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# Technical and socio-economic characterization of small ruminants production systems in Saudi Arabia: results from a survey to stockbreeders

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**Abstract.** Based on a survey of 818 small ruminant breeders and on participative work performed in rural areas of the Kingdom of Saudi Arabia, this study describes the main characteristics of small ruminants herd structure and their productive and commercial problems. Therefore, some conclusions and recommendations are deduced for both improving the operation of these herds and to take full advantage of the potential of sheep and goat farming sector in the design of sustainable development policies for Saudi Arabian's rural areas.

**Keywords.** Small ruminants sector – Less favored areas – Productive structure – Trade problems – Kingdom of Saudi Arabia.

## **Caractérisation technique et socio-économique des systèmes de production de petits ruminants dans le Royaume Arabie Saoudite: résultats à partir d'une enquête aux éleveurs**

**Résumé.** À partir d'une enquête à 818 éleveurs d'élevage caprin et ovin et de recherche participative dans des régions rurales de Royaume Arabie Saoudite, on décrit les principales caractéristiques de la structure des troupeaux et ses problématiques productives et commerciales. Finalement, des conclusions et des recommandations ont été présentées pour l'amélioration du fonctionnement de ces troupeaux, ainsi que pour profiter du potentiel du secteur des petits ruminants dans l'élaboration des politiques du développement durable des zones rurales du Royaume Arabie Saoudite.

**Mots-clés.** Petits ruminants – Zones défavorisées – Structure productive – Problèmes commerciales – Royaume Arabie Saoudite.

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## **I – Introduction**

Saudi Arabia occupies more than two third of the Arabian Peninsula (approximately 2,250,000 km<sup>2</sup>; 870,000 sq mi). Sheep, goat, camel and cow population in Saudi Arabia is estimated at 10 millions, 3 millions, 850,000 and 400,000 heads, respectively (Agriculture Statistical Year Book, 2012) distributed in different parts of the country.

Due to its geographical situation, agricultural and livestock systems are very heterogeneous, mainly dominated by very arid climate, where the desert occupies the most important areas. Last decades, development policies have been undertaken in the kingdom, where livestock farming generally and small ruminants particularly should play an important role for the design of sustainable development processes in the Saudi Arabia rural areas, mainly less favored and mountainous ones (Alshaikh *et al.*, 2010). Small ruminants are capable of adapting to different farm-

ing systems and environments (Castel *et al.*, 2010; Calatrava and Sayadi, 2007). They have an important socioeconomic role in many marginal and less favored rural areas of the word (Degen, 2007; Calatrava and Sayadi, 2003 and 2006; Sayadi and Calatrava, 2006; Sayadi, 2012).

In this context, to take full advantage of small ruminants sector for the economic, social and environmental development of these areas, this study try to characterize this livestock sector by identifying its technical and socioeconomic features. Then, its productive and commercial structure will be highlighted. Some strategies will be suggested for the livestock sustainable development of Saudi Arabian's rural areas, contributing therefore to maximize social welfare.

## II – Material and methods

Data was obtained in three different provinces of Saudi Arabia (Riyadh, Qassim and Hail) through a survey to 818 breeders producing goat and/or sheep. The survey was conducted between July 2009 and January 2011, being the aim of the surveyed farms to be representative of the different production systems and herd sizes in rural areas rather than forming a strictly representative sample of the population in terms of herd sizes.

The design of the first draft of the questionnaire, objectives, pilot test, work field execution, etc., has been performed with a multidisciplinary team from the Ministry of Agriculture, with a strong collaboration with researchers, veterinarians, technicians, stockbreeders, universities, etc.

The last version of the questionnaire include finally five major sections: (i) Social and economic characteristics of breeders (age, level of education, type of occupation, etc.); (ii) Production and management system (housing, feeding, reproductive cycle, genetic improvement, etc.); (iii) Health status of the herds (diseases, general practices of preventions, vaccination, etc.); (iv) Trade and marketing systems (products, market, prices, etc.); and (v) Opinions about the most important problems and some solutions to improve the running and economic results of the breed.

After debugging survey data, we proceeded to perform an univariate analysis of information generated. Added data has been analyzed using SPSS Statistics version 19 and Statgraphics version 5.0 in 2013.

## III – Results and discussion

### 1. Socio-economic characterization of breeders

Most breeders surveyed were from Hail (42%), almost 38% from Qassim and a 20% from Riyadh. Most proportion of small ruminants breeders are of ages between 46 and 55 years old. 56.8% of farmers are older than 55, being 12% older than 65 years and only 2.7% are younger than 25. As far as their educational level was concerned, of the interviewees, the highest percentages were for uneducated farmers (30% of the total sample). Only 10% of farmers had a university degree.

With respect to net monthly income per household, over 70% have income level less than 1.000 € (5.000 RS), having 42% monthly income ranging from 600 to 1000 € (3000 RS – 5.000 RS). Only 8% of breeders exceed than 2.000 €. These low-income levels not encourage breeders to invest in improving the production structure of their farms and limit the development of herds. This could be a consequence of the increasing cost of feeding, health situation, scarce of grazing and pasturage, among others.

The most common family size is from 6 to 9 people, accounting for 37% of households. Large families with more than 6 members represent 65% and those with less than 3 members was only about 13%.

Almost 30% of farms state that goat and sheep breeding first objective is for trade and business. However 13% of farmers affirm also that they practice this activity for hobby. For more than 70% of farmers, small ruminants breeding constitute their main occupation activity. These figures indicate the important role played by this sector as a source of income for many Saudi Arabian's rural families.

Almost of goat and sheep farms are multi-purpose operation. Meat followed by milk production being the main concern by 95% and 76% of total farms surveyed, respectively. The by-products of goat and sheep farming (wool, leather, etc.) are not significant.

The most important outlets for herd outputs are markets (80%) and only 20% of breeders sale their products within the farm and/or through other middlemen or exhibition (1%). Sales are made mainly throughout all the year (70%), particularly during the pilgrimage "Hajj" period (16%).

## 2. Goat and sheep production systems and management

The composition of farm herds in the area of the study is goat only (16.5%), sheep only (40%), as mixed of sheep and goat (43.8%). Small ruminants are also mixed with other species as camels accounting 23.7% of farms and less frequent the cows (only 7.3%) (Table 1). On a scale likert valuation 1: very interesting to 5 not interesting, 32% and 61% of breeders confirm that goat and sheep rearing are "quite" or "very interesting" activities in their areas, respectively (Table 1).

**Table 1. Characterization of herds by species and number of animals**

	Presence in the herd "Yes" (%)	Mean of animals	Typical Deviation	Quite / very interesting activity (%)
Goat	60.00	66.39	98.46	32.00
Sheep	83.50	264.31	391.82	61.10
Camel	23.70	10.78	31.82	16.10
Cow	7.30	1.76	23.07	2.30

Source: Own elaboration. Survey (2011).

Herd size in the region is very heterogeneous, responding to the following distribution chart (Table 2). The Gini index of the previous distribution is of 0.71 (being 0: perfect distribution – 1: Very unequal distribution), which indicates a high unequal degree of distribution of Saudi Arabian small ruminants sector. Thus, 16.23% of the herds are less than 50 head amounting to less than 2% of the total live-stock, whereas one fifth of the breeders, with more than 300 head each, possess over 60% of the total livestock. Almost 50% of herds have a size between 100 and 300 heads (Table 2).

**Table 2. Herd distribution according to size stratification and degree of concentration of the small ruminant livestock for all the zones combined**

Size stratification	% total livestock breeders	% total head
< = 50	16.23	1.96
50 – 100	17.14	4.33
100 – 200	28.34	14.81
200 – 300	18.05	15.53
> = 300	20.24	63.37
Total	100%	100%

Source: Own elaboration. Survey (2011).

The mean being 66 goats and 264 sheep respectively. These average indicate that breeders tend to breed larger number of sheep than goats. The balance between sheep and goats in the studied area is of 4 sheep/goat. In any case, mixed herds are frequent in the region (44%), despite diverse behavior of both species in the open field. The average number of animals incoming the herd is about 88 and the average of outgoing is about 106, indicating the possible future decrease of the size herd in Saudi Arabia rural areas. These data are consistent with those obtained in other studies in the Mediterranean areas (De Rancourt *et al.*, 2006).

As regards production systems intensiveness, 41,7% are traditional extensive (Bedia) while intensive (fully housed) and semi-intensive in all surveyed areas are only 6.1% and 1.5%, respectively.

Due to the geographical conditions of the Kingdom and the agriculture encroachment, grazing and pasture are very scarce and poor. Therefore, breeders have to feed their animals mainly using trefoil (alfalfa, hay: 93.2%), barley (89.7%) and staw (73.1%). Only 14% use food concentrates to feed animals and less than 5% use bran and crop residues (such as dates) as source of nutrition. Note that 30% of breeders do not use minerals and vitamins blocks to feed their herds. In this context, pastoralism during "all the year" (30%) or "short periods" (41%) are key and very common practices within goat and sheep breeders to feed their animals. The clean water is essential for the suitable running and management of herds. However, only 25% of stockbreeders affirm that they have available this water in their farm. Saltwater and average salt level water are the only type of water available for 14.1% and 57.7% of farmers, respectively. The main source of these waters is wells (91% of farms). There was no dependence on sea desalinated water (1%), nor on swamps which is available after the rains, nor on springs of water due to their rapid depletion and their low level flow.

The production system is based mainly on farms with primarily production structure and usually with a very low cost investment. In fact, wood and tents barns represent almost 50% and only 24% are cement building.

The results of the survey show that about 44% of breeders have not made a health control of the herd in the last year. The rest of educators affirm that the veterinary visit of herds varies between 1 and 6 times per year, being 12 the maximum of visits for 4% and the average is 4 visits/year. All breeders complain about health situation and the lack of veterinary services, attending usually a private clinics to treat their animals and the corresponding high costs. Therefore, almost 50% of farmers rely on traditional methods due to the limited veterinary services and, as they say, "the low efficiency and capacity of many veterinarians".

The majority of breeders (60%) do not give importance of prevention and general health of the herds. They don't clear periodically their farms, nor separate new or sick animals from the herds. Practically majority of breeders (95%) haven't books for register, control and identification of animals. Few breeders have reserved places for new births. All these factors can explain evidently the critic situation of small ruminants sector in Saudi Arabia which makes it difficult to apply any breeding programs and genetic improvement.

### **3. Most important problems of sheep and goat farming**

Almost all farmers are of the opinion that there are serious problems limited the development of the small ruminants sector in Saudi Arabia. Classing responses by groups, the specified problems were as follows:

- Health care and veterinary services: lack of veterinary services, pharmacies and controls, high costs and prices.
- Nutrition and pastures: lack of water resources, rainfalls, pastures, higher feed prices.
- Reproduction and production: high mortality; low fertility, lack of selection.

- Employment and human resources: shortage of trained labour; lack of manpower and high labour wages; absence of vulgarization.
- Marketing: poor marketing channels; control of sale prices by brokers, lack of social and professional organisations, loss of added values of herds products.
- Other constraint: difficulties of getting financial supports, lack of qualified staff, etc.

From the above, it is clear that a lot of the problems affecting the development of the sector in the area are internal to small ruminants farming (productive structure, deficient facilities, labour shortage, etc.) and others are external (insufficient advisory services, etc.). These problems are very common in small ruminant systems in the Mediterranean (Bernués *et al.*, 2011).

## IV – Conclusions

There is a tradition of and experience in raising small ruminants in Saudi Arabian rural areas, although it has been very affected by geographical and climatologically conditions. The typical herd is usually composed of an average of 264 sheep and 66 goats, with a traditional extensive and/or nomadic-semi nomadic system management. Milk and mainly meat are the main herd products. Strategies of maximising added value to the farmer are scarce in the area. The production structure is yet primarily with very low cost investment. Health and sanitary situation of herds is usually not acceptable as most breeders does not give importance to preventions and the lack of an adequate veterinary and pharmacies services. The mean age of breeder is high, being the most proportion (60%) older than 55 years, who is uneducated or with a very low education level. The most common family size is from 6 to 9 peoples. The income level is less than 1.000 €/month. This characterization shown that generally, the future expectations of small ruminants in the Kingdom are not very optimistic. Some strategies should be implemented urgently (education and training programs, government aids and financial support, development of the cooperatives, implement national programs for breeding, health, identification and artificial insemination, etc.) to improve the future prospects and to take full advantage of small ruminants potential for the design of sustainable rural development in Saudi Arabia.

This previous study provides for the first time a technical and economic diagnostic and reference of small ruminants rearing in Saudi Arabia rural areas. It constitute the beginning of the emergence of further studies both empirical, methodological and participative on the sector, using stratified sample by type of herds and more sophisticated analysis, including both structural and operational indicators (multivariate modelling, clustering, etc.).

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