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Economic losses Resulting from Respiratory Diseases in Cattle

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Abstract: The aim of this study is to identify economic losses resulting from respiratory diseases in cattle husbandry. The material for the study consisted of surveys conducted with a total of 45 cattle operations in the provinces of Kars and Ardahan which have substantial potential for animal husbandry in Turkey. These operations involved a total of 1198 head of cattle of which 254 had symptoms of respiratory illness. As a result, the prevalence of respiratory illness in the region was determined to be 21.20 and 55.60% of the respiratory illnesses were observed in the spring. In 44.40% of the operations that participated in the survey, animals were kept in drafty conditions and sick animals were kept together with healthy animals in 75.60% of the cases. In discussions with producers it was determined that the average economic loss per animal was $581.48 due to loss of milk production, reduced live weight and the expenses of early removal from the herd due to respiratory illness and treatment expenses varied between $6.26 and 15.96 depending on the animal group.

Key words: Bovine respiratory disease, economic losses, treatment expenses, Kars and Ardahan province, animal, Turkey

INTRODUCTION

As is true around the world, respiratory illness in cattle is frequently observed in Turkey and although, it is not generally fatal, these diseases do result in substantial economic loss. Due to the economic losses they cause, they are an increasingly important group of diseases in the animal husbandry economy and regions where animal husbandry is an important source of income (Yildirim and Burgu, 2005).

Various infectious agents such as bacteria, viruses and parasites, play a synergistic and interactive role in the etiology of respiratory system diseases observed in cattle (Irmak, 2005; Van der Felx-Klerx *et al*., 2001). Even though the primary factors are infectious agents, environmental and management factors are also important in clinical development and the rise in economic losses (Healy *et al*., 1993; Pritchard and Fishwick, 1997). Because the epizootiological characteristics of respiratory diseases are not sufficiently understood it is more difficult to take the measures required to bring the diseases under control.

The incidence of respiratory diseases varies depending on breed, age, nutrition, the way the animals are raised, lactation, genetic predisposition, environmental factors, climate and region. Studies conducted for the purpose of determining the epidemiological incidence of bovine respiratory diseases in Turkey and the region of Kars have reported that pneumonia rates vary between 3.6 and 65.83% (Bozukluhan and Gokce, 2009). Respiratory diseases are important for the producer and lead to economic losses caused by post-infection loss of condition, reduced milk production and inhibited development (Van der Fels-Klerx *et al*., 2001). The underlying reasons for the substantial economic losses inflicted by this disease are the fact that it affects animals from all breeds and ages, frequent relapses and the lack of adequate response to preventative measures and treatment (Jones *et al*., 1997).

A number of studies have been conducted regarding the financial/economic losses caused by respiratory diseases in various countries around the world (Snowder *et al*., 2006; Gardner *et al*., 1999; Griffin, 1997; Jim *et al*., 1993).

However, no scientific studies of the financial impact of respiratory disease in Turkey was encountered in a review of the literature. The purpose of this study is to identify economic losses resulting from respiratory diseases in cattle operations located in the Turkish provinces of Kars and Ardahan which have significant potential with regard to animal husbandry.

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MATERIALS AND METHODS

The research material consisted of survey data collected in face to face interviews between November 2010 and February 2011 with a total of 45 cattle operations in the provinces of Kars and Ardahan via the random sampling method. These operations involved a total of 1198 head of cattle of which 254 had symptoms of respiratory illness. The annual incidence rate was calculated using the number of cows exhibiting symptoms of the disease (cow/year)/the total number of cows in the herd (annual average).

In the financial analysis based on the data obtained from the producers, the partial budget method was used to calculate losses resulting from disease. In the determination of financial losses, average loss of productivity in animals exhibiting symptoms of respiratory disease in the operations that participated in the survey were examined regardless of the disease agent. Financial losses resulting from disease were grouped in 4 categories based on the answers given by producers to the survey namely loss of dairy production, decline in live weight, early disposal and treatment expenses and then total costs were calculated. Loss of productivity due to disease was calculated in the economic analysis and the savings in feed that occurred due to the animal's loss of appetite was taken into consideration. The net loss was calculated by deducting the revenue saved on feed from the total cost. The data were analyzed using the SPSS-11 package program. The average financial losses incurred per sick animal were calculated based on market conditions in March 2011.

RESULTS AND DISCUSSION

The average incidence of respiratory diseases was 21.20% and when calculated for each province, the average incidence in Kars was 17.7% and in Ardahan it was 26.0%. The total number of animals and the incidence of sick animals in the operations that participated in the survey as part of the study are shown in Table 1.

The study found that incidence of disease was an average of 11.63% in bulls, 19.05% in cows, 23.26% in heifers and 24.43% in calves. The survey conducted with producers revealed that on average bulls more frequently contracted the disease at 3 years of age, cows at 5 years of age and calves at 9 months.

The study calculated that on average each animal had 3.7 m^2 of space (min:1.63; max:10). According to 55.6% of the producers the space per animal was adequate but 44.4% viewed it as inadequate. According to 51.1% of the producers, ventilation of the space was inadequate and 46.7% said that upon entering the barn, the smell was nauseating (ammonia).

Table 1: The incidence of respiratory diseases in animal group

Animal group	Total number of animals	No. of sick animals	Incidence rate (%)
Bull	43	5	11.63
Cow	588	112	19.05
Heifer	129	30	23.26
Calf	438	107	24.43
Total	1198	254	21.20

Table 2: The months in which respiratory diseases were most prevalent

Months	Frequency	Percent (%)
January	4	8.8900
February	16	35.560
March	7	15.560
April	18	40.000
Total	45	100.00

Table 3: Clinical symptoms and percentages related to respiratory diseases

Clinical symptoms	Total number of holdings	No. of sick animals	Percent (%)
Does the animal have difficulty breathing?	34	77	30.43
Is the animal breathing abnormally?	11	75	29.64
Is the animal sneezing-wheezing?	25	67	26.48
Is the animal coughing?	44	162	64.03
Does the animal have a runny nose?	37	81	32.02

When the structures of the barns in the operations participating in the survey are examined, 68.9% were made of dirt and 31.1% of concrete. It was determined that in 44.4% of the operations, the animals were kept in drafty conditions and in 66.7%, the animals drank water outside of the barn in the Winter. About 75.6% of the producers said that they did not separate sick animals from healthy animals but kept them together.

The months in which respiratory diseases were most prevalent according to the data obtained from the survey are shown in Table 2. An examination of Table 2 shows that 55.6% of the respiratory diseases occurred in the fall and 44.4% in the Winter. The month in which this disease was most commonly observed was April. The clinical symptoms and percentages related to respiratory diseases in the survey conducted with producers are provided in Table 3.

The Table 3 shows that the most commonly observed symptoms in the animals with respiratory diseases are coughing and a runny nose. About 62.9% of the animals in the study had clear mucus running from their noses while 8.6% had green mucus and 28.4% had yellowish mucus. Moreover, it was determined that 59.0% of the sick

Table 4: Technical and financial parameters used in estimating bovine respiratory disease related losses

Parameters	N	Minimum	Maximum	Mean	SD
Animals affected by the rate of respiratory diseases each year in business (%)	45	7.00	61.00	21.20	12.358
Treatment time (day)	40	5.00	12.00	8.20	2.118
The average live weight (kg)	45	70.00	475.00	231.11	106.380
Loss of live weight (%)	45	5.00	30.00	11.32	6.659
The annual milk yield (lt)	40	1525.00	4575.00	3019.50	707.071
Loss of milk production (%)	40	8.33	57.14	28.99	14.657
Decreased feed consumption (%)	41	5.00	80.00	22.56	14.753

SD = Standard Deviation

Table 5: Financial losses due to bovine respiratory disease ($*)

Missing items ($)	Bull	Cow	Heifer	Calf
Loss of live weight	113.49	149.23	189.30	88.16
Loss of milk production	-	195.56	-	-
Treatment expenses	6.26	7.51	15.96	9.83
Maintenance-labor costs	6.26	14.49	6.26	21.25
Early removal from the herd**	478.39	478.39	182.00	86.19
Total losses	604.40	845.18	393.52	205.43
Income from decreased feed consumption	3.02	2.81	3.39	3.41
Total cost	601.38	842.37	390.13	202.02

*1$ = 1.597 TL **Suruden erken cikarma orani: 1.3% (Van der Fles-Klerx *et al*., 2001)

animals had a high fever and 31.3% had a medium-grade fever. Sores on the edges or inside the nose were not found. In the discussions that were held, 93.3% of the operations indicated that the average decline in the consumption of feed when the animals fell ill was 22.56%. In the survey conducted with producers, they said that no animals had died and no cows aborted due to respiratory illness in their operations. Therefore, these two cost categories were not included in the financial losses resulting from respiratory illness. The technical and financial parameters used in the financial analysis and the related values obtained during the survey are shown in Table 4.

Average financial losses in dairy cattle resulting from respiratory illnesses are shown in Table 5 according to the animal groups. Table 5 shows that the greatest loss from respiratory illness in cows was $842.37. The most important economic losses were expenses related to early removal from the herd and decreased revenues related to loss of milk production and loss of live weight, respectively. Treatment expenses varied between 6.25 and $15.96 according to the animal group.

According to the data obtained from discussions with the producers, the average decline in live weight was 5.8% in bulls, 9.0% in cows, 10.7% in heifers and 12.31% in calves. The study determined that in this respect the cost per animal of a reduction in live weight was $113.49 for bulls, $149.23 for cows, $189.30 in heifers and $88.16 in calves. Calculations also determined that average loss resulting from treatment expenses and lost productivity per animal was $581.48. According to these statistics it could be said that respiratory illnesses in the province of Kars which has a total of 402, 967 head of cattle and an incidence rate of 17.7%, result in annual economic losses of $41, 474, 153 and in losses of $32, 489, 311 in the province of Ardahan which has a total of 214, 898 head of cattle and an incidence rate of 26%.

Respiratory illnesses are one of the illnesses that cause the most substantial losses in productivity in beef and dairy cattle operations (Valarcher and Hagglund, 2006; Smith, 2000; Van der Fles-Klerx *et al*., 2001). These illnesses cause significant economic losses due to the fact that the diseases have a complex etiology with bacterial and viral factors, treatment options are difficult and the diseases are severe (Valarcher and Hagglund, 2006; Elvander, 1996; Fulton *et al*., 2002).

Diseases of the respiratory system are observed more frequently in cattle than in other species of animals. This is the result of the normal anatomic structure of bovine lungs and certain physiological features (Irmak, 2005). The spread of bovine pneumonias generally varies between countries and regions. This variation is related to geographical conditions weather conditions, the age, gender and breed of the cattle, resistance, feeding and hygiene in living conditions (Baysan, 2007).

In fact, these diseases can be induced by factors such as immunosuppressive stress, malnutrition, early weaning, dehydration, low or high temperatures and transportation. Dust particles and gases such as ammoniac and hydrogen sulfide in manure can act as an irritant and set the stage for respiratory disease (Callan and Garry, 2002). Large groups of animals, intensive stocking, elevated infection pressure as well as stress and keeping different animals and different ages together can result in susceptibility to respiratory illness (Valarcher and Hagglund, 2006). In the survey that was conducted it could be said that the irritating effect of dust particles and ammoniac and hydrogen sulfide gases from manure in connection with intensive stocking resulting from inadequate space for each animal and insufficient

ventilation in the barns coupled with exposure to freezing temperatures due to the fact that drinking water was located outdoors may all set the stage for respiratory illness. Studies conducted for the purpose of determining the incidence of bovine pneumonias in Turkey and the region of Kars have reported that pneumonia rates vary between 3.6 and 65.83% (Bozukluhan and Gokce, 2009). In this study however, the incidence of respiratory diseases was determined to be 21.2%. A number of factors may have played a role in the difference in incidence rates, including the total number of animals screened in the studies, regional differences as well as factors such as operational approaches, variations in the breeds and ages of the animals involved and differences in nutrition.

The clinical symptoms of respiratory disease are runny nose, rapid breathing, coughing, serous drainage, fever and loss of appetite (Van der Fkes-Klerx *et al*., 2001; Stovall *et al*., 2000). This study examined the economic losses in animals that displayed these symptoms at the operations.

In terms of the monthly course of the respiratory system diseases, these illnesses were observed most commonly in February (35.6%) and April (40%). In parallel with these results, Maity and Deb (1991) research determined that pneumonia rates varied depending on the season and the month with the highest percentage (23%) occurring in the winter followed by rainy months (21.7%).

Respiratory diseases are among the important problems faced by cattle producers and one of the reasons for substantial economic losses in the cattle industry (Collier, 1968; Houghton and Gourlay, 1984). Economic losses resulting from BRD (death losses, reduced feed efficiency and therapeutic costs) have been estimated at US$ 800-900 million annually (Chirase and Greene, 2000) and an additional loss of US$ 110 million annually in multiple processing (Smith *et al*., 1991). In another study annual losses to the US cattle industry are estimated to approach $1 billion while preventative and treatment costs are over $3 billion annually (Griffin, 1997). In this study, economic loss due to respiratory disease in the provinces of Kars and Ardahan which are located in the east of Turkey and have significant potential for animal husbandry was calculated as $73, 963, 464.

The literature review examined the effects of treatment for respiratory system illnesses on animal productivity since respiratory illnesses cause a number of direct and indirect losses (Van der Fles-Klerx *et al*., 2001; Stovall *et al*., 2000; Larson, 2005; Snowder *et al*., 2006). Extended time after the first calving, slower growth rates, more extensive labor requirements (Wittum *et al*., 1996; Ames, 1997), early slaughter age, reduced milk production (Elvander, 1996), increased mortality rates and treatment expenses (Fulton *et al*., 2002), farm management and care costs caused by the disease were all taken into account in the studies that were conducted (Speer *et al*., 2001; Van der Fels-Klerx *et al*., 2001). In the study, declining live weight and milk production and early slaughter age as well as treatment and care costs were examined in light of the data obtained from the producers. However, losses due to mortality were not calculated in this study because the producers stated that there were no deaths due to respiratory diseases in the survey that was conducted.

Although, average treatment expenses varied between $6.26 and 15.96 depending on the group of animals, this figure is similar to those found in other studies (Stovall *et al*., 2000; Fulton *et al*., 2002). Studies of carcasses have demonstrated how more than one treatment has a negative effect on growth (Speer *et al*., 2001; Van der Fles-Klerx *et al*., 2001). For example, Schneider *et al*. (2009) determined that the value of the carcass fell $23.23 in animals undergoing one treatment, $30.15 on those undergoing two treatments and $54.01 on animals treated 3 or more times.

The survey conducted with producers determined that average live weight loss was 11.32 kg although, this varied depending on the animal group. Stovall *et al*. (2000) reported a decline of 37.9% in the carcasses of heifers in a study that utilized USDA classifications.

CONCLUSION

Based on the data collected, researchers can conclude that losses resulting from respiratory diseases are far greater than treatment expenses and impaired animal performance. Consequently measures that will reduce the costs associated with respiratory diseases must be taken in operations by identifying effective prevention and control practices. In order to prevent economic losses from bovine pneumonia, treatment expenses, vaccinations, the use of preventative antibiotics, farm management and care must be reviewed and the cost of healing must be taken into account. Identifying and implementing an effective approach to care and management is necessary to reduce productivity losses in cattle and prevent economic losses resulting from treatment expenses.

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