Goat production systems in a mountainous community of the Middle Atlas, Morocco

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Abstract. A survey of 70 goat herders from Aït Bazza rural commune in the eastern part of the Middle Atlas Mountains has been carried out. Its aim was to characterize goat production systems. The survey was part of a research-development study on meat goats. Using a purposive sampling framework, all 11 douars (villages) of the commune were covered. The number of selected respondents within each douar was based on accessibility and availability of herders. The survey instrument focused on the main aspects of goat production. Results show that goats are raised in mixed herds with sheep and contribute significantly to farm income. Husbandry practices regarding reproduction, feeding and health care are described. Marketing behaviour of herders is examined. Farm-household needs for cash represent the most important reason for selling goats. Goat milk and hair are destined to household consumption. Family members supply the labour required for goat herding in most goat farms surveyed. Main constraints reported by herders include the high rates of abortion and mortality of the young. To conclude, it is argued that current practices embrace significant improvements in comparison with past practice but they still need further improvements.

Keywords. Aït Bazza – Production systems – Goat herders – Husbandry practices.

Systèmes d'élevage caprin dans une communauté du Moyen Atlas, Maroc

Résumé. *Une enquête a été réalisée auprès de 70 éleveurs de caprins de la commune rurale Aït Bazza située dans la partie Est du Moyen Atlas. Son objectif était de caractériser les systèmes d'élevage caprin. L'enquête s'inscrivait dans le cadre d'un travail de recherche-développement sur les caprins à viande. Sur la base d'un échantillonnage raisonné, tous les 11 douars (villages) de la commune ont été couverts. Le nombre d'éleveurs par douar était établi en fonction de l'accessibilité des éleveurs et leur disponibilité. Le questionnaire était focalisé sur les aspects majeurs des systèmes d'élevage. Les résultats montrent que les caprins sont conduits dans des troupeaux mixtes avec les ovins. Les caprins contribuent substantiellement au revenu de l'exploitation. Les pratiques en matière de reproduction, d'alimentation et de santé animale sont décrites. Le comportement de commercialisation est examiné. Les besoins de l'exploitation en trésorerie constituent la raison principale des ventes. Le lait et le poil sont autoconsommés. Les membres de la famille fournissent la force de travail requise par l'élevage caprin dans la majorité des cas. Les principales contraintes déclarées par les enquêtés sont l'avortement et la mortalité des jeunes. En conclusion sont présentées les améliorations notées au niveau de la conduite actuelle des élevages par rapport aux pratiques du passé et la nécessité d'autres améliorations.*

Mots-clés. *Aït Bazza – Élevages caprins – Éleveurs – Conduite d'élevage.*

I – Introduction

This paper on goat production systems is a part of a research and development activity on the role of goats as a lever for community development. The activity has been carried out in Aït Bazza rural commune in the Middle Atlas during the 2007-2010 period. In Aït Bazza, like in similar communes of Morocco, goats play vital roles. They contribute to satisfying the population nutritional needs and ensure people's income. Goats may be considered as contributing factors to the stabilization of population in mountain communities. The Middle Atlas mountains host 20% of national goat population estimated at 5,177,900 heads in 2008 (FAOSTAT). Meat goats of the Middle Atlas are the least known and least studied compared to goats of the North, namely in Chefchaouen province (Outmani, 2000; Chentouf *et al*., 2004; ICRA, 2005) and the goats reared under argan forest systems (El Assouli, 2001; Bas *et al.,* 2005; El Aich *et al.,* 2005;

El Aich *et al.,* 2008). The objective of this paper is to describe and analyze the grazing production systems of meat goats in a mountainous community of the Middle Atlas with the perspective of identifying most relevant areas for improvement.

II – Material and methods

Aït Bazza rural commune was selected for carrying out a research-development study on meat goats because of its mountainous character, semi-arid climate, land use, and the place assigned to goat herding. With 15,352 ha, grazing areas represent 63% of the commune's territory. Forests cover 21.5% and arable lands occupy the remaining of the territory. Rearing small ruminants is the main economic activity of the people. Raised animals include 20,000 heads of sheep and 10,000 of goats (DPA, 2008). Goat rearing is an integral part of the pastoral tradition of the community. Based on the latest population census (HCP, 2004), the commune counts 11 douars (villages) with a total population of 3480. According to local authorities' estimates, there are 246 goat herders in the commune. Using a purposive sampling framework, all 11 douars of the commune were covered. The number of selected respondents within each douar was based on accessibility and availability of herders. A total of 70 goat herders participated in the survey. The questionnaire focused on the main aspects of goat production, namely husbandry practices, marketing, perception of meat quality, household consumption of goats and goat products, and major constraints. For the data entry and descriptive statistics, Excel was used.

III – Results

1. Generalities on Aït Bazza goat herders and farms

Characteristics of goat herders indicate an average age of 48 years with 41% of respondents being less than 40 years old. Levels of education and organization of herders are low. No schooling was reported by 73% of respondents. Only 30% recognized being members in some type of organizations; half of them are members of the Marmoucha grouping established by the National Association of Sheep and Goat Breeders (ANOC) in 2005. The average household size is 9 persons and 43% of surveyed herders have families with over ten members. Main characteristics of goat farms are presented in Table 1. Surveyed respondents exploit landholdings under both rainfed and irrigation conditions. Cropped areas are limited with a high degree of fragmentation. Goats are reared in mixed herds with sheep and often relegated to secondary place. As indicated on Table 1, the average size of sheep flocks is higher than that of goat herds. Small ruminants are sources of total income for 67% of respondents. Based on phenotypic characters and reported local names, the number of goat genotypes amounts to ten with the predominance of local black goats.

Table 1. Characteristics of goat farms

	Mean ± SD
Cropped area under rainfed conditions (ha)	8 ± 5.47
Number of parcels (rainfed)	9 ± 5.42
Cropped area under irrigation (ha)	1 ± 0.95
Number of parcels (irrigation)	6 ± 3.56
Ewes	80 ± 50.52
Young animals (sheep)	51 ± 40.6
Does	52 ± 49.37
Kids	32 ± 41.70
Bucks	3 ± 3.43

2. Husbandry practices

The three most important aspects of herd management are reproduction, feeding and health care. The survey findings on reproduction parameters are presented in Table 2. Fertility tends to be low. Contrarily, abortion and mortality rates are high. Uncontrolled mating is the generalized practice. Bucks come primarily from the herd and are changed every 6 to 7 years, not a generalized practice though.

Table 2. Reproduction indicators of goats based on respondents' declarations

	Mean ± SD	Range from to	Most reported
Age at first pregnancy (months)	11.08 ± 1.76	6 to 12	12
Abortion (%)	24.82 ± 21.46	0 to 100	25
Fertility (%)	85 ± 13.52	66 to 100	100
Prolificacy (%)	107±11.54	100 to 135	100
Ratio does/buck	22.45 ± 10.12	10 to 60	20 to 30
Mortality (%)	25.30 ± 22.89	5 to 90	10

The most common feeding regime is daily direct grazing by the animals. The days when animals are prevented from leaving the pen are exceptional and are generally due to heavy snow. Three types of grazing areas are available. The first type consists of forests with predominantly oak trees (*Quercus ilex* L.) and Juniper trees (*Juniperus oxycedrus* L.). The second type concerns the mountain grazing areas locally called Adrar where thorn cushion plant species, namely *Bupleurum spinosum* L. and *Alyssum spinosum* L. are predominant. The third type is the steppe area stretching from Tizi n'Taida to Azinos with alfa (S*tipa tenacissima* L.) and associated plants. Based on the type of pasture and climate conditions, three grazing systems are practiced by respondents. The first one is the alternating forest-Adrar system followed by 43% of respondents. Under this system, animals spend the largest proportion of the year in the forest and are moved to the elevated areas of Adrar during the summer. The second system is primarily based on the steppe plants with some grazing in nearby forests. The third type is the all year round forest system practiced by 17% of respondents. The access to any one of these systems is regulated by communal and village rights. Negligible amounts of additional feedstuff are provided by 71% of respondents but rather sporadically during the cold months.

As for the health care, more than three fourths of respondents provide veterinary care in the form of curative treatments for sick animals. Preventive measures such as vaccines and anti parasite treatments are rarely used. Most importantly, some goat herders are skeptical about the necessity and effectiveness of sanitary treatments. However, mortality of offspring and abortion are high and vary temporally and spatially. As indicated in Table 2, mortality rates varied between zero losses to 100%. Most importantly, goat herders do not have any clue on the causes of occurred deaths in their herds. Most probably, the causes could be a combination of underfeeding, diseases and management deficiencies among others.

3. Marketing behavior of goat herders

The annual average number of sold goats per herd is 17 young males, 13 does and 11 young females. Sales of bucks are rare. Prices vary across the year. Average prices for each category of goats are 484 MAD (Moroccan Dirham) for does, 377 MAD for young males, 295 MAD for young females and 673 MAD for bucks. The bulk of the 1833 goats sold by respondents during 12 months was done at the livestock weekly souk held at Imouzzer Marmoucha on Mondays. Only few respondents declared selling goats in other souks of the region, particularly Missour and Outat Lhaj because they were using the Moulouya grazing areas. Sold animals are of different ages from the very young to the very old. The main reason for selling is the need for

cash to purchase other necessities. But things are changing in the study community and elsewhere in Morocco. One surveyed respondent from Aït Bazza reported purchasing young kids when prices are low and added them to the rest of the young kids of the herd. In addition to grazing, these animals are given supplementary feedstuffs, namely barley, bran and dried alfalfa. Most importantly, they are sold at the occasion of the celebration of the feast of sacrifice in Rabat and Casablanca.

4. Goat products and their use

Most respondents reported levels of milk production varying between 0.1 and 0.5 l per doe per day with an average of 0.34 l. The lactation period is extended from March to August with April-June being the most reported period. Herders also recognized that the lactation period is closely linked with births and available forage resources. The latter are climate dependent. All the milk production is consumed either fresh or processed into a dry type of cheese locally called "klila". Also, 63% of respondents slaughter some goats from their herds. Goat meat in general and meat of young kids is respondents' most preferred meat. However, more than half the respondents slaughter ewes for the celebration of the feast of Al Adha because ewes have more meat and more fat. The lambs are generally destined to the market.

5. Rearing goats: A family operation

Rearing goats is a family operation in the case of 76% of respondents. The remaining respondents recognized using salaried shepherds. The latter are of two categories, shepherds whose work is limited to the task of daily shepherding and those who assume the multiple tasks of caring for the goat herd generally assisted by their family members.

In the family operations, sons are generally assigned the tasks of shepherding and watering. The herder is responsible for animal sales and purchases of feedstuff and veterinary products. Milking and processing activities are exclusively done by women. In addition, women contribute significantly to cleaning the pen, caring for the young, and feeding when provided. In spite of the hardship of the living conditions, the multitude of daily tasks, and the restricted and precarious character of housing, women undertake some artisanal activities namely the weaving of necessary parts for tent making using available goat hair mixed with sheep wool.

IV - Discussion

The results of the survey of 70 goat herders in Aït Bazza reveal significant similarities with many mountainous communes throughout Morocco. In fact, Aït Bazza was selected because it was considered as an example of mountain goat rearing communities from environmental, social and economic perspectives. As observed by Lefdili (2007), similar practices to those found in Aït Bazza prevail throughout the Boulemane province.

It is worth noting that over 40% of respondents are less than 40 years old. This means that goat operations are carried out by young goat herders who inherited their herds and associated grazing rights to particular grazing areas.

While current goat production systems are far from optimal, they embody elements of improvement from traditional practices of the past when transhumance was the modus operandi of goat production. Then no sanitary treatments whatsoever were applied and no additional feed was provided. Not long ago even the government vaccine campaigns excluded goats. The current use of curative measures is in itself a progressive step in the process of developing good practice. The shift from zero health care to the use of preventive measures and permanent follow up of the herd requires knowledge, information and skills that goat herders may not have. Treatments cost money and goat herders may not always dispose of money or easily be willing to spend it on goats.

Goat herders are aware of the changing environment around them and are increasingly adapting their husbandry practices. One of the weakest features of goat operations in the study area and elsewhere in Morocco is the unorganized character of goat herders. Consequently, as long as goat herders continue to face production and post production challenges individually, it is difficult to achieve substantial progress in the sector. Goat herders are in need of joining the existing national association of sheep and goat breeders of which there is already a grouping in the area or creating alternative associations of their own. Herders' organization is necessary.

V - Conclusion

The goat production systems of Aït Bazza, Boulemane province have been described. On the animal husbandry side, reported current practices seem inadequate and full of flaws. Nevertheless, they reflect important attitudinal and behavioral changes among goat herders whose life experience is formed within a pastoralist tradition. To conclude, it is safe to agree with Alexandre and Mandonnet (2005) in their statement that "While encouraging herders to undertake new management practices and methods, one must be careful to prevent practical failures that will have a devastating effect on the herder's economy. Moreover, it is necessary to avoid ready-made unique and uniform technical solutions that are not adapted to the herder's objectives, conditions, choices and practices".

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