

## PRODUCTION AND HEALTH PARAMETERS IN CATTLE HERDS: A SURVEY FROM EASTERN TURKEY

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### ABSTRACT

In terms of its cattle population Erzurum constitutes a model for cattle management in eastern Turkey. The study was aimed at the assessment of the structure and health conditions of the cattle herds bred in Erzurum province from the perspective of alignment with the relevant European Union acquis. Randomly selected 379 cattle herds and data collected by means of a questionnaire, constituted the material of the study. It was determined that, the mean age of the cattle breeders operating in the province was 44 years old and that the breeders were generally of a low educational profile. The mean number of cattle per herd was 18. In the majority of the herds, no vaccination programme was applied, and it was observed that early postnatal calf mortality reached a level of 16%. Despite the presence of vast pasture areas in Erzurum province, poor pasture quality and low level of roughage production are of major concern. Furthermore, the lack of necessary precautions to protect the health of cattle herds, reduces the production level.

**Key words:** Cattle, Management, Herd size, Herd health

### INTRODUCTION

In developing countries like Turkey, cattle enterprises are semi-subsistence and serve for meeting both the needs of the families of the breeders for food of animal origin and the demand of consumers. Cattle manure is used as a fertilizer and enhances the structure of soil, and increases both produce and income. The productivity of cattle, contributes to both macro- and micro-economy and can be maintained through the protection of animal health.

In Turkey, the share of agriculture in gross national product is 8.5% and the share of animal breeding in agricultural income accounts for 22%. Sixty-four percent of the total surface area of Erzurum province is comprised of grasslands, and 13% of the grasslands of the entire country are located within the territories of this province. As 64% of the agricultural economy of Erzurum province relies on animal production and it is one of the main sources of income of the society (Anonymous 2011). Of the many factors that determine the performance and quality of animal production, the socioeconomic structure of animal enterprises is of priority. In order to ensure the realization of national development and the economic growth of the livestock sector, it is required that animal enterprises acquire a more rational structure. However, as is the case for the eastern region of the country in general, the cattle barns located in Erzurum province are units characterized by an irrational structure. The majority of these enterprises are family-type, which use traditional breeding methods.

In view of the unavailability of animal production records, the present study was aimed at the

determination of the technical and structural traits of cattle farms located in Erzurum province and the problems encountered in maintaining the health of cattle herds such that feasible recommendations be made.

### MATERIALS AND METHODS

The present study was conducted by interviewing 379 cattle keepers from 168 villages located within the borders of 18 district centres subordinate to the centre of Erzurum province, in eastern part of Turkey. The questionnaire was comprised of 67 questions. Thereby, the educational status, number of persons per household, size of land, total number and bred of cattle, barn conditions, feeding methods, milking methods, health status of herds, and the membership of the animal keepers to breeders' associations were determined.

**Calculation of Sample Size:** The sample size was calculated by the mathematical equation given below (Yildiz *et al.* 2006).

$$n = \left( \frac{Npqz^2_{\alpha/2}}{(N-1)d^2 + pqz^2_{\alpha/2}} \right)$$

In this equation, N is the population size, p is the theoretical frequency of the presence of the incident, q is the theoretical frequency of the absence of the incident, d is the accepted deviation between the population rate and the estimated rate (0.05). As the number of choices for each question ranged between 2 and 6, and the highest p\*q value was obtained when p was 0.5, where the p value was accepted as 0.5 and was accepted as 0.05.

According to the data of the Erzurum Provincial Agriculture Directorate, there are 11.448 registered

enterprises in Erzurum province. The sample size of cattle herds for this study was determined as 372. The number of questionnaires to be distributed in Erzurum province and its districts were determined by proportioning this sample size to the rural population residing in the province and its districts. Kendall's tau ( ) non-parametric correlation test was used to determine the coefficients for the correlations between discrete data by using SPSS software programme.

## RESULTS and DISCUSSION

**Structural Analyse of the Enterprises:** The mean age of animal keepers was  $44.06 \pm 0.57$  years and the mean number of persons per household was  $6.8 \pm 0.2$  (Table 1). It has been reported that, in the European Union, of the total agricultural population, only 6% is of an age of 35 years and below, whilst more than half is of an age of 55 years and above (EU 2011). The question related to the educational profile of the cattle breeders was answered as illiterate by 11.6%, primary education by 73.6%, high school by 14.0% and graduate school by 0.8% of the respondents. According to data published by the Turkish Statistical Institute (TUIK 2010), the percentage of illiterate people in Erzurum province accounts for 8.6%, while the percentage of those who are literate but have not attended school is 25.8%, the percentage of locals that have completed primary school education is 39.9%, and locals with high school, graduate school and post graduate degree are 15.1%, 5.2% and 0.8%, respectively. Accordingly, it has been observed that the educational profile of locals dependent on the agriculture sector for a living is below the province average.

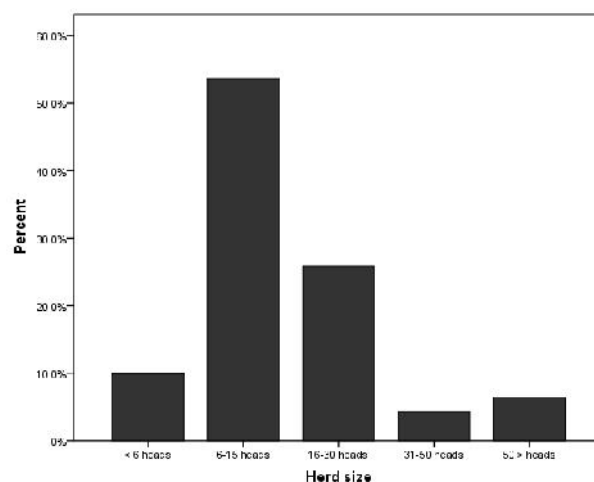
**Table 1. Descriptive statistics for variables**

<i>Variables</i>	<i>Mean</i>	<i>Std. Error</i>
<i>Age of Animal keepers (years)</i>	44,06	0,57
<i>Household (number of persons)</i>	6,77	0,17
<i>Farmland size (hectares)</i>	9,71	0,73
<i>Feed crop cultivation area size (hectares)</i>	3,12	0,22
<i>Herd size (head of)</i>	17,99	0,89
<i>Grazing period (mounts)</i>	5,60	0,06

While the average farming enterprise size in the European Union has been reported as 22 hectares (EU 2011), and in Turkey the mean value is 5.9 hectares (TUIK 2010). The mean acreage of the enterprises included in the sample size was determined as 9.74 hectares, whilst the acreage of feed crop cultivation area was 3.27 hectares (Table 1). According to these results, it was determined that the assets of the land owners

included in the study were above the average for Turkey but below the average for the European Union.

In a report published by the International Farm Comparison Network (IFCN 2011) for the year 2011, the average size of cattle herds across the globe was indicated as 3 heads with the number of countries with a herd size of 100 heads and more being only 11. In the same report, the average herd size for the 27 EU Member States was indicated as 12.3 heads. The number of cattle per enterprise in Turkey has been reported as 4.7 heads. TUIK (2010) has reported the percentile distribution of herds with a size of 1-4 heads, 5-9 heads, 10-19 heads and 20 heads as 59.7%, 21.3%, 12.8% and 6.2%, respectively. According to the responses given to the questionnaire, the average herd size for Erzurum province was calculated as  $17.80 \pm 0.89$  heads (Table 1).



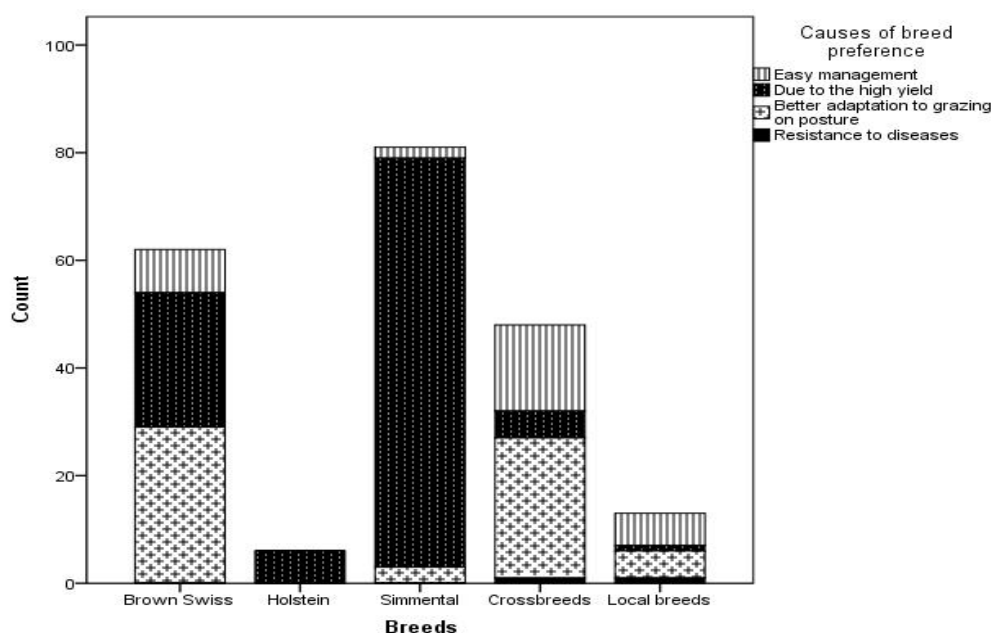
**Fig. 1 Percentage distribution of herd size**

Responses given by the participants to the questionnaire revealed that 16.0% were member to a breeders' association, and that 96.8% of the participants had not insured the animals they owned. Furthermore, it was ascertained that 86.7% of the cattle breeders did not keep any records on their farm.

According to data published by TUIK (2010), of the existing cattle population of the country, 36.9% was comprised of improved breeds, 41.4% of crossbreeds and 21.7% of local breeds. The same percentages for Erzurum province were 15.1%, 38.4% and 46.5%, respectively. Of the 6623 heads reported to be owned by the survey participants, 24.5% were of the Brown Swiss, 1.3% of the Holstein and 11.5% of the Simmental, whilst 35.3% were crossbreeds and 27.4% were local breeds. Cattle breeders were asked with which particular cattle breed they would like to continue their breeding activities. Accordingly, 31.5%, 3.2%, 28.3%, 22.5% and 14.5% of the participants indicated their breed of preference as the Brown Swiss, Holstein, Simmental, crossbreeds and local breeds, respectively. The common motives of preference

of the participants, who responded to the above mentioned question as the Brown Swiss, crossbreeds and local breeds, were the relatively easier management of

these breeds and their better adaptation to grazing on pastures (Fig. 2).



**Fig. 2** The distribution of reasons for cattle breed preference

Several studies conducted in various provinces of Turkey have shown that the share of feed costs in the total costs of cattle herds range from 79.76% to 86.60% (Demircan *et al.* 2006; Sahin 2001). Of the survey participants, only 1.4% performed extensive breeding. The mean length of the period during which animals were grazed on pasture was determined as  $5.8 \pm 1.0$  months for female animals and  $5.4 \pm 1.7$  months for males (Table 1). According to data published by the Ministry of Food, Agriculture and Livestock, the grazing capacity of grasslands located within the borders of Erzurum province is 309885 but the total grazing capacity of the province during the summer months was calculated as 349350 animal units. Overgrazing causes the degradation and deforestation of grasslands.

The question related to the source of roughage, demonstrated that 51.6% of the respondents produced their own roughage, whilst 20.2% purchased and 28.2% purchased roughage in addition to the roughage they produced themselves. While 16.7% of the respondents indicated that they produced mixed feed rations themselves, 80.4% stated that they purchased mixed feed rations, and another 2.9% stated that they both purchased and produced mixed feed rations. The insufficiency of grasslands and the obligation of cattle breeders to purchase a large part of their roughage, reduce the incomes.

In response to the question asking at what frequency and by which methods the need of animals for

drinking water was met, 11.4% of the respondents indicated that they provided water to their animals once a day, 63.6% indicated a watering frequency of twice a day, 22.0% stated a watering frequency of more than twice a day, whilst 3.0% indicated that they used automatic waterers. Water is of great significance in cattle breeding in terms of the maintenance of health and performance. Studies conducted in free stalls have shown that lactating cows consume water 5.2 to 9.4 times per day on average (Cardot *et al.* 2008; Huzzey *et al.* 2005; Jago *et al.* 2005). Responses given to the survey clearly show that there is a lack of use of automatic watering equipment, and thus, inadequacy in the *ad libitum* watering of animals.

The use of automatic milking devices was limited to 7.2% of the respondents. The survey revealed that, to a great extent (82.7%), milking was performed by women, and that the percentage of milking by men and milking by both men and women accounted for 9.9% and 7.2%, respectively.

Of the survey respondents, 45.1% indicated that they used manure as fuel, 15.5% indicated that they used manure as a soil fertilizer in their fields, 1.4% stated that they sold the manure they obtained from their animals, and finally, 38.0% indicated that they used manure as both fuel and a fertilizer. Accordingly, it was concluded that, cattle manure was mainly used as fuel. (Bhattacharya *et al.* 2000) have reported that the burning of manure with traditional methods increases  $\text{CO}_2$ ,  $\text{CO}$ ,

CH<sub>4</sub>, SO<sub>x</sub> and NO<sub>x</sub> emissions. In such systems, the burning of manure results in energy losses and causes adverse effects on both human health and the environment. Furthermore, the inappropriate storage of manure increases the risk of the spread of infectious diseases (Pell 1997).

**Health Analyse of the Herds:** In the report of the World Organisation for Animal Health (OIE 2012), it has been indicated that bluetongue, bovine tuberculosis, *Brucella abortus* infection and foot-and-mouth disease (FMD) are observed in cattle in Turkey. No specific report was available for the province, which indicated the prevalence of animal diseases in the cattle population of Erzurum. In 2010, 119.615 heads of cattle were transported from Erzurum province to 74 different provinces in Turkey. The highest number of animal transportation was reported for October (22.877 heads) and the lowest number was reported for May (1.557 heads), (Anonymous 2011). As can be understood from these data, animal transported from Erzurum province to a very large part of Turkey throughout the year. Furthermore, the respondents of the survey indicated that they had sold 2274 heads of cattle and had purchased 1464 heads of cattle of different age and sex, in a year. These results clearly show a high rate of animal movements, which in return creates a high risk of transmission of animal diseases between farms, and thus, the need for preventive measures being taken to protect herd health.

The option of vaccination in veterinary medicine constitutes an important tool for animal health, animal welfare, animal food production and public health. Vaccination is a cost effective method that can be applied to prevent the transmission of animal diseases, increase the efficacy of animal food production, and reduce and prevent the transmission of zoonotic and foodborne diseases to humans (Roth 2011). Animals can be protected by either the prevention of disease transmission through the use of antiseptics, disinfectants, antibiotics, etc. or the stimulation of immunity through vaccination and the administration of sera, probiotics, immunostimulators etc. Of the survey respondents, 41.9% indicated that they did not apply any kind of disinfection procedure. Another 59.1% indicated that they did not have any vaccination programme. In Turkey, wherever there is a risk of animal disease, the vaccination and medication of animals are performed by official veterinarians and private veterinary practitioners in accordance with the programme and instructions of the Ministry of Food, Agriculture and Livestock (Anonymous 1986). Responses given to the survey showed that of the survey participants, 5.9% vaccinated their animals themselves, 9.0% had their animals vaccinated by private veterinary practitioners, 28.2% had their animals vaccinated by official veterinarians, and 56.9%, apart from vaccinations performed by official

veterinarians and private veterinary practitioners, also vaccinated their animals themselves.

Parasitic infections cause economic losses in animal production due to several reasons, including mortality, decreased fertility and reduced feed conversion rates. The control of parasitic infections requires the determination of the prevalence of these diseases and the development of control plans. For this purpose, a multitude of studies have been conducted across the globe, including other countries and Turkey. Accordingly, the prevalence of *hydatidosis* in Erzurum province has been reported to range from 34.3% to 46.4% in some studies (Arslan and Umur 1997; Balkaya and Simsek 2010; Simsek *et al.* 2005). Furthermore, the prevalence of *Faciola hepatica* in Erzurum province has been indicated as 21.0% (Balkaya and Simsek 2010). In a study on *Toxicaravitulorum*, known to cause both mortality and morbidity in calves younger than 3 months of age, researchers (Avcioglu and Balkaya 2011) reported the prevalence of this parasite in Erzurum province as 22.2%. Responses given by the survey participants to the questionnaire demonstrated that 8.4% of the cattle breeders did not apply any parasitic control procedure, whilst those that applied parasitic control procedures once, twice and 3 or more times per year accounted for 29.4%, 49.4% and 12.8% of the participants, respectively. Despite the use of anti-parasitic drugs, the high prevalence of parasitic diseases reaching a level of 92% suggested that these drugs were not used appropriately and at the recommended doses. Furthermore, some parasites may have developed resistance against these drugs. For the effective control of parasitic diseases, which may cause production losses and zoonose transmission, organized and institutional measures should be taken, and animal breeders should be informed to raise awareness and ensure that preventive measures are put into practice.

Of the survey participants, only 1.1% indicated calving to be observed throughout the year, whilst 83.9% indicated that calving took place in winter and spring.

Artificial insemination, which is an important tool for animal improvement and reduced disease transmission, was used by only 8.1% of the survey participants, and the results of the questionnaire showed that 27.7% of the participants used both the artificial insemination and natural insemination techniques. It is reported that the use of artificial insemination in the European Union Member States reaches a level of 100% (Van Arendonk and Liinamo 2003). The intention of 63% of the survey participants to continue with their breeding activities with improved cattle breeds and the number of animals per herd being high are considered as advantages for the dissemination of artificial insemination. On the other hand, cattle farms being distributed over a wide area [total surface area of Turkey /total cattle population (6.86 hectares/heads), total surface area of Erzurum

province/total number of cattle (7.37 hectares/heads)], calving being seasonal and animal breeding activities being dependent on pasture grazing are considered as disadvantages.

In response to a question on the length of the dry period of cows, 1.6% of the survey participants indicated that they did not dry off their animals, whilst 1.9%, 2.1%, 5.1%, 20.8% and 68.3% of the participants indicated a dry period of 15 days, 30 days, 45 days, 60 days and more than 60 days, respectively. Researchers (Sorensen and Enevoldsen 1991) have reported that, the shortening of the dry period from 7 weeks to 4 weeks reduces milk production in the following lactation period, whilst the extension of the dry period from 7 weeks to 10 weeks brings about a slight increase in milk production in the following lactation period. Study results have shown that, the increase observed in milk yields in the following lactation period with the extension of the dry period is more evident in young cows, compared to adult cows. Furthermore, the over extension of the dry period reduces the milk yield of the animal over its economic life. On the other hand, the excessive shortening of the dry period or the animal not being dried off delays the first ovulation, protracts the service period, and thus, causes significant economic loss (Watters *et al.* 2009). In general, the dry off period being longer than 60 days in the cattle herds included in the study suggested that the duration of the lactation period was short and that the milk yields of the animals had decreased.

Early postnatal calf mortality has both short- and long-term effects on the performance of cattle. According to the responses given to the questionnaire, the mean rate of calf mortality until weaning was calculated as 16.49 ± 22.11%. In previous studies conducted in Turkey, this rate has been reported to range between 4.5 – 17.4% (Akbulut *et al.* 1993; Karakas 2002; Kocak *et al.* 2008). Furthermore, in other studies conducted in different countries, the rate of early postnatal calf mortality has been reported to range between 2.6- 7.9% (Tarrés *et al.* 2005; USDA 2002; Wittum *et al.* 1994). Early postnatal calf mortality may emerge as a result of multiple factors, including those related to the environment, management practices and the presence of pathogenic agents. Although the questionnaire included many questions related to the environment and management practices, it was determined that early postnatal calf mortality was statistically correlated with only cattle breed and the educational profile of cattle breeders. The percentages of imported breeds, crossbreeds and local breeds in the cattle herds included in the survey were calculated, and the coefficients of the correlations between the percentages of these breeds and the rate of postnatal calf mortality observed until weaning were determined as 0.071 (p=0.221), -0.136 (p= 0.029) and 0.192 (p= 0.01), respectively. A statistically significant and negative correlation was determined to exist between the share of

crossbreeds in cattle herds and the rate of early postnatal calf mortality. This result is in agreement with previous reports indicating that crossbreeds display higher survival rates (Gaines *et al.* 1966; Maltecca *et al.* 2006). The non-parametric correlation coefficient between the educational profile of cattle breeders and early postnatal calf mortality being calculated as -0.097 (p= 0.044) demonstrated that with higher educational profile, early postnatal calf mortality decreased.

### Conclusion and Recommendations

- 1- The low educational profile of persons involved in cattle breeding requires the predominant use of visual materials in training activities targeted at this group.
- 2- Despite the acreage of grasslands seeming to be adequate for cattle breeding activities on pasture, it has been observed that these pastures are of low quality and that there is a deficit in roughage supply in the region.
- 3- The region was characterized by intensive animal movements, which has been known as a major risk factor for animal health and public health, and it was concluded that veterinary services failed to meet the needs.
- 4- It was concluded that early postnatal calf mortality caused major economic losses and that the underlying reasons should be diagnosed with a view to develop feasible solutions.

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