Archives of Razi Institute, Vol. 74, No. 4 (2019) 441-446

Short Communication

Characterization and Pattern of Culling in Goats

Didarkhah [1]*, M., Vatandoost [2], M., Dirandeh [3], E., Dadashpour Davachi [4], N.

1. Faculty of Agriculture Sarayan, University of Birjand, Birjand, Iran
2. Department of Agriculture, Payame Noor University
3. Department of Animal Science, Sari Agricultural Sciences and Natural Resources University, Sari, Mazandaran, Iran
4. Department of Research, Breeding and Production of Laboratory Animals, Razi Vaccine and Serum Research Institute, Agricultural Research, Education and Extension Organization (AREEO), Karaj, Iran

Received 11 February 2019; Accepted 21 February 2019
Corresponding Author: masooddidarkhah@birjand.ac.ir

ABSTRACT

In order to describe the proportion and pattern of culling in commercial goatherds, this survey was carried out in an industrialized goatherd in Torbat-e-Jam, Iran, over a period of 18 years from 1996 to 2013. In total, the data of 3945 goats were used in this study. Finally, out of all samples, 499 (12%) goats were culled. The involuntary culling was performed mainly due to shortage disorders (3.8%), viral disorders (3.3%), microbial diseases (2.8%), and other disorders (2.1%). Sheep pox was the most important reason (64%) for culling due to viral disorders. Tick paralysis was the most common parasitic disease that contributed to culling and responsible for 88% of parasitic disorders. On the other hand, enterotoxemia accounted for 55% of microbial disorders is considered the most common cause of culling. The high proportion of culling due to shortage disorders, especially nutritional deficiencies should be considered the most important cause of culling. It requires precautionary measures and planning in order to reduce the aforementioned rate.

Keywords: Culling, Goat herds, Microbial disease, Viral disease

Caractérisation et Modèle de Réforme (abattage) chez les Chèvres

Résumé: Afin de décrire la proportion et le modèle de l'abattage chez les chèvres commerciales, cette enquête a été menée sur une période de 18 ans, de 1996 à 2013, dans un chevrier industrialisé. Au total, les données de 3945 chèvres ont été utilisées dans cette étude. Dans l'ensemble, 499 (12%) chèvres ont été abattues. L'abattage involontaire était principalement dû à des troubles de pénurie (3,8%), à des troubles viraux (3,3%), à une maladie microbienne (2,8%) et à d'autres troubles (2,1%). En raison de pénuries, les désordres ont représenté 30% des dispositions des chèvres abattues. La variole ovine était la principale raison (64%) de l'abattage en raison de troubles viraux. La paralysie due aux tiques était la maladie parasitaire la plus courante ayant contribué à l'abattage. En moyenne, elle était responsable de 88% des troubles parasitaires. En revanche, l'entérotoxémie représentait 55% des troubles microbiens. La forte proportion de réforme due à des problèmes de pénurie, en particulier de carences nutritionnelles, doit être considérée comme une perte économique importante et des mesures de précaution sont nécessaires pour réduire cette perte.

Mots-clés: Abattage, Troupeaux de chèvres, Maladie microbienne, Maladie virale

INTRODUCTION

The ability to prevent goat culling due to low production, low fertility, or illness is greater than lifetime reflections. Important and influential factors in the livestock economy are a number of potentially life-saving products up to the time of release; however, this is less relevant, and there are no plans for record-keeping, genetic evaluation, and effective management factors. In Iran, a limited number of studies were conducted on the factors affecting the length of life-span (Safari et al., 2005; Mandal et al., 2007). Persistence is one of the most important factors affecting the profitability of sheep (Southey et al., 2001). Mortality is a complex issue influenced by environmental factors, such as weather conditions, nutrition, management, as well as diseases and infections. One of the critical goals in dairy farm husbandry is economic profit via mainly increasing the milk and calf production. Culling management is one of the most important determinants of this goal (Allaire et al., 1977; Van Arendonk and Dijkhuizen, 1985; Azizzadeh, 2011). Culling is a complex issue, and many factors are involved in this regard. Dairy cows may be culled for either involuntary reasons (i.e., mortality, acute disease, and infertility) or voluntary reasons (i.e., low yield). Both biology and management affect the decision to cull. When making a decision, Sheep farmers consider five major reasons, including illness, low milk yield, conception status, stage of lactation, and parity. Culling increases profits potentially or reduces costs through the replacement of sick animals that are expensive to keep and may die or low yielding cows or sheep. The culling rate, which varies from herd to herd, depends on input and output price, yields, seasonal variation of price, incidence of disease, and other variable factors (Van Arendonk and Dijkhuizen, 1985; Van Arendonk, 1988; McCullough and DeLorenzo, 1996; Grohn et al., 1997). There are 43,754,000 commercial sheep herds in Iran (www.amar.org.ir). Althougha limitednumber of studies have investigated the pattern of culling, further knowledge of factors controlling culling may lead to the development of programs for the better management of culling under Iranian sheep farming conditions. Therefore, the present study was carried out to assess the characterization and pattern of culling in commercial goatherds in Iran.

MATERIAL AND METHODS

The study was performed in Khorasan Razavi Province, Torbat-e-Jam, as one of the most important centersof dairy product manufacturing located in the northeast of Iran. The present study was conducted in acommercial goat farm. A total of 3,945 goats were investigatedfor a period of 18 years. This herd wasused due to the completeness of its records and farmer compliance. According to local weather conditions, (usually from late April) ewes used graze feed. Among the ward pastures are sent daily around the station. Due to pasture forage conditions, typically to early July and harvest time wheat and barley are grazed farmlands in the city. In the winter, rain and snow weather flock transfer to the station and the set animal diets tailored to each group (pregnant ewes, Brh- Male and female, and rams) separately to three meals a day Are manually fed. All sheep fed on total mixed rations (i.e., corn silage, alfalfa hay, and concentrates). The study population was composed of all goatspresented in herdsduring 1996 to 2013 (Table 1). Primary reasons for culling were broadly categorized into fourgroups. Table 2 tabulates the definition of each culling reason used in this study.

RESULTS AND DISCUSSION

With the rapid growth ofthe world population, the need for human flesh as a source of protein isincreasingly vital. Despite all efforts, various livestock diseases play a deterrent role in human achievement to supply protein (Regassa et al., 2013). Culling is one of the most complex decisions sheep farmers make on an almost day-to-day basis. In general, both biological and managerial factors can impress sheep farmers' decisions. The major aspects considered in culling decisions are parity, health status, fertility status, milk yield status, and stage of lactation,

as well as value of animal replacement and its cost (Allaire et al., 1977; Cobo-Abreu et al., 1979; Milian-Suazo et al., 1988). Beaudeau et al. (1993) estimated that more than half of all cullingisassociated with health disorders.Out of 15 health disorders studied in Finnish Ayrshire cows, all except retained placenta had an impact on culling (Rajala-Schultz and Gröhn, 1999a). Morbidity plays a significant role in culling decisions, and economic impact on the profitability of a herd will be considered, especially at the time when afarmer is deciding whether to keep the cow or cull it (Gröhn et al., 2003). The indirect effects of diseases on culling are manifested through decreased milk yield and/or fertility of a cow. Many diseases lower milk production (Detilleux et al., 1997; Rajala and Grohn, 1998; Rajala-Schultz and Gröhn, 1999a), and it might be the low yield that triggers the decision to have the cow removed rather than the disease occurrence itself. Open cows are more likely to leave the herd than pregnant ones. The results ofthe current experiment indicated that the reproductive status of a sheep was the most important single factor in a farmer's culling decision. This result is in agreement with those of similar studies demonstrating that the failure to conceive at first service or a longer period of open days increases the risk of culling (Martin et al., 1982; Erb et

Table 1. Study population

Year	1996-1998	1999-2001	2002-2004	2005-2007	2008-2010	2011-2013	1996-2013
Total	631	425	691	725	815	658	3945

Table 2. Definition of culling reason categories

Category	Definition
Microbial disorders	Charbon, enterotoxemia, mastitis, and brucellosis
Viral disorders	Sheep pox, foot and mouth, and plague
Parasitic foreign disorders	Tick paralysis, myiasis, and scabies
Parasitic internal disorders	Liver fluke, as well as nematode parasites of stomach and intestines
Due to shortage	Rickets, copper deficiency, and cobalt deficiency
Due to vitamin deficiency	White muscle

Table 3. Effect of microbial track disorders on the percentage of culling

Disorder / Year	1996-1998	1999-2001	2002-2004	2005-2007	2008-2010	2011-2013	1996-2013
Tick paralysis	83% (05)	100% (02)	60% (03)	100% (12)	89% (08)	88% (30)	88% (60)
Myiasis	17% (01)	00% (00)	03% (02)	00% (00)	11% (01)	12% (04)	22% (8)
Total	100% (06)	100% (02)	100% (05)	100% (12)	100% (09)	100% (34)	100% (68)

Table 4. Effect of viral track disorders on the percentage of culling

Disorder / Year	1996-1998	1999-2001	2002-2004	2005-2007	2008-2010	2011-2013	1996-2013
Charbon	22% (02)	00% (00)	00% (00)	12% (02)	29% (04)	14% (08)	14% (16)
Enterotoxemia	22% (02)	80% (02)	92% (12)	52% (09)	35% (05)	55% (30)	55% (60)
Mastitis	36% (03)	00% (00)	08% (01)	05% (01)	15% (02)	13% (07)	13% (14)
Brucellosis	22% (02)	20% (01)	00% (00)	30% (05)	21% (03)	18% (10)	18% (21)
Total	100% (9)	100%(03)	100% (13)	100% (17)	100% (14)	100% (55)	100% (111)

Table 5. Effect of parasitic foreign track disorders on the percentage of culling

Disorder / Year	1996-1998	1999-2001	2002-2004	2005-2007	2008-2010	2011-2013	1996-2013
Sheep pox	62% (05)	58% (07)	63% (12)	71% (25)	60% (14)	65% (22)	64% (85)
Foot and mouth	48% (03)	42% (05)	37% (07)	29% (10)	40% (09)	35% (12)	36% (46)
Plague	0% (00)	0% (00)	0% (00)	0% (00)	0% (00)	0% (00)	0% (00)
Total	100% (8)	100% (12)	100% (19)	100% (35)	100% (23)	100% (34)	100% (131)

al., 1985; Beaudeau et al., 1995). Moreover, Grohn et al. (1998) reported that after a cow conceives, her risk of culling decreases. Improved lambing percentage is the biggest contributor to higher profits on New Zealand sheep farms. Many sheep breeders have selected and bred ewes for increased fecundity over the last 4 decades. Lamb survival is an important issue in highly fecund sheep flocks. In contrast to other studies, metabolic and digestive track disorders constituted a considerable proportion of culling in the present study. According to the results of the present study, among other health-related culling reasons, those related to metabolic and digestive track disorders are the second most frequent ones. This is likely to be related to nutritional and feeding problems in the studied farm. Some dairy cow diseases related to metabolic and digestive track disorders occur only at or around calving (e.g., milk fever) (Gröhn et al., 2003; Rajala-Schultz and Gröhn, 1999a, b). Milk fever increased the risk of culling at the time of occurrence and the end of lactation. In two main studies, cows with milk fever were observedto be at greater risk of being culled within 45 days postpartum (Grohn et al., 1998). Most previous studies did not report any effects, maybe because the moment of culling was not accounted for within the lactation. A few studies investigated the

Table 6. Effect of parasitic internal disorders on the percentage of culling

Disorder	Year	1996-1998	1999-2001	2002-2004	2005-2007	2008-2010	2011-2013	1996-2013
Liver fluke		50% (01)	50% (01)	00% (00)	66% (02)	00% (00)	50% (03)	54% (7)
Nematode parasites of stomach and intestines		50% (01)	50% (01)	00% (00)	34% (01)	00% (00)	50% (03)	46% (6)
Total		100% (02)	100% (02)	100% (00)	100% (03)	100% (00)	100% (6)	100% (13)

Table 7. Effect of nutritional shortage on the percentage of culling

Disorder	Year	1996-1998	1999-2001	2002-2004	2005-2007	2008-2010	2011-2013	1996-2013
Rickets		36% (06)	30% (07)	62% (15)	65% (18)	60% (16)	55% (09)	46% (71)
Copper deficiency		25% (07)	43% (10)	15% (07)	25% (14)	25% (10)	25% (02)	33% (50)
Cobalt deficiency		18% (05)	26% (06)	21% (10)	09% (03)	13% (05)	16% (03)	21% (32)
Total		100% (18)	100% (23)	100% (32)	100% (35)	100% (31)	100% (14)	100% (153)

Table 8. Effect of vitamin deficiency on the percentage of culling

Disorder	Year	1996-1998	1999-2001	2002-2004	2005-2007	2008-2010	2011-2013	1996-2013
White muscles		100% (02)	100% (07)	100% (00)	100% (07)	100% (02)	100% (03)	100% (23)
Total		100% (02)	100% (07)	100% (00)	100% (07)	100% (02)	100% (03)	100% (23)

Table 9. Proportion of health problems contributing to culling based on the type of disease in 18 years (1996-2013)

Type of disease	Frequencyofculled sheep diseases in 18 years (1996-2013)
Microbial disorders	2.8% (111/3945)
Viral disorders	3.3% (131/3945)
Parasitic foreign disorders	1.7% (68/3945)
Parasitic internal disorders	0/32% (13/3945)
Due to shortage	3.8% (153/3945)
Due to vitamin deficiency	0/58% (23/3945)
Total	12% (499/3945)

Table10. Percentage of culled sheep due to health problems based on raised sheep in the herd in 18 years (1996-2013)

Type of disease	Proportion of culled sheep based on sheep raisedin the herd in 18 years (1996-2013)
Microbial disorders	22% (111/499)
Viral disorders	26% (131/499)
Parasitic foreign disorders	13% (68/499)
Parasitic internal disorders	2% (13/499)
Due to shortage	30% (153/499)
Due to vitamin deficiency	4% (23/499)
Total	100% (499/499)

effect of lameness on culling, andmost studies reported no significant effect in this regard (Beaudeau et al., 1995). This result is in agreement with the findings of the current study. A possible explanation is that many foot problems stay on a subclinical level and perhaps do not play a major role in culling decisions. The first step is to promote longevity and disease reduction by environmental factors, such as nutrition, health, hygiene,as well asmanagement and enhancement ofgenetic resistance to the disease. In contrast to other studies (Grohn et al., 1998; Stevenson and Lean, 1998), the reasons for involuntary culling, such as infectious diseases, constituted a considerable proportion of culling in the present study. This is likely to be related to the diseases present in the herd or region, as there is a strong relationship between the existing diseases in a herd and culling rate (Grohn et al., 1998; Stevenson and Lean, 1998). Since the disease is the most important reason for the early elimination of ewes in the studied tract, it is possible to impede the spread of the disease and early ejaculation through the implementation of accurate and well-documented health and animal programs, as well as regular vaccination programs. Another reason was the removal of echoes sooner than the deadline for eating, which can be performed through regular programs of mating and appropriate nutritional programs.

In conclusion, the disease is the main cause of livestock mortality; therefore, the first step to increase the lifetime of sheep is to reduce the incidence rate of disease that can be achieved by the improvement off lock management, including health status, nutrition, as well as vaccination and immunization scheduled plans. With minimal environmental factors affecting shelf life can prevent from reducing the number of ewes in thefinal parities. Although a number of studies have investigatedthe elimination pattern, greater knowledge of the control of the elimination factors can lead to the development of programs to better eliminate dairy production in Iran. For this purpose, it is required to carry outfurther studiesfor thedetermination ofthe characteristics and patterns of removal in commercial herds.

Ethics

We hereby declare all ethical standards have been respected in preparation of the submitted article.

Conflict of Interest

The authors declare that they have no conflict of interest.

References

Allaire, F.R., Sterwerf, H.E., Ludwick, T.M., 1977. Variations in Removal Reasons and Culling Rates with Age for Dairy Females1. J Dairy Sci 60, 254-267.

Azizzadeh, M., 2011. Characterisation and pattern of culling in Holstein-Friesian dairy herds in Khorasan Razavi Province, Northeast of Iran. Vet ResForum 2, 254-258.

Beaudeau, F., Ducrocq, V., Fourichon, C., Seegers, H., 1995. Effect of disease on length of productive life of French Holstein dairy cows assessed by survival analysis. J Dairy Sci 78, 103-117.

Beaudeau, F., Henken, A., Fourichon, C., Frankena, K., Seegers, H., 1993. Associations between health disorders and culling of dairy cows: a review. Livest Prod Sci 35, 213-236.

Cobo-Abreu, R., Martin, S.W., Stone, J.B., Willoughby, R.A., 1979. The rates and patterns of survivorship and disease in a university dairy herd. Can Vet J 20, 177-183.

Detilleux, J.C., Grohn, Y.T., Eicker, S.W., Quaas, R.L., 1997. Effects of left displaced abomasum on test day milk yields of Holstein cows. J Dairy Sci 80, 121-126.

Erb, H.N., Smith, R.D., Oltenacu, P.A., Guard, C.L., Hillman, R.B., Powers, P.A., *et al.*, 1985. Path model of reproductive disorders and performance, milk fever, mastitis, milk yield, and culling in Holstein cows. J Dairy Sci 68, 3337-3349.

Grohn, Y.T., Ducrocq, V., Hertl, J.A., 1997. Modeling the effect of a disease on culling: an illustration of the use of time-dependent covariates for survival analysis. J Dairy Sci 80, 1755-1766.

Grohn, Y.T., Eicker, S.W., Ducrocq, V., Hertl, J.A., 1998. Effect of diseases on the culling of Holstein dairy cows in New York State. J Dairy Sci 81, 966-978.

Gröhn, Y.T., Rajala-Schultz, P.J., 2000. Epidemiology of reproductive performance in dairy cows. Anim Reprod Sci 60-61, 605-614.

Gröhn, Y.T., Rajala-Schultz, P.J., Allore, H.G., DeLorenzo, M.A., Hertl, J.A., Galligan, D.T., 2003. Optimizing replacement of dairy cows: modeling the effects of diseases. Prev Vet Med 61, 27-43.

Mandal, A., Prasad, H., Kumar, A., Roy, R., Sharma, N., 2007. Factors associated with lamb mortalities in Muzaffarnagari sheep. Small Ruminant Res 71, 273-279.

Martin, S.W., Aziz, S.A., Sandals, W.C.D., Curtis, R.A., 1982. Theassociationbetween clinical disease, production and culling of holsten-friesian cows. Can J Anim Sci 62, 633-640.

McCullough, D.A., DeLorenzo, M.A., 1996. Effects of Price and Management Level on Optimal Replacement and Insemination Decisions1. J Dairy Sci 79, 242-253.

Milian-Suazo, F., Erb, H.N., Smith, R.D., 1988. Descriptive epidemiology of culling in dairy cows from 34 herds in New York State. Prev Vet Med 6, 243-251.

Rajala-Schultz, P.J., Gröhn, Y.T., 1999a. Culling of dairy cows. Part I. Effects of diseases on culling in Finnish Ayrshire cows. Pre Vet Med 41, 195-208.

Rajala-Schultz, P.J., Gröhn, Y.T., 1999b. Culling of dairy cows. Part II. Effects of diseases and reproductive performance on culling in Finnish Ayrshire cows. Prev Vet Med 41, 279-294.

Rajala, P.J., Grohn, Y.T., 1998. Effects of dystocia, retained placenta, and metritis on milk yield in diary cows. J Dairy Sci 81, 3172-3181.

Regassa, A., Moje, N., Megersa, B., Beyene, D., Sheferaw, D., Debela, E*., et al.*, 2013. Major causes of organs and carcass condemnation in small ruminants slaughtered at Luna Export Abattoir, Oromia Regional State, Ethiopia. Prev VetMed 110, 139-148.

Safari, E., Fogarty, N.M., Gilmour, A.R., 2005. A review of genetic parameter estimates for wool, growth, meat and reproduction traits in sheep. Livest Prod Sci 92, 271-289.

Southey, B.R., Rodriguez-Zas, S.L., Leymaster, K.A., 2001. Survival analysis of lamb mortality in a terminal sire composite population. J Anim Sci 79, 2298-2306.

Stevenson, M., Lean, I., 1998. Descriptive epidemiological study on culling and deaths in eight dairy herds. Aust Vet J 76, 482-488.

Van Arendonk, J.A.M., 1988. Management Guides for Insemination and Replacement Decisions. J Dairy Sci 71, 1050-1057.

Van Arendonk, J.A.M., Dijkhuizen, A.A., 1985. Studies on the replacement policies in dairy cattle. III. Influence of variation in reproduction and production. Livest Prod Sci 13, 333-349.