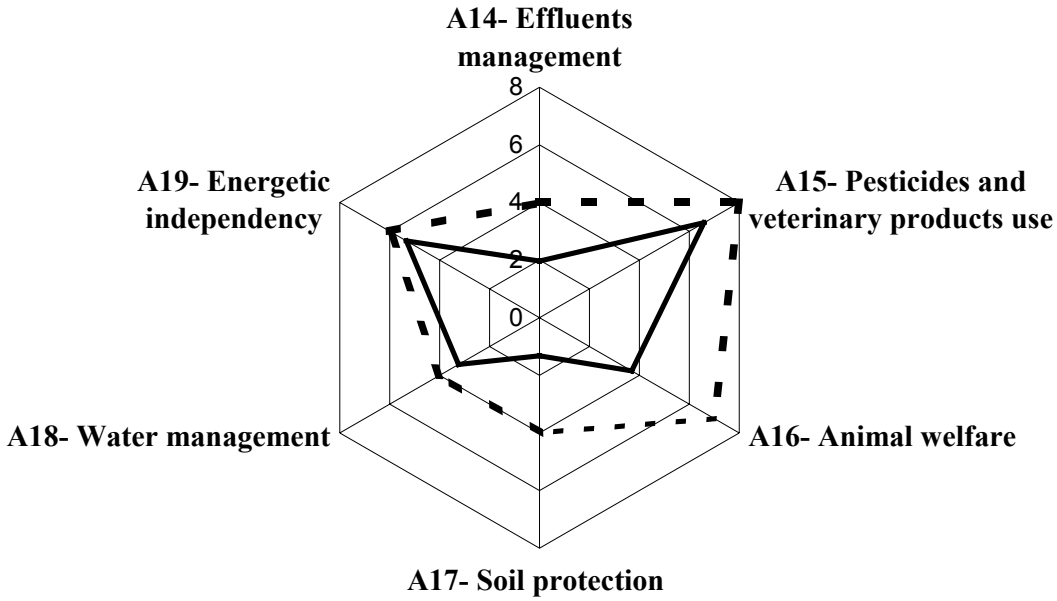

Figure 5: Agricultural practices scores (—Means, ------ Maximal score).

Conclusion

Many indicators have been modified in comparison with the original IDEA method (for example for taking into account the small size of the parcels of land) to be more representative of the local situation. Some indicators have to be further developed, such as A11 (stocking density) and A13 (nitrogen apparent balance).

This study initiates the debate on the future sustainable methods in the Lebanese agricultural sector. Statistical analyses show that the improvement of sustainability of small ruminant production systems in Lebanon has to pass through improvement of crop rotation, better management of organic matter and forage culture, and better protection of soil and water.

In this study only agro-environmental criteria have been discussed; they are a part of sustainability, who takes into consideration also the social and economical dimensions.

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